

## Howto: setup DHCP Server on FreeBSD

I am running a home network. Most likely in violation of the terms of service I have with my ISP. Yeah I know living on the edge. I think I will move up to running with scissors for my next step in bravado.

This little article will teach a little bit about the DHCP server and how to set it up on a FreeBSD machine. And damn if this isn't going to be loads of fun.

This is probably one of the few things where the [FreeBSD Handbook](#) actually gives a decent description on how to set up [DHCP](#). Remind me to send them a cookie.

### **DHCP and why should I care:**

Well unless you plan on buying a DSL line for every computer you've got this is probably the way to go. Now just a side note. I will also be getting into some gateway issues here. Why because that is how mine is setup. I will try to keep that near the end of the article.

DHCP stands for: Dynamic Host Configuration Protocol. It is basically a way to give or receive an address (IP) for your computer or to have your computer give the IPs to other computers. DHCP servers are kinda like the planning and zoning dept. When you build a house they give it an address. The DHCP server is in charge of giving out addresses (IPs) to your computer. Unlike the zoning dept. Your IP is leased from the DHCP server ( This also known as dhcpd ). That is because if your computer decides it wants to move to a different section of town, say for example, the landfill your DHCP server will give some other more worthy computer that address eventually.

So you know the server is the machine in charge, what about the other machines that aren't servers. We call them clients. The DHCP server can make them offers they can't refuse. Well they can but then they suffer horribly. These clients want an address from the server. They have to ask, but if they ask nicely like say, "May I please have an IP address almighty DHCP server?" Then the ego of the server being fed grants a lease to a computer and gives it an IP. The computer is at the beginning stages of being on a network. The client must also be told what is the gateway ( If there is one). That is the place traffic flows in and out of ( Sometimes this is a router).And the subnet mask is the equivalent to the zip code that the computers on the network belong to.

The server is what you want to create in the computer that is going to be in charge. I say this loosely. The DHCP server can be any computer but it is easier on a small network if it is the machine in charge.

In order to install the software and the files that will work with the DHCP server, you must be logged in as root.

**Addendum: 3/17/04. The port for isc-dhcp has changed slightly this paragraph reflects the new port.**

**Ports** (not the kind for ships)

In the ports tree is a program called [isc-dhcp3-server](#). It is usually in /usr/ports/net/isc-dhcp3-server directory. You will need to install this port. Neat way to do that is this:

```
cd /usr/ports/net/isc-dhcp3-server
make clean &make &make install &rehash
```

This will install the port. We then need to customize a few things to get it running. You will need the following:

A [NIC](#) (Network Interface Card) please make sure your computer has one. When you are running a gateway it will need to have two. We are dealing with just one for right now.

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Make sure your computer sees your NIC. At the prompt type:

```
ifconfig
```

You should see something like this:

```
rl0: flags=8843 <UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST >mtu 1500
  inet6 fe80::204:acff:fe06:6837%fxp0 prefixlen 64 scopeid 0x1
  inet 10.0.0.12 netmask 0xfffff00 broadcast 10.0.0.255
  ether 00:04:ac:xx:xx:xx
  media: Ethernet autoselect (100baseTX)
  status: active
lp0: flags=8810 <POINTOPOINT,SIMPLEX,MULTICAST >mtu 1500
faith0: flags=8002 <BROADCAST,MULTICAST>mtu 1500
lo0: flags=8049 <UP,LOOPBACK,RUNNING,MULTICAST >mtu 16384
  inet6 ::1 prefixlen 128
  inet6 fe80::1%lo0 prefixlen 64 scopeid 0x4
  inet 127.0.0.1 netmask 0xff000000
ppp0: flags=8010 <POINTOPOINT,MULTICAST > mtu 1500
sl0: flags=c010 <POINTOPOINT,LINK2,MULTICAST >mtu 552
```

The rl0 represents the type of NIC in this box it may not be what is yours that is okay you can see results like this:

```
de      # DEC/Intel DC21x4x (`Tulip")
em      # Intel PRO/1000 adapter Gigabit Ethernet Card (`Wiseman")
txp     # 3Com 3cR990 (`Typhoon")
vx      # 3Com 3c590, 3c595 (`Vortex")
dc      # DEC/Intel 21143 and various workalikes
fxp     # Intel EtherExpress PRO/100B (82557, 82558)
pcn     # AMD Am79C97x PCI 10/100 NICs
rl      # RealTek 8129/8139
sf      # Adaptec AIC-6915 (`Starfire")
sis     # Silicon Integrated Systems SiS 900/SiS 7016
ste     # Sundance ST201 (D-Link DFE-550TX)
tl      # Texas Instruments ThunderLAN
tx      # SMC EtherPower II (83c170 `EPIC")
vr      # VIA Rhine, Rhine II
wb      # Winbond W89C840F
xl      # 3Com 3c90x (`Boomerang", `Cyclone")
```

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```
bge      # Broadcom BCM570x (``Tigon III")
```

Remember computers start counting at 0 not 1 so the first device is called 0 not 1. That is why my NIC is rl0. These represent most of the common types of NICs supported by the kernel. As a matter of fact this is a copy of the section in the kernel that shows it with some of the extraneous information left off.

Patch Cords straight pass through types. Not crossover types. [Addendum 4/15/03 Changed to bring a up better link.](#)

A HUB. This is the device all of the computers plug into. Think of it as the post office. The IPs are addresses on your computers. The hub is the post office the mail goes through before it reaches your house. [Addendum 4/15/03 Changed to bring a up better link.](#)

At least one other computer. Preferably a few more. There is no point in setting up a dhcp server if it is the only computer you've got.

If you have only two computers and no hub you can still do this but you would connect the two computers together from one NIC to the other NIC with a crossover patch cable.

Now a couple of side notes. The DHCP server uses something in the kernel known as the "bpf" (Berkeley Packet Filter). In early versions of FreeBSD this was commented out. In version 4.4 and up I have not seen it commented out. Using bpf is considered a bit more of a security risk. In that it may allow certain packet sniffers in. I have been using it for a while now and have had no problems related to bpf. But if you are working at a top secret NSA system you may want to think about it. Otherwise you should be fine

We need to give the box you are working on an IP address of it's own. You do that by editing rc.conf which is located in your /etc/ directory.

```
ee /etc/rc.conf
```

You can leave off the /etc/ if you are already in that directory. You will need to add this line to the rc.conf file:

```
ifconfig_XXX="inet XXX.XXX.XXX.XXX netmask XXX.XXX.XXX.XXX"
```

Okay ifconfig\_XXX replace the XXX with the NIC in your computer. Example ifconfig\_fxp0 . "inet XXX.XXX.XXX.XXX replace the XXX with the IP that NIC will have. I recommend something outside the lease range ( more on that later). Example "inet 10.0.0.12 . netmask XXX.XXX.XXX.XXX" replace the XXX with the subnet mask. Example 255.255.255.0" . So the whole line when it is done will look like this:

```
ifconfig_rl0="inet 10.0.0.12 netmask 255.255.255.0"
```

One you have added those lines to rc.conf Esc and save the changes. Because unless you restart you have not yet told the NIC what it's IP will be. Want to do it without a restart. At the command prompt type in this line:

```
ifconfig rl0 10.0.0.12 netmask 255.255.255.0
```

Basically you have told the computer that at startup you want to configure your NIC (ifconfig\_) for an internal network (inet) with an IP of 10.0.0.12 and a subnet of 255.255.255.0 . Very cool. Also because of the this IP address is in the range of the setup of the dhcpd.conf( which you are coming up on) this will identify

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this NIC as the broadcast point for the dhcp server to the clients. Pocket protectors and tape to hold your glasses together are available at the front desk.

Now let's see what was installed. Type this at prompt for a list of files in a directory:

```
ls -a /usr/local/etc/
```

The directory should have at least this file in it:

```
dhcpd.conf.sample
```

You can read through it if you want. It is long confusing to newbies ( like me ) and boring. Nobody dies in the whole story. So why even bother. Well because in order for dhcp server to work you will need a dhcpd.conf file. And there will need to be some stuff in it.

You can create a dhcpd.conf file by going to easy editor and the name you wish to give the file. You can create the file with Easy Editor (ee). Please make sure you are in or have cd to /usr/local/etc/ directory when placing this file.

```
ee dhcpd.conf
```

You will want to add these lines to it:

```
#dhcpd.conf file
```

```
#options and netmask
```

```
#Place a domain name here if you have one.
```

```
#You can make one up. If you do not have a real domain name do not use a real one
```

```
#and do not use a real end like .com ,.net ,.org. Use something like "unreal.fakenet"
```

```
option domain-name "example.com" ;
```

```
#replace xxx with the IP of the DNS.
```

```
#If you have more than one use a comma between them
```

```
option domain-name-servers xxx.xxx.xxx.xxx;
```

```
#IP of the gateway if you have one comment out this line if you don't have one.
```

```
option routers xxx.xxx.xxx.xxx ;
```

```
#the dynamic DNS update
```

```
ddns-update-style none;
```

```
#lease times in seconds for clients
```

```
default-lease-time 3800;
```

```
max-lease-time 18000;
```

```
# IP subnet netmask and lease range of addresses
```

```
subnet 10.0.0.0 netmask 255.255.255.0 {range 10.0.0.20 10.0.0.150;}
```

```
#The subnet mask for the client
```

```
option subnet-mask 255.255.255.0;
```

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#end of dhcpd.conf

Items with # in front of them are comments, they are not read by the computer they are there for your information.

That is the file for a dhcpd (server). It uses what is known as private IPs. You may have seen another example of private IPs such as. 192.168.... or 172.16.....I use the 10.0... set. Why? Because I can. If you have a range of real IPs you can use them. Just make sure you have subnets and netmasks setup correctly.

The lease range is what the name says. It is the range of possible addresses (IPs) you can have. My range starts at 10.0.0.150 and can go down to 10.0.0.20. I don't know why it gives the high numbers first but it does and it works fine that way.

Going into a discussion of what subnets and netmasks are isn't really all that necessary. You can read this article on it [here](#).

There is a lot of customizing that can be done to a dhcpd.conf file. I am keeping it simple here. You can read the [man dhcpd.conf](#) pages for more info.

### Hostname

You will need to add these lines to your rc.conf in your /etc/directory.

```
ee /etc/rc.conf
```

```
#Place a domain name here if you have one.  
#You can make one up. If you do not have a real domain name do not use a real one  
#and do not use a real end like .com ,.net ,.org. Use something like "Dave.unreal.fakenet"  
hostname="name.example.com"
```

Remember your dhcpd.conf file above? The line option domain-name "example.com" ;. It uses just the second and third part of the hostname. They should match. The hostname is the computer name. Some of the client computers may require it for dhcp.

### Startup

Okay you want to start your dhcp server. Here is how you do that at the prompt type:

```
/usr/local/sbin/dhcpd
```

You should see something like this :

```
Internet Software Consortium DHCP Server V3.0rc11  
Copyright 1995-2001 Internet Software Consortium.  
All rights reserved.  
For info, please visit http://www.isc.org/products/DHCP  
Wrote 0 leases to leases file.  
Listening on BPF/r10/00:e0:29:19:fe:92/10.0.0.0/24  
Sending on BPF/r10/00:e0:29:19:fe:92/10.0.0.0/24  
Sending on Socket/fallback/fallback-net
```

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Now what you may see will be slightly different depending on what version you have and if you have any computers hooked up to the network ready to receive an IP. If that is the case it will tell you how many leases it wrote.

Now if you would like dhcpd to be there at start up, all you have to is this. Go to your /etc/ directory and create if you don't have one already this file. rc.local. You can do that with easy editor by typing this:

```
ee rc.local
```

Add this to that file:

```
#dhcpd at boot up  
/usr/local/sbin/dhcpd  
#end of dhcpd startup
```

Press Esc and save the changes.

This is what you needed to do in order to set up a DHCP server (dhcpd).

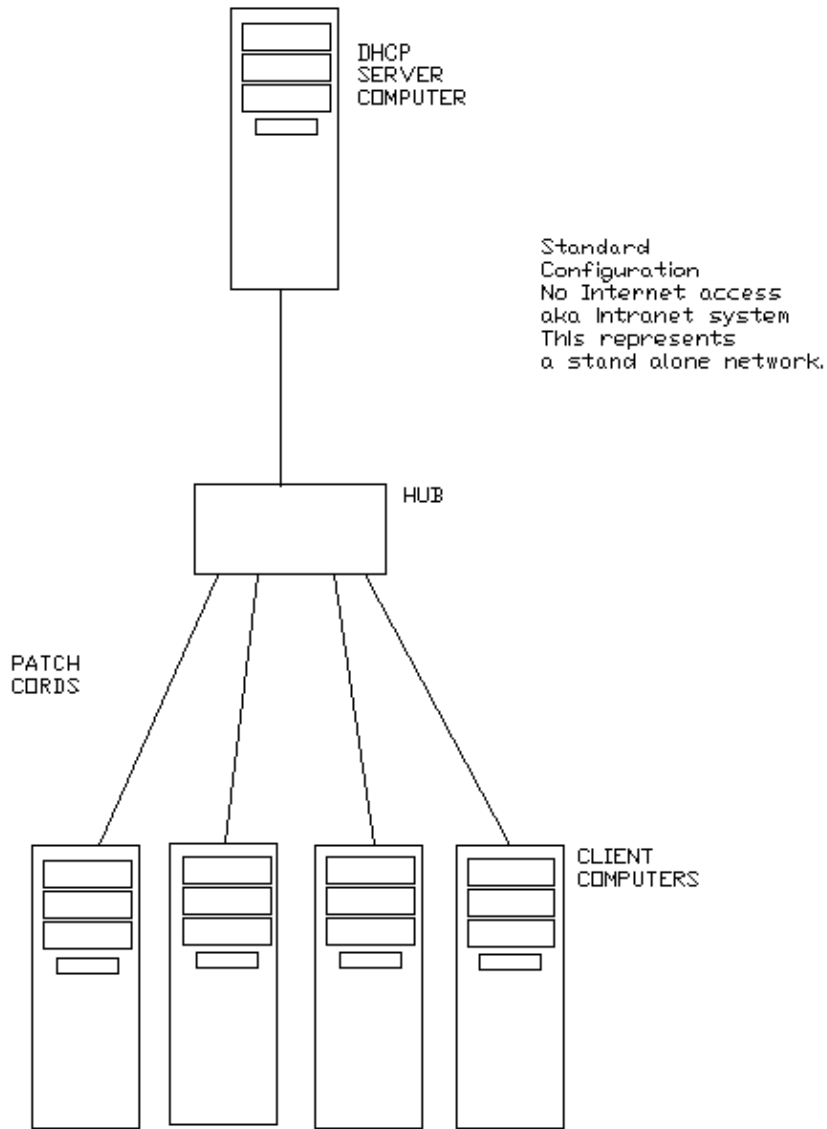
### **The Client Computers**

These are the machines that will need to get an IP and subnet from the server. You can not get it if you don't connect to the HUB. The thing here is there are many different operating systems out there. And how to setup each one as a dhcp client could make this a huge article so. I will weasel out by saying this. Basically you will need to enable DHCP on your client machines. Do a search on Google to find the best way for your specific operating system.

### **Gateways**

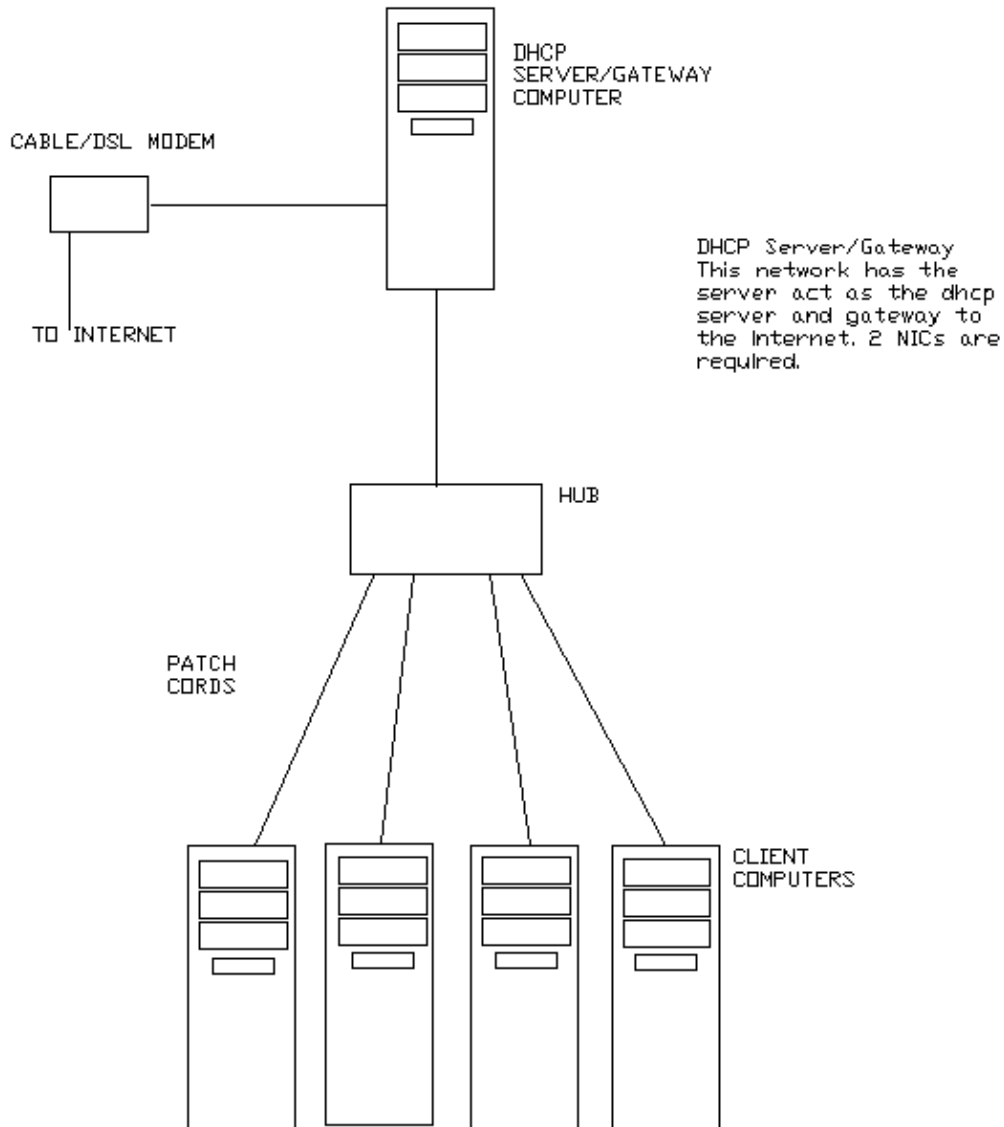
Let us look at what is currently setup.

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Now let us look at another of the other common setups:

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When we are done here you should be able to gain Internet access through your network. You will need to add a second NIC to your computer. Once that NIC is in. You will need to make sure your computer sees it.

ifconfig

```
r10: flags=8843 <UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST >mtu 1500
  inet 10.0.0.12 netmask 0xfffff00 broadcast 10.0.0.255
  inet6 fe80::2e0:29ff:fe19:fe92%r10 prefixlen 64 scopeid 0x1
  ether 00:e0:29:xx:xx:xx
  media: Ethernet autoselect (100baseTX)
  status: active
x10: flags=8843 <UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST >mtu 1492
  inet6 fe80::210:4bff:fe31:5cae%x10 prefixlen 64 scopeid 0x2
  ether 00:10:4b:xx:xx:xx
  media: Ethernet 10baseT/UTP
```



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```
status: active
lp0: flags=8810 <POINTOPOINT,SIMPLEX,MULTICAST >mtu 1500
faith0: flags=8002 <BROADCAST,MULTICAST >mtu 1500 lo0: flags=8049
<UP,LOOPBACK,RUNNING,MULTICAST >mtu 16384
    inet6 ::1 prefixlen 128
    inet6 fe80::1%lo0 prefixlen 64 scopeid 0x5
    inet 127.0.0.1 netmask 0xff000000
ppp0: flags=8010 <POINTOPOINT,MULTICAST >mtu 1500
sl0: flags=c010 <POINTOPOINT,LINK2,MULTICAST >mtu 552
tun0: flags=8051 <UP,POINTOPOINT,RUNNING,MULTICAST >mtu 1492
    inet 65.80.254.234 ---> 65.80.254.1 netmask 0xfffff00
    inet 65.81.21.34 ---> 65.81.21.1 netmask 0xfffff00
    inet 65.80.253.81 ---> 65.80.253.1 netmask 0xfffff00
    inet 65.80.255.169 ---> 65.80.255.1 netmask 0xfffff00
Opened by PID 72
```

### Addendum 5/25/04

My computer shows the two NICs r10 and xl0 in a working status with my PPPoE. Please tell me you have your ability to connect to the Internet ready. If not read [here](#). If you are not running a PPPoE for connection to the internet and are connecting to a Cable Modem, you may have some issues. The NIC for a Cable Modem in /etc/rc.conf is usually set for ifconfig\_XXX="DHCP". Well the problem is that the DHCP server (dhcpd) on your box is trying to give an ip address to the NIC that is connected to your Cable Modem. Your NIC connected to your Cable Modem needs an ip address from the Cable Modem not from the dhcp server on the box. So basically you have two servers one giving a single IP address to a single NIC your cable modem, and a DHCP server for your network, also trying to give an ip address to that NIC. You need to tell the dhcp server on your box to broadcast only on one NIC. I have been told this will help, but I don't have a cable modem so I can't be sure. Here's the possible solution.

At the command prompt type this:

```
ee /usr/local/etc/rc.d/isc-dhcpd.sh
```

Look for this section:

```
# override these variables in /etc/rc.conf
dhcpd_enable=NO
dhcpd_flags= # command option(s)
dhcpd_conf=/usr/local/etc/dhcpd.conf # configuration file
dhcpd_ifaces= # ethernet interface(s)
Place the interface of the NIC that goes out to your network.
```

```
dhcpd_ifaces="xxx" # ethernet interface(s)
```

This should set up the specific NIC for the dhcp Server only. You can run tcpdump -ni xxx port bootps or bootpc, if the port is installed and check it against the MAC address you see when you run ifconfig.

The NIC that connects to the HUB along with the client computers becomes the gateway. Earlier I made the ifconfig\_r10="inet10.0.0.12 netmask 255.255.255.0" That will make the gateway the r10 NIC and the IP 10.0.0.12. and the subnet 255.255.255.0. Remember that. You will need it for your client computers. The other NIC xl0 works with the PPPoE setup.

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I had left out a very important step here. Thanks to a reader who submitted a problem I have updated this section. (08/21/03)

Updated again (5/25/04)

### Kernel Recompile

You will need to recompile your FreeBSD kernel in order to have ipnat.rules work. This is not a difficult procedure. But if you have not done it before it can be very intimidating. Warning this can also be a time consuming process that will take a while. Hours in some cases. Your machine's CPU, RAM, Disk I/O speed will all be a factor.

Make sure you have a source to recompile from. You should have a directory that goes like this:

```
/usr/src/sys/i386/conf/
```

If you do not you will need to get it from the ftp site or the CD. If you have been using cvsup stable-supfile as way to keep your FreeBSD sources up to date do not use the source files from the CD or FTP site as you do not need to.

Use the following command to help you if you do not already have a source code file on your system:

```
/stand/sysinstall
```

That will bring up this window:

```
lqqqqqqqqqqqqqqqqqqqqqqqqqqqq /stand/sysinstall Main Menu qqqqqqqqqqqqqqqqqqqqqqqqqk
x Welcome to the FreeBSD installation and configuration tool. Please x
x select one of the options below by using the arrow keys or typing the x
x first character of the option name you're interested in. Invoke an x
x option with [SPACE] or [ENTER]. To exit, use [TAB] to move to Exit. x
x lqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk x
x x Usage Quick start - How to use this menu system x x
x x Standard Begin a standard installation (recommended) x x
x x Express Begin a quick installation (for the impatient) x x
x x Custom Begin a custom installation (for experts) x x
x x Configure Do post-install configuration of FreeBSD x x
x x Doc Installation instructions, README, etc. x x
x x Keymap Select keyboard type x x
x x Options View/Set various installation options x x
x x Fixit Enter repair mode with CDROM/floppy or start shell x x
x x Upgrade Upgrade an existing system x x
x x Load Config Load default install configuration x x
x x Index Glossary of functions x x
x mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq] x
tqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq]
x [Select] X Exit Install x
mqqqqqqqqqqqqqqqqqqqqqq[ Press F1 for Installation Guide ]qqqqqqqqqqqqqqqqqqqq]
```

You want to do a post install configuration of FreeBSD.

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```
lqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq FreeBSD Configuration Menu qqqqqqqqqqqqqqqqqqqqqqqqk
x If you've already installed FreeBSD, you may use this menu to customize x
x it somewhat to suit your particular configuration. Most importantly, x
x you can use the Packages utility to load extra "3rd party" x
x software not provided in the base distributions. x
x lqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk x
x x  Exit Exit this menu (returning to previous) x x
x x  Distributions Install additional distribution sets x x
x x  Packages Install pre-packaged software for FreeBSD x x
x x  Root Password Set the system manager's password x x
x x  Fdisk The disk Slice (PC-style partition) Editor x x
x x  Label The disk Label editor x x
x x  User Management Add user and group information x x
x x  Console Customize system console behavior x x
x x  Time Zone Set which time zone you're in x x
x x  Media Change the installation media type x x
x x  Mouse Configure your mouse x x
x x  Networking Configure additional network services x x
x mqv(+)qqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk x
tqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
x   OK  Cancel x
mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
```

Next you will want the source (src) codes.

```
lqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq Select the distributions you wish to install. qqqqqqqqqqqqqk
x Please check off the distributions you wish to install. At the x
x very minimum, this should be "bin". x
x lqqqqqq^(-)qqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk x
x x  [ ] crypto Basic encryption services x x
x x  [ ] krb4 KerberosIV authentication services x x
x x  [ ] krb5 Kerberos5 authentication services x x
x x  [ ] dict Spelling checker dictionary files x x
x x  [ ] doc Miscellaneous FreeBSD online docs x x
x x  [ ] games Games (non-commercial) x x
x x  [ ] info GNU info files x x
x x  [ ] man System manual pages - recommended x x
x x  [ ] catman Preformatted system manual pages x x
x x  [ ] proflibs Profiled versions of the libraries x x
x x  [ ] src Sources for everything x x
x x  [ ] ports The FreeBSD Ports collection x x
x x  [ ] local Local additions collection x x
x x  [ ] XFree86 The XFree86 3.3.6 distribution x x
x mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk x
tqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
x   OK  Cancel x
mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
```

Then you will want the FreeBSD kernel source code.

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```
lqqqq Select the sub-components of src you wish to install. qqqqqk
x Please check off those portions of the FreeBSD source tree x
x you wish to install. x
x lqqqqq^(-)qqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk x
x x [ ] games /usr/src/games (the obvious!) x x
x x [ ] include /usr/src/include (header files) x x
x x [ ] lib /usr/src/lib (system libraries) x x
x x [ ] libexec /usr/src/libexec (system programs) x x
x x [ ] release /usr/src/release (release-generation tools) x x
x x [ ] bin /usr/src/bin (system binaries) x x
x x [ ] sbin /usr/src/sbin (system binaries) x x
x x [ ] crypto /usr/src/crypto (contrib encryption sources) x x
x x [ ] share /usr/src/share (documents and shared files) x x
x x [ ] skrb4 /usr/src/kerberosIV (sources for KerberosIV) x x
x x [ ] skrb5 /usr/src/kerberos5 (sources for Kerberos5) x x
x x [ ] ssecure /usr/src/secure (BSD encryption sources) x x
x x [ ] sys /usr/src/sys (FreeBSD kernel) x x
x x [ ] tools /usr/src/tools (miscellaneous tools) x x
x mqqqqqv(+)qqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqj x
x tqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq x
x [ OK ] Cancel x
mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq
```

It goes back to src screen and then you want to click okay. It will then ask if you want to install from a CD-ROM, DVD, FTP, or some other source. Use the appropriate answer and click okay.

If you already have a source code than you start here.

It will install the source for you and then you will need to go in and adjust a small thing. Type this:

```
cd /usr/src/sys/i386/conf
```

That tells you to change directory to where the source is. You can view it with this command:

```
ls -a
```

You will see something like this:

```
... GENERIC LINT
```

The file called GENERIC is the kernel source file and what you will edit to make ipnat.rules work.

Okay some small items here. This is where you can have some fun with kernel customizing. You can name your kernel. For example I call mine THEBARON. And yes the all caps thing is vital. You must name your kernel with all capitol letters and you cannot use spaces. We will call our new kernel BOB.

At the command prompt type this:

```
cp GENERIC BOB
```

At this stage you have copied GENERIC and renamed it BOB

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Next we want to make a safe place for BOB. At the command prompt type this:

```
mkdir /root/kernels
```

This will create a sub-directory of the root main directory called kernel. Basically it is a folder in a folder.

Next we want to move BOB to that directory we created:

```
mv BOB /root/kernels/
```

Now we need to create a symbolic link from where the source is normally kept to the safe place. At the command prompt type this:

```
ln -s /root/kernels/BOB
```

This way if your source (src) is deleted or damaged you still have your custom kernel safe and sound.

Now lets edit this thing (the kernel). At the command line bring up your favorite editor. Mine is Easy Editor so at the command prompt I will type:

```
ee BOB
```

The kernel file will come up and you will need to scroll down just a little and change this line:

```
machine      i386
cpu          I386_CPU
cpu          I486_CPU
cpu          I586_CPU
cpu          I686_CPU
ident       GENERIC
```

You will want to change it to the name of your custom kernel. In this example BOB.:

```
machine      i386
cpu          I386_CPU
cpu          I486_CPU
cpu          I586_CPU
cpu          I686_CPU
ident       BOB
```

Then you will want to scroll down to the bottom and add this line:

```
options      IPFILTER          #kernel ipfilter support
```

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Then you will need to exit and save your changes. You will now need to change to the directory that you will do the kernel recompile from. At the prompt type this:

```
cd /usr/src
```

Then you will build the new kernel and install the new kernel. At the command prompt type this:

```
make buildkernel KERNCONF=BOB
```

This will cause the file to be built in such a way that it can run in the computer. It is basically taking the file you edited and turning into computer readable information.

Next we need to install that new kernel. At the command prompt type:

```
make installkernel KERNCONF=BOB
```

Now you will need to reboot. At the command prompt type:

```
shutdown -r +3
```

This will cause the computer to reboot in three minutes. Login as root and then type at the prompt, You can then check you new kernel is in place with this command:

```
uname -a
```

```
FreeBSD Bob.bjh.homenet 4.8-RC FreeBSD 4.8-RC #2: Fri Apr 4 06:43:52 EST 2003  
root@Bob.bjh.homenet:/usr/obj/usr/src/sys/BOB i386
```

The part of that line that says, /usr/obj/usr/src/sys/BOB shows that I am using the BOB custom kernel.

This will also create a /dev/ipnat file. This way you can use the ipnat.rules.

**This ends the addendum to the article. My apologies for leaving that out.**

Let's edit.

You will need to create ipnat.rule in your /etc/ directory.

```
ee /etc/ipnat.rules
```

You will want to add these lines to the file:

```
map tun0 10.0.0.0/24 -> 0/32 proxy port ftp ftp/tcp  
map tun0 10.0.0.0/24 -> 0/32 portmap tcp/udp 40000:60000  
map tun0 10.0.0.0/24 -> 0/32
```

Press Esc and save the changes

The ipnat.rules is a file that helps convert private IPs to real IPs. The first line allows you to use ftp downloads to your machine. The second line allows tcp/udp to go to your machine. The third line is a catch all for the

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first two. If it wasn't covered by those lines this line tries to make up for it.

Ipnat is basically a compound acronym for Internet Protocol (ip) and Network Address Translation (nat). This basically allows Internet traffic to convert from one ip to another on the network. Think of it as having your mail forwarded when you move.

You really didn't care to know that did you. Could you at least pretend you're awake next time.

More editing:

We have to add some lines to the rc.conf file again. If you are in your /etc/ directory you can just:

```
ee rc.conf
```

If you are not sure you are in your /etc/ directory:

```
ee /etc/rc.conf
```

If you would like to know what directory you are in:

```
pwd
```

Okay that was silly.

In your rc.conf add these lines.

```
gateway_enable="YES"  
ipnat_enable="YES"
```

Okay placing those lines in your rc.conf will cause them to activate the next time you boot up. If you don't want to reboot. You can do this. For the gateway type:

```
sysctl -w net.inet.ip.forwarding=1
```

For the ipnat.rules type this:

```
ipnat -C -f /etc/ipnat.rules
```

Now that everything is in place you should be able to gain access from a client machine. Do the following:

ping the gateway. In my case that is 10.0.0.12

```
$ ping 10.0.0.12  
PING 10.0.0.12 (10.0.0.12): 56 data bytes  
64 bytes from 10.0.0.12: icmp_seq=0 ttl=64 time=0.315 ms  
64 bytes from 10.0.0.12: icmp_seq=1 ttl=64 time=0.337 ms  
64 bytes from 10.0.0.12: icmp_seq=2 ttl=64 time=0.267 ms  
64 bytes from 10.0.0.12: icmp_seq=3 ttl=64 time=0.318 ms  
^C  
--- 10.0.0.12 ping statistics ---  
4 packets transmitted, 4 packets received, 0% packet loss
```

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round-trip min/avg/max/stddev = 0.267/0.309/0.337/0.026 ms

You stop the ping command by pressing the Ctrl and C keys at the same time.

You should also be able to ping a website.

```
$ ping www.yahoo.com
PING www.yahoo.akadns.net (216.109.125.71): 56 data bytes
64 bytes from 216.109.125.71: icmp_seq=0 ttl=46 time=48.263 ms
64 bytes from 216.109.125.71: icmp_seq=1 ttl=46 time=46.304 ms
64 bytes from 216.109.125.71: icmp_seq=2 ttl=46 time=46.661 ms
64 bytes from 216.109.125.71: icmp_seq=3 ttl=46 time=47.081 ms
^C
--- www.yahoo.akadns.net ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max/stddev = 46.304/47.077/48.263/0.738 ms
```

That is from a client machine running FreeBSD. Both of these tests show me I am able to see the gateway and pass through it to the internet. If you get these results you should be very happy. If you didn't please get a Prozac prescription so you can still be happy.

### Warning!

This article doesn't cover firewalls. While a setup like this will get you out onto the Internet. It will also leave you wide open. I will do Firewalls as a separate article. But don't expect it real soon. Now aren't you glad you got that Prozac with you.

### The Comment Section

Now that it is finished you can make comments and ask questions [here](#). That is a link to Chucktips. You can reply at the bottom section for this article so don't freak out.

### Credit where credit is due.

Net\_Fish: because most of the scripts are his. He helped me setup dhcpd almost two years ago. I still use those scripts and that is what I have posted here.

acb: because when Net\_Fish wanted ring my neck he would step in.


Jason: who has that cool article on subnets which makes sense. And also for letting me use and abuse his site with my third grade writing efforts.

ale sharifi who pointed out my error on ipnat.rules.

Thanks to all of them.

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