



Interested in learning  
more about security?

# SANS Institute InfoSec Reading Room

This paper is from the SANS Institute Reading Room site. Reposting is not permitted without express written permission.

## More Secure at home Using Linux

In this paper, the author describes his personal experience of implementing defensive security measures on his home computer network consisting of a mixed platform.

Copyright SANS Institute  
Author Retains Full Rights

AD

DEEPAARMOR®

## **More Secure @home using Linux**

Hans Lie

September 15, 2001

### **Introduction**

I invested in a new PC at home and wanted to get a faster connection, than the current isdn setup I have today. Since I am starting to work with security I also wanted to find a good solution to protect the data I have. I have not decided what type of connection I will get, but it will be cable, adsl or wireless, so I have to make a flexible solution. It is my intent to stay connected to the Internet 24x7. I could have used one of the personal firewalls for Windows, but I feel more comfortable with a less graphical environment, where I have more control over what is happening. It forces me to know more about how things are interconnected. The best part of it, it's more fun. At least I thought so.

### **Threats**

So what is it I try to protect, why bother?

Well, I have a small network with a few computers, mostly Linux, a Windows 98 computer, and a laser printer. I use them for several things:

Web surfing, On-line Banking and trading, mail and news, private economy programs, personal letters, genealogy research, store family pictures, contact information and connect my computer to the corporate LAN.

I believe several of these are common to a lot of people.

Today people have pretty speedy computers at home, and more connect them up to the Internet 24\*7\*365, through high-speed connections. Most of the day these computers are idle, and waiting for something to do. It is very tempting for a lot of people to break in to these computers, and use them for whatever cause they believe in. Some use them as a launch pad for other break-ins, making it harder to trace back the attack to the originator. Other uses could be as part of a bigger task, like a distributed cracking of passwords, or finding out if there is life in outer space. Whatever reasons people have, the default setup of today's computers makes it pretty easy to breaking, unless the owners take some measures to protect the computers.

I have asked myself, why people go online without protecting their computers. Most people lock up their home, when they leave it. I believe it is a basic trust in computers, and lack of knowledge.

Some years ago, viruses started to flow around. After some years, corporates realized they had to protect themselves, and they did it in the perimeter, and on the servers. They started to inform the employees about the threat and said they should check all

floppies for viruses. What we see today is that most people have anti-virus software programs on the desktops. Every new pc bought today is protected, with software, but the users don't update it, so they are not protected for long.

Seems like the same cycle is coming with firewalls. First businesses started putting up firewalls. Now more and more people have the same speedy connection at home, and the need also arises here. Many magazines now have started to write about the need to install personal firewalls at home, but will the consumers listen and act?

*"For consumers, no matter how many times you indicate to someone that they ought to have antivirus software and a firewall installed, they have to be in the right mindset or they don't do it"*

-- Eric Hemmendinger, research director for information security, Aberdeen Group.

### According to the Cert Advisory: CA-2001-20, about home security

This year, we have seen a significant increase in activity resulting in compromises of home user machines. In many cases, these machines are then used by intruders to launch attacks against other organizations. Home users have generally been the least prepared to defend against attacks. Many home users do not keep their machines up to date with security patches and workarounds, do not run current anti-virus software, and do not exercise caution when handling email attachments. Intruders know this, and we have seen a marked increase in intruders specifically targeting home users who have cable modem and DSL connections.

Some of the information I keep in my computer I would like to keep secret. It should be available when I need them, and should not be altered without my knowledge. This brings us to the three pillars of security, which is fundamental in information security:

#### C-I-A triad

<b>Confidentiality</b>	Keeping information private or secret, and to avoid disclosing information to those who don't need it. It can be achieved by use of encryption, separate it from publicly available information or use access control to determine who gets to see the information.
<b>Integrity</b>	Keeping the information complete and unaltered, keep a record of all changes of the information, and make sure only authorized personnel are allowed change it.
<b>Availability</b>	Having the information available to those who need it, when they need it.

What are the threats to my computers?

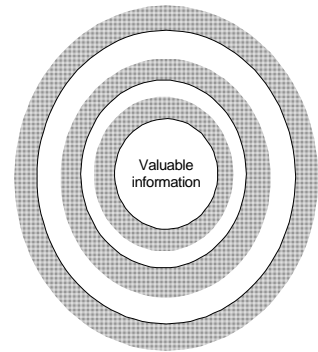
**Physical**      The computers are all situated in my condominium, and a burglar could just go in and grab the boxes.

- Virus** There are a lot of mails circulating with attached viruses.
- Script kiddies** People running scripts or programs to probe computers for vulnerabilities, exploiting these vulnerabilities to gain access to computer systems. Little knowledge required doing this, and the programs are easy to obtain. Once access is acquired they can install 'back-doors', to make it easier to return to the system.
- Vandals** Wants to make visible damage to my data.

## Protection

In order to protect my valuable information I will apply a principle known as defense-in-depth.

If you look at the figure, you see that we place the things we want to protect in the middle. Around the center we put successive (gray) layers of protection. Even though we use several means of protecting the data, does not make it impossible to get to the information, but it sure makes it harder. The concept of in-depth-in-depth is not limited to information only, but also useful in other areas, e.g. physical security, and other thing you might want to protect.

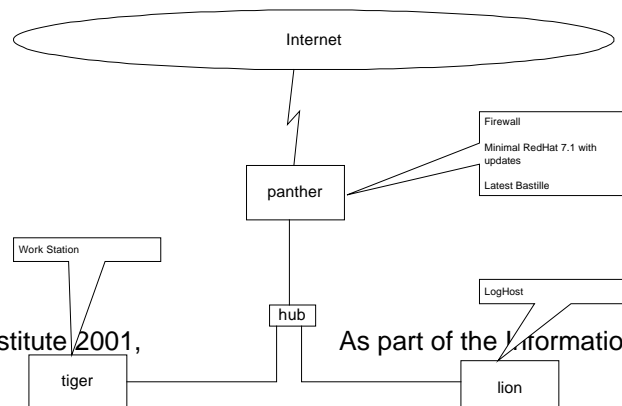


Another important thing is to know-your-system: If you know how your system behaves, it is much easier to tell if something is wrong. Ideally you should use some time every day to get to know it.

## Implementation

Of course I could have used some sort of Windows type of firewall, but I kind of hate the feeling of not know what is happening on the system. Well I guess I have worked to long with UNIX, to even thing about using Microsoft stuff. I didn't want to pay too much either and I have a pile of old pentiums I could use, they should be good enough for the tasks.

I'll show you a picture of what I try to do. I have a network at home, with a few hosts. This is a simplified view, since I also got a Laser Printer and a few other hosts. I want to be ready to get a speedier connection, as soon as it's available in my neighborhood. I hope to get a wireless connection, since they provide the best speed, but if it takes to long I will consider cable or adsl as well. Originally I hoped to use floppyfw, as my firewall, but I have not been able to verify, that they supports wireless connection.



When I started to implement the security I decided to go for RedHat-7.1 as a basis. The reason for this is that I have used

RedHat for years, and it is the one Linux distribution I know best. If we take a look at the firewall, panther, I installed a customized version of RedHat-7.1. I installed as few packages as I could, in the spirit of 'small is beautiful'. It is also easier to get to know a smaller system, and there are fewer vulnerabilities to exploit. I installed the updates I could find, and keep checking for updates, to be released. There are lots of bugs ready to be exploited, and I want to get rid of them if I can. There are some tools, like autoprpm for updating the systems automatically, but I like to check the system myself before installing the updates. I will probably look into a solution that will notify me when there is anything new.

There were some factors I knew I wanted in a new system, all part of my in-depth-in-depth strategy:

- Netfilter/IP Tables - to block all traffic except what I wanted to allow
- Network Address Translation (NAT) - to hide the ip-setup of my internal network to the world, so they can't scan the ports of my internal hosts.
- tcp\_wrappers - to limit which ip-addresses are allowed to connect to the services I allow into the firewall
- A few user accounts with solid passwords, remove the rest
- ssh - only allow remote login to the system via secure channels. Disable telnet and ftp.
- Integrity of files on the system - tripwire and rpm -V
- syslog - remote logging to a dedicated host.
- ntp - to synchronize the time to a accurate time-source
- Use the SANS: Securing Linux: Step-by-step - to check other things I have forgotten. Get a copy of that paper, if you don't have it already.
- Need a regular backup of the system as well.
- Updated Anti-virus software, on MS Windows boxes.

I remembered hearing, a while ago, about Linux software that was supposed to tighten up the system. It was called Bastille, so I decided to take a closer look at it.

## 1) Bastille Linux

This is what they say about themselves:

The Bastille Hardening System attempts to "harden" or "tighten" the Linux operating system. It currently supports Red Hat and Mandrake systems. We attempt to provide the most secure, yet usable, system possible. The project is run by Jon Lasser, Lead Coordinator and Jay Beale, Lead Developer, and involves a number of developers, beta-testers and concept-creators. Bastille Linux was developed with several major goals:

<b>Comprehensiveness</b>	Bastille Linux draws from every available major reputable source on Linux Security. The initial development integrated Jay Beale's existing O/S
--------------------------	---

	hardening experience for Solaris and Linux with most major points from the SANS' Securing Linux Step by Step, Kurt Seifried's Linux Administrator's Security Guide, and countless other sources.
<b>Instructiveness</b>	Bastille Linux has been designed to educate the installing administrator about the security issues involved in each of the script's tasks, thereby securing both the box and the administrator. Each step is optional and contains a description of the security issues involved.
<b>Community</b>	Once the initial development was near complete, we brought the effort to the developers of the Bastille Discussion mailing list. Further, we began soliciting outside suggestions and testing. The script was GPL'd promptly and the Specification shared.

### a) Features

- Packet Filters: IP Tables/Chains
- NAT
- Disables SUID programs
- Users: Password aging, Restrict root-login to local ttys at console, Password Protect single-user mode, and Restrict console-login to a few accounts
- Restrict use of cron to administrative accounts only (/etc/cron.allow)
- Password protect boot loader (LILO)
- Disable Ctrl-Alt-Del rebooting
- Setup a default deny on tcp-wrappers.
- Deactivates telnet and ftp
- Setup extra logging to tty's and files
- Log to a remote loghost
- Process accounting - log who's doing what, when
- Deactivate routing daemon
- Restrict sendmail

And even more. Bastille adapts to what is installed on the system. If you don't have a dns-server installed on the host, you will not get questions about securing the server.

Bastille has a lot of what I originally wanted and even more. It made the setup of the firewall much easier than I had expected.

### b) Installing

It is really easy to install, just download three rpm-packages from [www.bastille-linux.org](http://www.bastille-linux.org) and install them. You have to decide if you want to configure the firewall, using X-windows or the console (higher security). Depending on which interface you choose.

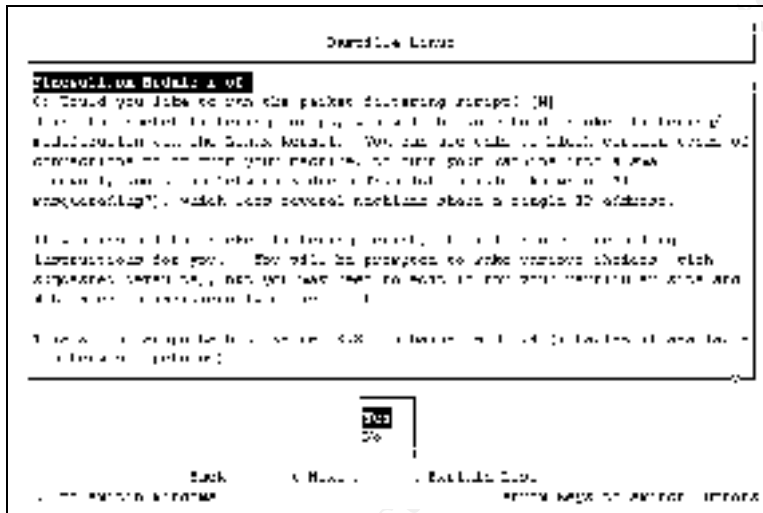
- Main RPM (Bastille)
- Using Console
  - Bastille-Curses-module
  - perl-Curses
- Using X-windows
  - Bastille-Tk-module
  - perl-Tk

I choose the console version, since I don't want X-windows on the firewall.

### c) Configuring

After the packages are installed you just have to start: **InteractiveBastille**

Here is a screenshot from the configuration of Bastille:



The questions you have to answer are explained well, and it also gives you guidance if you are in doubt. If you have to give other input than yes or no, the examples are excellent.

At the end it asks if you want to use the firewall, and start it at every boot of the host. Then you're all set.

## 2) Other measures

Bastille did most of what I wanted, but I still lacked file integrity check. For this there are two things I do to check if anything has changed.

### a) tripwire

is bundled with RedHat, so it's just to install the package.

- Then run `/etc/tripwire/twinstall.sh`, and follow the direction.
- Once that is finished you have to edit the policy file: `/etc/tripwire/tw-pol.txt`. In this file you setup which files you want to check regularly, and which alarm level to set if it has changed.
- Now you are able to apply the policy, using: `twadmin -m P /etc/tripwire/tw-pol.txt`
- Initialize tripwire using: `tripwire -init`
- Check the host for changes using: `tripwire --check`, this is done daily by cron, so all you have to do is to check the mail.
- If you have installed new files, and want to acknowledge the changes: `tripwire -update -r <report file>`, find the latest report-file in `/var/lib/tripwire/report`

### **b) rpm -V <package>**

a way to check that the files in a package has not changed

### **c) ssh**

in addition to using ssh instead of telnet I, used two additional measures secure the sshd on the host:

- Limit from which ip-addresses I can login to the firewall (`/etc/hosts.allow`)
- Only allow a few users to login via ssh. root is not one of them.

There is an option in `/etc/ssh/sshd_config`, called `AllowGroups` who let me say that only users of a certain Unix-group is allowed to login to the system. There is another option to disallow root to login: `PermitRootLogin`

© SANS Institute. Author retains full rights.



## Conclusion

To state is simple:

"If you are not connected to the Internet, then you don't need a firewall.  
Otherwise, you do"

"If you loose your data and identity, the ultimate impact on your life is  
real"

According to Gregor Freund, CEO of ZoneLabs

Check out Cert: "Home Network Security", for more information about threats and actions you can do to protect your computer.

It has been brought to my attention, that there are some problems with the wireless protocol 802.11b. Seems like it is possible to discover the 'secret' key that is used to encrypt the data. Check the reference for more information.

One thing is for sure, nothing is secure. If you use defense-in-depth, relying on several means, you are better protected than many others.

## References

- RedHat <http://www.redhat.com/>
- Bastille Linux <http://www.bastille-linux.org/>
- IP Tables <http://netfilter.samba.org/>
- Home and Small Office [http://www.sans.org/infosecFAQ/homeoffice/homeoffice\\_list.htm](http://www.sans.org/infosecFAQ/homeoffice/homeoffice_list.htm)
- Step-by-Step Security Guides <http://www.sansstore.org/>
- floppyfw <http://www.zelow.no/floppyfw/>
- trinux <http://trinux.sourceforge.net/tools.html>
- Usefull security Articles <http://www.bastille-linux.org/jay/security-articles-jjb.html>
- autorpm <http://www.kaybee.org/~kirk/html/linux.html>
- Home PC users wake up to need for firewalls <http://news.cnet.com/news/0-1006-200-6994590.html?tag=prntfr>
- Home Network Security [http://www.cert.org/tech\\_tips/home\\_networks.html](http://www.cert.org/tech_tips/home_networks.html)
- tripwire <http://www.tripwire.org/>
- Wireless protocol problems <http://www.isaac.cs.berkeley.edu/isaac/wep-faq.html>  
<http://www.powerbookcentral.com/columns/knowles/052101.shtml>  
<http://www.zdnet.com/special/stories/wireless/0,10676,5095205,00.html>



# Upcoming SANS Training

[Click Here for a full list of all Upcoming SANS Events by Location](#)

SANS Atlanta 2018	Atlanta, GAUS	May 29, 2018 - Jun 03, 2018	Live Event
SEC487: Open-Source Intel Beta Two	Denver, COUS	Jun 04, 2018 - Jun 09, 2018	Live Event
SANS Rocky Mountain 2018	Denver, COUS	Jun 04, 2018 - Jun 09, 2018	Live Event
SANS London June 2018	London, GB	Jun 04, 2018 - Jun 12, 2018	Live Event
DFIR Summit & Training 2018	Austin, TXUS	Jun 07, 2018 - Jun 14, 2018	Live Event
Cloud INsecurity Summit - Washington DC	Crystal City, VAUS	Jun 08, 2018 - Jun 08, 2018	Live Event
Cloud INsecurity Summit - Austin	Austin, TXUS	Jun 11, 2018 - Jun 11, 2018	Live Event
SANS Milan June 2018	Milan, IT	Jun 11, 2018 - Jun 16, 2018	Live Event
SANS Cyber Defence Japan 2018	Tokyo, JP	Jun 18, 2018 - Jun 30, 2018	Live Event
SANS Oslo June 2018	Oslo, NO	Jun 18, 2018 - Jun 23, 2018	Live Event
SANS Philippines 2018	Manila, PH	Jun 18, 2018 - Jun 23, 2018	Live Event
SANS ICS Europe Summit and Training 2018	Munich, DE	Jun 18, 2018 - Jun 23, 2018	Live Event
SANS Crystal City 2018	Arlington, VAUS	Jun 18, 2018 - Jun 23, 2018	Live Event
SANS Minneapolis 2018	Minneapolis, MNUS	Jun 25, 2018 - Jun 30, 2018	Live Event
SANS Cyber Defence Canberra 2018	Canberra, AU	Jun 25, 2018 - Jul 07, 2018	Live Event
SANS Paris June 2018	Paris, FR	Jun 25, 2018 - Jun 30, 2018	Live Event
SANS Vancouver 2018	Vancouver, BCCA	Jun 25, 2018 - Jun 30, 2018	Live Event
SANS London July 2018	London, GB	Jul 02, 2018 - Jul 07, 2018	Live Event
SANS Cyber Defence Singapore 2018	Singapore, SG	Jul 09, 2018 - Jul 14, 2018	Live Event
SANS Charlotte 2018	Charlotte, NCUS	Jul 09, 2018 - Jul 14, 2018	Live Event
SANSFIRE 2018	Washington, DCUS	Jul 14, 2018 - Jul 21, 2018	Live Event
SANS Malaysia 2018	Kuala Lumpur, MY	Jul 16, 2018 - Jul 21, 2018	Live Event
SANS Pen Test Berlin 2018	Berlin, DE	Jul 23, 2018 - Jul 28, 2018	Live Event
SANS Cyber Defence Bangalore 2018	Bangalore, IN	Jul 23, 2018 - Jul 28, 2018	Live Event
SANS Riyadh July 2018	Riyadh, SA	Jul 28, 2018 - Aug 02, 2018	Live Event
Security Operations Summit & Training 2018	New Orleans, LAUS	Jul 30, 2018 - Aug 06, 2018	Live Event
SANS Pittsburgh 2018	Pittsburgh, PAUS	Jul 30, 2018 - Aug 04, 2018	Live Event
SANS August Sydney 2018	Sydney, AU	Aug 06, 2018 - Aug 25, 2018	Live Event
SANS San Antonio 2018	San Antonio, TXUS	Aug 06, 2018 - Aug 11, 2018	Live Event
SANS Boston Summer 2018	Boston, MAUS	Aug 06, 2018 - Aug 11, 2018	Live Event
SANS Hyderabad 2018	Hyderabad, IN	Aug 06, 2018 - Aug 11, 2018	Live Event
Security Awareness Summit & Training 2018	Charleston, SCUS	Aug 06, 2018 - Aug 15, 2018	Live Event
SANS Amsterdam May 2018	OnlineNL	May 28, 2018 - Jun 02, 2018	Live Event
SANS OnDemand	Books & MP3s OnlyUS	Anytime	Self Paced