

Transparent Proxy with Linux and Squid mini-HOWTO

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Transparent Proxy with Linux and Squid mini-HOWTO

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This document provides information on how to setup a transparent caching HTTP proxy server using only Linux and squid.

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1. [Introduction](#)

1.1 Comments

Comments and general feedback on this mini HOWTO are welcome and can be directed to its author, Daniel Kiracofe, at drk@unxsoft.com.

1.2 Copyrights and Trademarks

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2. [Overview of Transparent Proxying](#)

2.1 Motivation

In "ordinary" proxying, the client specifies the hostname and port number of a proxy in his web browsing software. The browser then makes requests to the proxy, and the proxy forwards them to the origin servers. This is all fine and good, but sometimes one of several situations arise. Either

- You want to force clients on your network to use the proxy, whether they want to or not.
- You want clients to use a proxy, but don't want them to know they're being proxied.
- You want clients to be proxied, but don't want to go to all the work of updating the settings in hundreds or thousands of web browsers.

This is where transparent proxying comes in. A web request can be intercepted by the proxy, transparently. That is, as far as the client software knows, it is talking to the origin server itself, when it is really talking to the proxy server. (Note that the transparency only applies to the client; the server knows that a proxy is involved, and will see the IP address of the proxy, not the IP address of the user. Although, squid may pass an

X-Forwarded-For header, so that the server can determine the original user's IP address if it groks that header).

Cisco routers support transparent proxying. So do many switches. But, (surprisingly enough) Linux can act as a router, and can perform transparent proxying by redirecting TCP connections to local ports. However, we also need to make our web proxy aware of the affect of the redirection, so that it can make connections to the proper origin servers. There are two general ways this works:

The first is when your web proxy is not transparent proxy aware. You can use a nifty little daemon called transproxy that sits in front of your web proxy and takes care of all the messy details for you. transproxy was written by John Saunders, and is available from

<ftp://ftp.nlc.net.au/pub/linux/www/> or your local metalab mirror. transproxy will not be discussed further in this document.

A cleaner solution is to get a web proxy that is aware of transparent proxying itself. The one we are going to focus on here is squid. Squid is an Open Source caching proxy server for Unix systems. It is available from www.squid-cache.org

Alternatively, instead of redirecting the connections to local ports, we could redirect the connections to remote ports. This is discussed in the [Transparent Proxy to a Remote Box](#) section. Readers interested in this approach should skip down to that section. Readers interested on doing everything on one box can safely ignore that section.

2.2 Scope of this document

This document will focus on squid version 2.4 and Linux kernel version 2.4, the most current stable releases as of this writing (July 2001). It should also work with most of the later 2.3 kernels. If you need information about earlier releases of squid or Linux, you can find some earlier documents at www.unxsoft.com/transproxy.html.

If you are using a development kernel or a development version of squid, you are on your own. This document may help you, but YMMV.

Note that this document focuses only on HTTP proxying. I get many emails asking about transparent FTP proxying. Squid can't do it. Now, allegedly a program called Frox can. I have not tried this myself, so I cannot say how well it works. You can find it at <http://www.hollo32.fsnet.co.uk/frox/>.

Finally, as far as transparently proxying HTTPS (e.g. secure web pages using SSL, etc.), you can't do it. Don't even ask. For the explanation, do a search for 'man-in-the-middle attack'. Note that you probably don't really need to transparently proxy HTTPS anyway, since squid does not cache secure pages.

3. [Configuring the Kernel](#)

First, we need to make sure all the proper options are set in your kernel. If you are using a stock kernel from your distribution, transparent proxying may or may not be enabled. If you are unsure, the best way to tell is to simply skip this section, and if the commands in the next section give you weird errors, it's probably because the kernel wasn't configured properly.

If your kernel is not configured for transparent proxying, you will need to recompile. Recompiling a kernel is a complex process (at least at first), and it is beyond the scope of this document. If you need help compiling a kernel, please see [The Kernel HOWTO](#)

The options you need to set in your configuration are as follows (Note: none of these can be built as modules)

- Under General Setup
 - ◆ Networking support
 - ◆ Sysctl support
- Under Networking Options
 - ◆ Network packet filtering
 - ◆ TCP/IP networking
- Under Networking Options → IP: Netfilter Configuration
 - ◆ Connection tracking
 - ◆ IP tables support
 - ◆ Full NAT
 - ◆ REDIRECT target support
- Under File Systems
 - ◆ /proc filesystem support

You must say NO to "Fast switching" under Networking Options.

Once you have your new kernel up and running, you may need to enable IP forwarding. IP forwarding allows your computer to act as a router. Since this is not what the average user wants to do, it is off by default and must be explicitly enabled at run-time. However, your distribution might do this for you already. To check, do `cat /proc/sys/net/ipv4/ip_forward`. If you see `1` you're good. Otherwise, do `echo '1' > /proc/sys/net/ipv4/ip_forward`. You will then want to add that command to your appropriate bootup scripts (depending on your distribution, these may live in `/etc/rc.d`, `/etc/init.d`, or maybe somewhere else entirely).

4. [Setting up squid](#)

Now, we need to get squid up and running. Download the latest source tarball from www.squid-cache.org. Make sure you get a STABLE version, not a DEVEL version. The latest as of this writing was `squid-2.4.STABLE1.tar.gz`. Note that AFAIK, you must have squid-2.4 for linux kernel 2.4. The reason is that the mechanism by which the process determines the original destination address has changed from linux 2.2, and only squid-2.4 has this new code in it. (For those of you who are interested, previously the `getsockname()` call was hacked to provide the original destination address, but now the call is `getsockopt()` with a level of `SOL_IP` and an option of `SO_ORIGINAL_DST`).

Now, untar and gunzip the archive (use `tar -xzf <filename>`). Run the autoconfiguration script and tell it to include netfilter code (`./configure --enable-linux-netfilter`), compile (`make`) and then install (`make install`).

Now, we need to edit the default squid.conf file (installed to `/usr/local/squid/etc/squid.conf`, unless you changed the defaults). The squid.conf file is heavily commented. In fact, some of the best documentation available for squid is in the squid.conf file. After you get it all up and running, you should go back and reread the whole thing. But for now, let's just get the minimum required. Find the following directives, uncomment them, and change them to the appropriate values:

- `httpd_accel_host virtual`

- `httpd_accel_port 80`
- `httpd_accel_with_proxy on`
- `httpd_accel_uses_host_header on`

Next, look at the `cache_effective_user` and `cache_effective_group` directives. Unless the default `nobody/nogroup` has been created on your system (AFAIK, it is not created out of the box on many popular distributions, including RH7.1), you'll either need to create those, or create another username/group for squid to run under. I strongly recommend that you create a username/group of `squid/squid` and run under that, but you could use any existing user/group if you want.

Finally, look at the `http_access` directive. The default is usually `http_access deny all`. This will prevent anyone from accessing squid. For now, you can change this to `http_access allow all`, but once it is working, you will probably want to read the directions on ACLs (Access Control Lists), and setup the cache such that only people on your local network (or whatever) can access the cache. This may seem silly, but you should put some kind of restrictions on access to your cache. People behind filtering firewalls (such as porn filters, or filters in nations where speech is not very free) often "hijack" onto wide open proxies and eat up your bandwidth.

Initialize the cache directories with `squid -z` (if this is a not a new installation of squid, you should skip this step).

Now, run squid using the `RunCache` script in the `/usr/local/squid/bin/` directory. If it works, you should be able to set your web browser's proxy settings to the IP of the box and port 3128 (unless you changed the default port number) and access squid as a normal proxy.

For additional help configuring squid, see the squid FAQ at

5. Setting up iptables (Netfilter)

iptables is a new thing for Linux kernel 2.4 that replaces ipchains. If your distribution came with a 2.4 kernel, it probably has iptables already installed. If not, you'll have to download it (and possibly compile it). The homepage is netfilter.samba.org. You may be able to find binary RPMs elsewhere, I haven't looked. For the curious, there is plenty of documentation on the netfilter site.

To set up the rules, you will need to know two things, the interface that the to-be-proxied requests are coming in on (I'll use `eth0` as an example) and the port squid is running on (I'll use the default of 3128 as an example).

Now, the magic words for transparent proxying:

- `iptables -t nat -A PREROUTING -i eth0 -p tcp --dport 80 -j REDIRECT --to-port 3128`

You will want to add the above commands to your appropriate bootup script under `/etc/rc.d/`. Readers upgrading from 2.2 kernels should note that this is the only command needed. 2.2 kernels required two extra commands in order to prevent forwarding loops. The infrastructure of netfilter is much nicer, and only this command is needed.

6. Transparent Proxy to a Remote Box

Now, the question naturally arises, if we can do all this nifty stuff redirecting HTTP connections to local ports, could we do the same thing but to a remote box (e.g., the machine with squid running is not the same machine as iptables is running on). The answer is yes, but it takes a little different magic words. (Thanks to Giles Coochey for help writing this section).

For the purposes of example commands, let's assume we have two boxes called squid-box and iptables-box, and that they are on the network local-network. In the commands below, replace these strings with the actual IP addresses or name of your machines and network.

First, the machine that squid will be running on, squid-box. You do not need iptables or any special kernel options on this machine, just squid. You do not need the 'http_accel' options as described above, just a plain squid (although, if you are a squid newbie, it is suggested that you read the above section on squid, since everything else but the 'http_accel' options will be useful to you).

Now, the machine that iptables will be running on, iptables-box. You will need to configure the kernel as described above, except that you don't need the REDIRECT target support). Now, for the iptables commands. You need three:

- `iptables -t nat -A PREROUTING -i eth0 -s ! squid-box -p tcp --dport 80 -j DNAT --to squid-box:3128`
- `iptables -t nat -A POSTROUTING -o eth0 -s local-network -d squid-box -j SNAT --to iptables-box`
- `iptables -A FORWARD -s local-network -d squid-box -i eth0 -o eth0 -p tcp --dport 3128 -j ACCEPT`

The first one sends the packets to squid-box from iptables-box. The second makes sure that the reply gets sent back through iptables-box, instead of directly to the client (this is very important!). The last one makes sure the iptables-box will forward the appropriate packets to squid-box. It may not be needed. YMMV. Note that we specified '-i eth0' and then '-o eth0', which stands for input interface eth0 and output interface eth0. If your packets are entering and leaving on different interfaces, you will need to adjust the commands accordingly.

Add these commands to your appropriate startup scripts under /etc/rc.d/

6.1 What if iptables-box is on a dynamic IP?

If the iptables-box is on a dynamic IP address (e.g. a dialup PPP connection, or a DHCP assigned IP address from a cable modem, etc.), then you will want to make a slight change to the above commands. Replace the second command with this one:

- `iptables -t nat -A POSTROUTING -o eth0 -s local-network -d squid-box -j MASQUERADE`

This change avoids having to specify the IP address of iptables-box in the command. Since it will change often, you'd have to change your commands to reflect it. This will save you a lot of hassle.

7. Put it all together

If everything has gone well so far, go to another machine, change it's gateway to the IP of the box with iptables running on it, and surf away. To make sure that requests are really being forwarded through your proxy instead of straight to the origin server, check the log file /usr/local/squid/logs/access.log

8. Further Resources

Should you still need assistance, you may wish to check the squid FAQ or the squid mailing list at www.squid-cache.org. You may also e-mail me at drk@unxsoft.com, and I'll try to answer your questions if time permits (sometimes it does, but sometimes it doesn't). Please, please, please, send the output of ``iptables -t nat -L'' and relevant portions of any configuration files in your e-mail, or else I will probably not be able to help you out much...
