



# **Red Hat Enterprise Linux Benchmark v1.0.5**

(Red Hat Enterprise Linux including  
RHEL 2.1, RHEL 3.0, RHEL 4.0,  
and Fedora Core 1, 2, 3, 4 & 5)

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## **Red Hat Enterprise Linux Benchmark v1.0.7**

**October 2006**

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## CIS Red Hat Enterprise Linux Benchmark

### **Applicability**

This benchmark was developed and tested on Red Hat Enterprise Linux (RHEL) including RHEL 2.1, RHEL 3.0, RHEL 4.0, and Fedora Core 1, 2, 3, 4 & 5. It is likely to work for other Linux distributions – especially Red Hat and Fedora derivatives - as well. The scoring tool may not run or may yield inaccurate results on non-RHEL and non-Fedora systems.

### **Conventions**

The following typographical conventions are used in this document:

Roman font	normal text
Courier	used to indicate either a command or a standard Unix parameter or a file
<i>Italics</i>	used for a question that you must evaluate before continuing

### **Root Shell Environment Assumed**

The actions listed in this document are written with the assumption that they will be executed by the root user running the bash shell and without `noclobber` set. Also, the following directories are assumed to be in root's path:

```
/bin:/sbin:/usr/bin:/usr/sbin
```

### **Executing Actions**

The actions listed in this document are written with the assumption that they will be executed in the order presented here. Some actions may need to be modified if the order is changed. Actions are written so that they may be copied directly from this document into a root shell window with a "cut-and-paste" operation. You may find that many of the "chkconfig" actions, which activate or deactivate services, produce the message "error reading information on service <service>: No such file or directory." These messages are quite normal and should not cause alarm – they simply indicate that the program being referenced was not installed on your machine. As Red Hat Enterprise Linux installs allow a great deal of flexibility in what software you choose to install, these messages are unavoidable.

## Reboot Required

Rebooting the system is required after completing all of the actions below in order to complete the re-configuration of the system. In many cases, the changes made in the steps below will not take effect until this reboot is performed. If substantial operating system updates are performed after the initial OS load, you may have to reboot more than once.

## Vulnerabilities

In addition to any specific issues presented by a particular service or protocol, *every* service has the potential of being an entry point into a system if a vulnerability is found. This is why we recommend that some services are disabled even though there is no clear way to exploit them, and there has never been a problem with the service. If you are running an unnecessary service, you add additional risks of a vulnerability being found in the service in the future.

## Backup Key Files

Before performing the steps of this benchmark it is strongly recommended that administrators make backup copies of critical configuration files that may get modified by various benchmark items. If this step is not performed, then the site may have no reasonable back-out strategy for reversing system modifications made as a result of this document. The script provided in Appendix B of this document will automatically back up all files that may be modified by the actions below. Note that an executable copy of this script is also provided in the archive containing the PDF version of this document and the CIS scoring tool. Assuming the administrator is in the directory where the archive has been unpacked, the command to execute the backup script would be:

```
./do-backup.sh
```

One of the byproducts of the `do-backup.sh` script is `/root/do-restore.sh`, which is dynamically generated based on the results of the `do-backup.sh` script. To roll back the changes performed by this benchmark, first run `RevertBastille` followed by `do-restore.sh`, and all changes will be backed out. Since not all Linux installations are identical, the `do-restore.sh` script is created based on the files that actually existed at the time `do-backup.sh` was run.

Note: If you make any changes manually to any of the files that were preserved by `do-backup.sh`, those changes will be lost when `do-restore.sh` is executed. It may be prudent to delete the `do-restore.sh` script once you have validated the changes to prevent inadvertently undoing the changes.

## Build Considerations

If you have not done so already, plan out a partitioned hard drive. The default partitioning is similar to this:

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```
/dev/hda5    380679 109961 251064 31% /  
/dev/hda1    49743  8669  38506 19% /boot  
/dev/hda3    2312736 32852 2162404 2% /home  
/dev/hda2    6321524 704364 5295964 12% /usr  
/dev/hda6    253775 23992 216681 10% /var
```

It is important to keep `/var` and `/home` on their own partitions. Some applications have a tendency to crash when the `/` or `/usr` filesystem reaches 100%. This could happen if users were to store considerable amounts of data (developers storing jar files or copies of application logs, for example) or logs were to fill up their partition. Some Enterprises define a `/logs` partition and store application logs there.

To limit the inconveniences caused by filling up `/home`, consider implementing user and group quotas on the `/home` filesystem. Quotas will limit how much a single user (or single group) can store on a given filesystem. More information is available from the Red Hat Manuals (<http://www.redhat.com/docs/manuals/linux/RHL-9-Manual/custom-guide/ch-disk-quotas.html>).


### Software Package Removal

There is considerable debate over the maintenance of unused software packages. Some people feel that as long as the software is not being used, leaving it installed poses no appreciable risk. Others feel that unused software presents another attack vector and increases the maintenance effort for the administrators. This Benchmark makes no recommendation for the removal of unused software. If vulnerable software is present on a system, that vulnerability may be exploitable by a local attacker, and the reader is advised to consider the effort in either its removal or maintenance and the risks thereof.

### Software Package Installation

Throughout this Benchmark, you may be directed to enable software package init scripts using the `chkconfig` command. This assumes you already installed said package(s). If the `chkconfig` command fails, verify you actually installed the software required.

### Notes About Bastille



Throughout this Benchmark, you will see the Bastille castle in the left margin. This indicates a section that is addressed by Bastille. If you installed Bastille and ran it with the configuration file provided, this area will already be taken care of for you.

It is still worth walking through that section to ensure your system is configured properly. In some cases where the logo appears, that section is addressed by Bastille, but the script provided does not address it as manual intervention is required. Setting a LILO/GRUB password is an example of this case. Bastille addresses setting the password, however, that must be set per system. In those cases, a note will appear in ***bold italics*** regarding Bastille.

## 1 Patches, Packages and Initial Lockdown

### 1.1 Apply Latest OS Patches

#### **Action:**

Update system per your enterprise update procedures. For non-enterprise environments, and or environments without a formal update procedure use either `up2date` which is typically used for Red Hat Enterprise and `yum` is commonly used for Fedora Core systems.

Red Hat Enterprise:

```
up2date -u
```

Fedora Core:

```
yum update
```

#### **Discussion:**

Developing a procedure for keeping up-to-date with vendor patches is critical for the security and reliability of the system. Vendors issue operating system updates when they become aware of security vulnerabilities and other serious functionality issues, but it is up to their customers to actually download and install these patches.

When Red Hat publishes an update, they include with it the procedures for updating the package. This usually entails downloading the new RPMs from Red Hat, and making them available to the individual servers. Some Enterprises make these packages available over an NFS share or an internal anonymous FTP/HTTP server – your Enterprise may follow this practice or do something different.

It is also important to observe that your applications work properly after patching. Though problems in patches are quite rare in Red Hat Enterprise Linux, it is generally recommended that any patch be deployed to a non-production system first for testing.

Some RPMs may need to be installed before others. For the most part, RPM understands and solves dependencies. Red Hat creates separate instructions for special cases, like the replacement of the kernel or the general C library `glibc`. You may need to examine the list of updates that you have downloaded to check for any of these cases.

Finally, there is some risk to using a non-patched, non-hardened machine to download the patches, as this involves connecting a system with security vulnerabilities on a network, which is not an Industry Best Practice. Please consider these issues carefully.

Red Hat offers at least partially automated patch download and installation, via Red Hat `up2date`. In lieu of an existing Enterprise Standard, consider installing either `up2date` (Red Hat Enterprise Linux) or `yum` (Fedora Core) now, and using it whenever Red Hat

announces a vulnerability. If your Enterprise has several servers, consider installing an update server that can be used in place of Red Hat's `update` servers – the updates will go much faster, you will use much less bandwidth from your ISP, and you will reduce the load on Red Hat's servers. If `update/yum` is used, it should be used on a lab server and the patches validated and the system regression tested before going to live/production systems. For Fedora Core systems there is a `chkconfig` script which if enabled, will perform nightly yum updates.

### ***1.2 Validate Your System Before Making Changes***

Ensuring your system is functioning properly before you make a change is a prudent system administration best practice and will save you hours of aggravation. Applying this Benchmark to a system that already has issues makes troubleshooting very difficult and may lead you to believe the Benchmark is at fault.

Examine the system and application logs (`/var/log`). Key words to look for include, but are not limited to, "error", "warning", "critical", and "alert".

***Resolve all issues before continuing.***

### ***1.3 Configure SSH***

#### **Action:**

```
unalias cp rm mv
cd /etc/ssh
cp ssh_config ssh_config.tmp
awk '/^#? *Protocol/ { print "Protocol 2"; next };
     { print }' ssh_config.tmp > ssh_config
if [ "`egrep -l ^Protocol ssh_config`" == "" ]; then
    echo 'Protocol 2' >> ssh_config
fi
rm ssh_config.tmp
diff ssh_config-preCIS ssh_config
```

Manually edit `/etc/ssh/ssh_config` to put "Protocol 2" under the "Host \*" entry. Because of the substantially different `/etc/ssh/ssh_config` files in the versions of RHEL and Fedora covered by this Benchmark, a manual edit is required.

```
cp sshd_config sshd_config.tmp
awk '/^#? *Protocol/ { print "Protocol 2"; next };
     /^#? *X11Forwarding/ \
     { print "X11Forwarding yes"; next };
     /^#? *IgnoreRhosts/ \
     { print "IgnoreRhosts yes"; next };
     /^#? *RhostsAuthentication/ \
     { print "RhostsAuthentication no"; next };
```

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```
/^#? *RhostsRSAAuthentication/ \
{ print "RhostsRSAAuthentication no"; next };
/^#? *HostbasedAuthentication/ \
{ print "HostbasedAuthentication no"; next };
/^#? *PermitRootLogin/ \
{ print "PermitRootLogin no"; next };
/^#? *PermitEmptyPasswords/ \
{ print "PermitEmptyPasswords no"; next };
/^#? *Banner/ \
{ print "Banner /etc/issue.net"; next };
{print}' sshd_config.tmp > sshd_config
rm sshd_config.tmp
diff sshd_config-preCIS sshd_config
```

### **Discussion:**

OpenSSH is a popular free distribution of the standards-track SSH protocols which has become the standard implementation on Linux distributions. For more information on OpenSSH, see <http://www.openssh.org>.

The settings in this section attempt to ensure safe defaults for both the client and the server. Specifically, both the ssh client and the sshd server are configured to use only SSH protocol 2, as security vulnerabilities have been found in the first SSH protocol. This may cause compatibility issues at sites still using the vulnerable SSH protocol 1 these sites should endeavor to configure all systems to use only SSH protocol 2.

Note that a banner is added in the `sshd_config` file – we will create this banner later and it is discussed in detail in section 9. If you choose not to implement a banner, you will have to remove the reference to `/etc/issue` from `sshd_config` manually. Please read the section on the legal use of banners before deciding to remove it.

### ***1.4 Enable System Accounting***

Install package `sysstat`.

#### **Action – Red Hat Enterprise Linux:**

```
up2date -i sysstat
```

#### **Action –Fedora Core:**

```
yum install sysstat
```

### **Discussion:**

Note: RHEL 2.1 installation includes `sysstat` by default.

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System accounting gathers baseline system data (CPU utilization, disk I/O, etc.) every 10 minutes. The data may be accessed with the `sar` command, or by reviewing the nightly report files named `/var/log/sa/sar*`. Once a normal baseline for the system has been established, unauthorized activity (password crackers and other CPU-intensive jobs, and activity outside of normal usage hours) may be detected due to departures from the normal system performance curve. Note that this data is only archived for one week before being automatically removed by the regular nightly cron job. Administrators may wish to archive the `/var/log/sa/` directory on a regular basis to preserve this data for longer periods.

### ***1.5 Install and Run Bastille***

#### **Action:**

Download and install the Bastille RPM from [http://www.bastille-linux.org/running\\_bastille\\_on.htm](http://www.bastille-linux.org/running_bastille_on.htm). As of this writing, the current version is 3.0.9 – install it like so:

```
rpm -ivh Bastille-3.0.9-1.0.noarch.rpm
```

Note: Bastille is under constant revision. As of August 2006, the current version of Bastille is 3.0.9. Download and install the current version listed from the site above.

Installing the perl modules shown at <http://www.bastille-linux.org/perl-rpm-chart.html> is not required unless you want to rebuild the Bastille configuration file and need the Bastille tutorial to help you with the choices. Before running Bastille, please review Appendix C and understand the changes that it will make.

After Bastille is installed, copy the `bastille.CIS.conf` file provided in the archive containing the PDF version of this document (and in Appendix C) to `/etc/Bastille/config`. Run Bastille in batch mode as shown:

```
cd /etc/Bastille
cp /path/to/bastille.CIS.conf config
bastille -b
```

At this point, Bastille commits the changes.

If you get the following warning:

```
WARNING: Non-fatal warnings and errors have occurred in the
configuration of this system. Please view the following file for more
details:
```

```
/var/log/Bastille/error-log
```

read the log and resolve the issues presented.

***Reboot now: init 6***

## Discussion:

Bastille is a series of perl scripts that ask you questions and hardens your machine based on the answers. The Benchmark will then walk you through opening up your system for the services that have a legitimate Business need.

In this benchmark, it was decided it is better to direct you to use Bastille rather than incorporate their procedures into this document. This provides fair credit to an excellent resource, and reduces the maintenance effort involved to keep this Benchmark up to date.

Appendix C discusses the rationale behind all of the answers used in the configuration file.

## Note Regarding SUID Programs

Bastille will remove the SUID bit from several utilities like ping, mount and traceroute. If your Enterprise has a business need to allow unprivileged users access to these commands, then you will have to restore the SUID bit (chmod 4755) after running Bastille. A complete list of files changed is in Appendix B.

**Reboot now.** Then proceed with the Benchmark. Rebooting is required as many services are disabled by Bastille and the remainder of the Benchmark is based on this environment.

## 2 Minimize xinetd network services

You will need to unalias the mv and cp commands as some commands overwrite files and you may be prompted numerous times about overwriting these files:

```
unalias mv cp
```

### 2.1 Disable Standard Services

*Note: Bastille configuration does not cover all of these services*

#### Action:

```
cd /etc/xinetd.d
for FILE in chargen chargen-udp cups-lpd cups daytime \
daytime-udp echo echo-udp eklogin ekrb5-telnet finger \
gssftp imap imaps ipop2 ipop3 krb5-telnet klogin kshell \
ktalk ntalk pop3s rexec rlogin rsh rsync servers services \
sgi_fam talk telnet tftp time time-udp vsftpd wu-ftpd
do
```



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```
chkconfig ${FILE} off
done
```

### **Discussion:**

On Linux, `xinetd` has outpaced `inetd` as the default network superserver. Red Hat Enterprise Linux and Fedora continue the Red Hat tradition of using `xinetd`.

The stock `inetd` and `xinetd` configurations have gotten better and better with each major release over the past years. In 1999, at the time of Red Hat 5.2, distributions offered many services which were either rarely-used or for which there were more secure alternatives. After enabling SSH, it is possible to nearly do away with all `xinetd`-based services, since SSH provides both a secure login mechanism and a means of transferring files to and from the system. The actions above will disable all standard services normally enabled in the Red Hat `xinetd` configuration.

When running the above commands, you may receive one or more errors like this:

```
error reading information on service xxx: No such file
or directory
```

This is perfectly acceptable as all it means is the software for that service was not installed.

The rest of the actions in this section give the administrator the option of re-enabling certain services. Rather than disabling and then re-enabling these services, experienced administrators may wish to simply disable only those services that they know are unnecessary for their systems. If there is any doubt, it is better to disable everything, then re-enable the necessary services based on the function of the server.

Note: If you attempt to re-enable a service and get a message like this:

```
error reading information on service xxx: No such file
or directory
```

it means that you have not installed the software for that service yet. Install the software package then proceed with the Benchmark.



## ***2.2 Configure TCP Wrappers and Firewall to Limit Access***

### ***Question:***

Is there a reason to allow unlimited network access to this server?

If the answer to this question is no, then perform the action below.

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### **Action:**

**Note:** *Bastille configuration set to 'No'*

**Note:** Do not deny access to your system without allowing access. Complete both parts of this section.

### TCP Wrappers

Deny access to this server from all networks:

```
echo "ALL: ALL" > /etc/hosts.deny
diff /etc/hosts.deny-preCIS /etc/hosts.deny
```

To allow access from the authorized networks, refer to the `hosts.allow` man page and enter the service and the network in `/etc/hosts.allow`. At a minimum, you need to allow localhost traffic. The following script will create a sample `hosts.allow` file that will allow access to the locally connected networks:

```
printf "ALL: localhost" > /etc/hosts.allow
for I in `ifconfig | grep "inet addr" | cut -f2 -d: |
cut -f1-3 -d"." | grep -v ^127 | sort -n`; do
    printf ", $I." >> /etc/hosts.allow;
done
echo >> /etc/hosts.allow
diff /etc/hosts.allow-preCIS /etc/hosts.allow
```

**Note:** The above script intentionally ignores IPv6 networks.

**Note:** The above script assumes a netmask of 255.255.255.0. If yours is different, you will have to adjust `/etc/hosts.allow` for your environment.

You should review the resulting `/etc/hosts.allow` to ensure it meets your needs. Test your configuration now by logging in remotely.

You may wish to further customize your configuration. For example, if you would like to ensure that only one ip address, 192.168.50.4, can access SSH on your server at 192.168.50.2, then follow the example below.

Change `/etc/hosts.allow` from:

```
ALL: localhost, 192.168.50.2/255.255.255.0
```

to:

```
sshd : 192.168.50.4
      ALL EXCEPT sshd: localhost, 192.168.50.4/255.255.255.255
```

Further customization of TCP Wrappers is beyond the scope of this standard.

### Firewall

See discussion.

## **Discussion:**

TCP Wrappers and Host-Based Firewalls are presented together as they are similar and complementary in functionality.

### TCP Wrappers

By limiting access to the server, you reduce your exposure to threats from attackers on remote systems. For Internet-connected servers that provide service to the whole Internet, limiting access may not make sense. Intranet servers, limited-access servers, and workstations should limit access to only authorized networks.

Many daemons (SSH for example) are compiled with TCP Wrapper support, so you can use `/etc/hosts.allow` and `/etc/hosts.deny` to limit SSH access to your systems. The portmap daemon also uses TCP wrappers and there is a specific note to this effect in the default TCP wrappers config files.

It is important to note that TCP wrappers looks at `hosts.allow` first, then `hosts.deny`, and controls access based on the first match. If you omit entries in `hosts.allow` and deny access to ALL in `hosts.deny`, you will block network access to all network clients.

### Host-Based Firewalls

Host-based firewalls (also known as personal firewalls) have the following benefits:

- Protection from compromised systems on the local network;
- Defense in depth where an attacker must overcome both the border firewall and the host-based firewall to attack a system;
- Extremely fine tuned control over what systems may or may not access the system.

The Center for Internet Security recommends installing a host-based firewall on workstations, and suggests end-users consider installing them on servers as well.

Workstations are defined as Linux systems that offer no services to any external network or system. For example, a workstation that is running Apache and serving up content to the local network segment is not a workstation.

Host-based firewalls are available in iptables (installed by default) or via commercial offerings. The Center for Internet Security makes no recommendations for a vendor or even a specific firewall configuration as firewalls are very complex systems. Entire books have been written on iptables and are outside the scope of this benchmark. The default Red Hat iptables configuration or the default Bastille Linux iptables configuration are suitable for workstations and are good starting points for servers. The Center for Internet Security does recommend using a tool (graphical- or text-based) to configure the firewall as manual rule configuration is extremely error-prone and you may end up with a false sense of security and have less secure system.

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See the following iptables resources:

### ***Web-Based***

Linux Firewall Design Tool - <http://linux-firewall-tools.com/linux/firewall/index.html>

### ***Package-Based***

FireHOL - <http://firehol.sourceforge.net/>

Firewall Builder - <http://sourceforge.net/projects/fwbuilder/>

GuardDog - <http://www.simonzone.com/software/guarddog/>

*Note: Inclusion of a tool on this list is not an endorsement or recommendation by the Center for Internet Security.*

## **2.3 Only Enable `telnet` If Absolutely Necessary**

### **Question:**

Is there a mission-critical reason that requires users to access this system via telnet, rather than the more secure SSH protocol?

If the answer to this question is yes, proceed with the actions below.

### **Action:**

```
chkconfig telnet on
```

### **Discussion:**

`telnet` uses an unencrypted network protocol, which means data from the login session (such as passwords and all other data transmitted during the session) can be stolen by eavesdroppers on the network, and also that the session can be hijacked by outsiders to gain access to the remote system. The freely-available SSH utilities that ship with Red Hat Linux (see <http://www.openssh.com/>) provide encrypted network logins and should be used instead.

To aid in the migration to SSH, there is a freely available SSH client for Windows called `putty`, which is available from Simon Tatham (see <http://www.chiark.greenend.org.uk/~sgtatham/putty/>). There are numerous commercially supported SSH clients as well – check to see if your Enterprise already has an Enterprise SSH client.

Some Enterprises are using telnet over SSL, however, the simpler and more standard solution is to use SSH. Configuring telnet over SSL is beyond the scope of a Level 1 Benchmark and will not be addressed here.

It is understood that large Enterprises deeply entrenched in using `telnet` may take

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considerable effort in migrating from `telnet` to `ssh`, so `telnet` may have to be enabled. When it can be disabled, simply run `chkconfig telnet off` to turn it off again.

### ***2.4 Only Enable FTP If Absolutely Necessary***

#### **Question:**

Is this machine an FTP server, or is there a mission-critical reason why data must be transferred to and from this system via an ftp server, rather than `sftp` or `scp`?

If the answer to this question is yes, proceed with the actions below.

#### **Action – Red Hat Enterprise Linux 2.1:**

```
chkconfig wu-ftp on
```

#### **Action – Red Hat Enterprise Linux 3 / 4:**

```
chkconfig vsftpd on
```

#### **Action – Fedora Core 1 / 2 / 3 / 4 / 5:**

```
chkconfig vsftpd on
```

#### **Discussion:**

Note: Red Hat switched from distributing `wu-ftp` to `vsftpd` after RHEL2.1 was released. For security reasons, as well as consistency with future Red Hat versions, you should consider replacing `wu-ftp` with `vsftpd`. `vsftpd` is available from the Red Hat Enterprise Linux updates as well as from the Fedora Core distribution.

Like `telnet`, the FTP protocol is unencrypted, which means passwords and other data transmitted during the session can be captured by sniffing the network, and that the FTP session itself can be hijacked by an external attacker. Anonymous FTP servers are common for providing fast and easy downloading of publicly available files, however anonymous access should be configured to not allow uploading of files to the ftp server. FTP servers are also commonly used for Web Servers, but should be replaced by `sftp` if possible. `Ftp` / `sftp` access should be chrooted to include the document root of the web site or the portion of the web site that the individual is responsible for. Of course access to the system configuration files and other web files is to be excluded from the chrooted environment. This is especially important if there are multiple web sites.

SSH provides two different encrypted file transfer mechanisms – `scp` and `sftp` – which should be used instead. Even if FTP is required, consider requiring non-anonymous users

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on the system to transfer files via SSH-based protocols. For further information on restricting FTP access to the system, see section 7.2 below.

Note: Any directory writable by an anonymous FTP server should have its own partition. This helps prevent an FTP server from filling a hard drive used by other services.

To aid in the migration away from FTP, there are a number of freely available `scp` and `sftp` client for Windows, such as FileZilla from <http://sourceforge.net/projects/filezilla> and WinSCP available from <http://winscp.sourceforge.net/eng/index.php> which provides for a Graphical interface to `putty`, and `pscp`, which is a part of the previously mentioned `putty` package.

Some Enterprises are using FTP over SSL, however, the simpler and more standard solution is to use SSH. Configuring FTP over SSL is beyond the scope of a Level 1 Benchmark and will not be addressed here.

### ***2.5 Only Enable `rlogin/rsh/rcp` If Absolutely Necessary***

#### **Question:**

Is there a mission-critical reason why `rlogin/rsh/rcp` must be used instead of the more secure `ssh/scp`?

If the answer to this question is yes, proceed with the actions below.

#### **Action:**

```
chkconfig shell on
chkconfig rsh on
chkconfig login on
chkconfig rlogin on
```

#### **Discussion:**

The `r`-commands suffer from the same hijacking and sniffing issues as `telnet` and `ftp`, and in addition have a number of well-known weaknesses in their authentication scheme. SSH was designed to be a drop-in replacement for these protocols. Given the wide availability of free SSH implementations, it seems unlikely that there is ever a case where these tools cannot be replaced with SSH (again, see <http://www.openssh.com/>).

If these protocols are left enabled, please also see section 7.1 for additional security-related configuration settings.

## ***2.6 Only Enable TFTP Server if Absolutely Necessary***

### **Question:**

Is this system a boot server or is there some other mission-critical reason why data must be transferred to and from this system via TFTP?

If the answer to this question is yes, proceed with the actions below.

### **Action:**

```
chkconfig tftp on
if [ ! -d "/tftpboot" ] ; then
    mkdir -m 0755 /tftpboot && \
    chown root:root /tftpboot
fi
```

### **Discussion:**

TFTP is typically used for network booting of diskless workstations, X-terminals, and other similar devices. Routers and other network devices may copy configuration data to remote systems via TFTP for backup. However, unless this system is needed in one of these roles, it is best to leave the TFTP service disabled.

Note: The tftp-server software is not installed by default on Red Hat Enterprise Linux. You will have to install it if you need to use it. After installing it, perform the actions above.

## ***2.7 Only Enable IMAP If Absolutely Necessary***

### **Question:**

Is this machine a mail server with a mission-critical reason to use `imap` to serve mail to remote mail clients?

If the answer to this question is yes, proceed with the actions below.

### **Action:**

```
chkconfig imap on
```

### **Discussion:**

Remote mail clients (like Eudora, Netscape Mail and Kmail) may retrieve mail from remote mail servers using IMAP, the Internet Message Access Protocol, or POP, the Post Office Protocol. If this system is a mail server that must offer this protocol, `imap` may

be activated.

`imapssl` activates an SSL-encrypted, and thus much safer, version of IMAP. Standard IMAP is not encrypted and allows an attacker to eavesdrop on e-mails being transferred or to take over the connection. It may, based on which authentication method is used, allow an attacker to steal user passwords as well. IMAP-SSL suffers none of these problems.

You may wish to generate a new SSL certificate. For more information, consult <http://www.redhat.com/docs/manuals/linux/RHL-9-Manual/ref-guide/s1-email-mua.html#S2-EMAIL-SECURITY>.

Should you have an absolute need to reactivate the insecure IMAP server without encrypting SSL, you may apply the above action with `imap` in place of `imapssl`.

## ***2.8 Only Enable POP If Absolutely Necessary***

### **Question:**

Is this machine a mail server with a mission-critical reason to use pop to serve mail to remote mail clients?

If the answer to this question is yes, proceed with the actions below.

### **Action:**

```
chkconfig pop3s on
```

### **Discussion:**

Remote mail clients (like Eudora, Netscape Mail and Kmail) may retrieve mail from remote mail servers using IMAP, the Internet Message Access Protocol, or POP, the Post Office Protocol. If this system is a mail server that must offer the POP protocol, `pop3s` may be activated.

`pop3s` activates an SSL-encrypted, and thus much safer, version of POP. Standard POP is not encrypted and thus allows an attacker to eavesdrop on e-mails being transferred or to take over the connection. It may – based on which authentication method is used – allow an attacker to steal user passwords as well. POP-SSL suffers none of these problems. You may wish to generate a new SSL certificate. For more information, consult <http://www.redhat.com/docs/manuals/linux/RHL-9-Manual/ref-guide/s1-email-mua.html#S2-EMAIL-SECURITY>. Should you have an absolute need to reactivate the insecure POP server without encrypting SSL, you may apply the above action with `pop3` in place of `pop3s`.



## 3 Minimize boot services

### 3.1 Set Daemon *umask*

#### Action:

```
cd /etc/init.d
awk '($1=="umask") { if ($2 < "027") { $2="027"; } }; \
  { print }' functions-preCIS > functions
if [ `grep -c umask functions` -eq 0 ]; then
    echo "umask 027" >> functions
fi
diff functions-preCIS functions
```

#### Discussion:

The system default `umask` should be set to at least `027` in order to prevent daemon processes (such as the `syslog` daemon) from creating world-writable files by default. If a particular daemon needs a less restrictive `umask`, consider editing the daemon startup script to grant that daemon the required `umask` while maintaining the increased server security posture.

### 3.2 Disable *xinetd*, If Possible

#### Action:

```
cd /etc/xinetd.d
if [ `find . -type f | \
  xargs awk '($1=="disable" && $3=="no") {print}' | \
  wc -l` -eq 0 ]; then
    echo "Disabling xinetd"
    chkconfig --level 12345 xinetd off
fi
```

#### Discussion:

If the actions in Section 2 of this benchmark resulted in no services being enabled in the `inet` super daemon `/etc/xinetd.d`, then the `xinetd` service may be disabled completely on this system.

Experienced SysAdmins will note that the `inet` super daemon is usually restarted after a change to its configuration file. This is not necessary in this case as the system will be rebooted and the change will take effect at that time.

### 3.3 Disable *sendmail* Server, If Possible

#### Question:

Is this system a mail server – that is, does this machine receive and process email from other hosts? Note: The email server need not be running to send outgoing mail.

Proceed with the appropriate actions below.

#### Action – Yes – *sendmail* is required:

```
cd /etc/sysconfig
cp -pf sendmail-preCIS sendmail
chown root:root sendmail
chmod 644 sendmail
```

#### Action – No – *sendmail* is not required:

```
cd /etc/sysconfig
if [ `grep -ci "daemon=yes" sendmail` -ne 0 ]; then
    cat <<END_ENTRIES > sendmail
DAEMON=no
QUEUE=1h
END_ENTRIES
    chown root:root sendmail
    chmod 644 sendmail
    chkconfig sendmail off
fi
diff sendmail-preCIS sendmail
```

#### Discussion:

It is possible to run a Unix system with the Sendmail daemon disabled and still allow users on that system to send email out from that machine. Running Sendmail in "*daemon mode*" (with the `-bd` command-line option) is only required on machines that act as mail servers, receiving and processing email from other hosts on the network. Note that if the system is an email server, the administrator is encouraged to search the Web for additional documentation on Sendmail security issues. Some information is available at <http://www.deer-run.com/~hal/dns-sendmail/DNSandSendmail.pdf> and at <http://www.sendmail.org>.

Although recent versions of Red Hat have set Sendmail to listen only to the *loopback* network interface, this document still deactivates "*daemon mode*." Listening on the loopback interface still presents a slightly higher level of exposure to attack than not listening at all. Experienced administrators will understand that a `chroot`-jailed user or program can still interact with a Sendmail process listening on the *loopback* interface.

### ***3.4 Disable GUI Login If Possible***

#### **Question:**

Is there a mission-critical reason to run a GUI login program on this system?

If the answer to this question is no, proceed with the actions below.

#### **Action:**

```
sed -e 's/id:5:initdefault:/id:3:initdefault:/' \
< /etc/inittab-preCIS > /etc/inittab
chown root:root /etc/inittab
chmod 0600 /etc/inittab
diff /etc/inittab-preCIS /etc/inittab
```

#### **Discussion:**

There is usually no reason to run X Windows on a dedicated server machine, like a dedicated web server. This action disables the graphical login, if present, leaving the user to login via SSH or a normal text-based console. If you elect to deactivate the GUI login screen, users can still run X Windows by typing `startx` at the shell prompt. In Red Hat Enterprise Linux, there are two main runlevels that the system runs in. Runlevel 5 boots directly into X Windows, so as to allow graphical login or easy use of specialized X terminals. Otherwise, for normal text-based console login, runlevel 3 is desirable. GUI login is activated or deactivated by changing this runlevel in `/etc/inittab`. Again, note that runlevel 3 still allows the user to run X Windows by typing `startx` at the shell prompt.

### ***3.5 Disable X Font Server If Possible***

#### **Question:**

Is there a mission-critical reason to run X Windows on this system?

If the answer to this question is no, proceed with the actions below.

#### **Action:**

```
chkconfig xfs off
```

#### **Discussion:**

There's usually no reason to run X Windows on a dedicated server machine, like a dedicated web server. If you won't be using an X server on this machine, this action will

deactivate the font server.



### 3.6 Disable Standard Boot Services

#### Action:

```
for FILE in apmd avahi-daemon canna cups-config-daemon \
    FreeWnn gpm hidd hpoj hplip innd irda isdn kdcrotate \
    lvs mars-nwe messagebus oki4daemon privoxy rstatd \
    rusersd rwalld rhod spamassassin wine; do
    service $FILE stop
    chkconfig $FILE off
done
for FILE in nfs nfslock autofs ypbind ypserv yppasswdd \
    portmap smb netfs lpd apache httpd tux snmpd \
    named postgresql mysqld webmin kudzu squid cups \
    ip6tables iptables pcmcia bluetooth mDNSResponder; do
    service $FILE stop
    chkconfig $FILE off
done
```

#### Discussion:

Every system daemon that does not have a clear and necessary purpose on the host should be deactivated. This greatly reduces the chances that the machine will be running a vulnerable daemon when the next vulnerability is discovered in its operating system.

Red Hat Linux uses a facility called `chkconfig` to manage all the SysV rc-scripts. `chkconfig` adds or deletes links in each of the appropriate runlevel directories (`/etc/rc.d/rc*.d`) to activate or deactivate each of the rc-scripts.

This process "chkconfig's" all of the rc-scripts off, so that the local administrator can easily reactivate any of these scripts upon discovery of a mission-critical need for one of these services. One could reactivate the daemon script by typing `chkconfig daemon on` in most cases, which activates it in runlevels 2 through 5. If one of these runlevels is undesirable, like runlevel 2 for the NFS script, or the script needs to run in one of the other available runlevels, `chkconfig` takes the argument " level <levels>" where one can explicitly specify runlevels that it should act on.

Note that vendor patches may restore some of the original entries in the startup script directories `/etc/rc.d/rc*.d` – it is always a good idea to check these boot directories and remove any scripts that may have been added by the patch installation process. This would be a good time to ensure this check is in your Enterprise OS Upgrade Procedure.

The rest of the actions in this section give the administrator the option of re-enabling

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certain services – in particular, the services that are disabled in the second loop in the "Action" section above. Rather than disabling and then re-enabling these services, experienced administrators may wish to simply disable only those services that they know are unnecessary for their systems.

The third loop in the "Action" section locks daemon-user accounts related to servers that we examine by setting a lockout password. This will not prevent a given daemon from running as these users – it simply confirms that these users are not available for human login. It also changes the shell to `/sbin/nologin` (standard for most service accounts under RHEL4) for an additional layer of security as long as shell access is not necessary. Bear in mind that some packages (`find-utils` up to version 4.1.20, for example) do not work properly without a shell for the `nobody` account – be sure you test this thoroughly if you choose to invalidate the daemon shells.

Note: Not all of the scripts listed above will exist on all systems, as this is a superset of the available rc-scripts in the various Red Hat distribution versions. The benchmark's recommended action will register some trivial errors on each distribution version as a result – these are not cause for alarm.

### ***3.7 Only Enable SMB (Windows File Sharing) Processes If Absolutely Necessary***

#### **Question:**

Is this machine sharing files via the Windows file sharing protocols?

If the answer to this question is yes, proceed with the actions below.

#### **Action:**

```
chkconfig smb on
```

#### **Discussion:**

Red Hat Linux includes the popular Open Source Samba server for providing file and print services to Windows-based systems. This allows a Unix system to act as a file or print server in on a Windows network, and even act as a Domain Controller (authentication server) to older Windows operating systems. However, if this functionality is not required by the site, the service should be disabled.

This section removes the SMB client software as well. If there is some business reason to mount Windows Shares, do not remove the packages: `samba-client` and `samba-common`.

### ***3.8 Only Enable NFS Server Processes If Absolutely Necessary***

#### ***Question:***

Is this machine an NFS file server?

If the answer to this question is yes, proceed with the actions below.

#### **Action:**

```
chkconfig --level 345 nfs on
```

#### **Discussion:**

NFS is frequently exploited to gain unauthorized access to files and systems. Clearly there is no need to run the NFS server-related daemons on hosts that are not NFS servers. If the system is an NFS server, the administrator should take reasonable precautions when exporting file systems, including restricting NFS access to a specific range of local IP addresses and exporting file systems "read-only" where appropriate. For more information, consult the exports manual page.

### ***3.9 Only Enable NFS Client Processes If Absolutely Necessary***

#### ***Question:***

Is there a mission-critical reason why this system must access file systems from remote servers via NFS?

If the answer to this question is yes, proceed with the actions below.

#### **Action:**

```
chkconfig --level 345 nfslock on  
chkconfig --level 345 autofs on
```

#### **Discussion:**

Again, unless there is a significant need for this system to acquire data via NFS, administrators should disable NFS-related services. Note that other file transfer schemes (such as `rdist` via SSH) can often be preferable to NFS for certain applications.

### ***3.10 Only Enable NIS Client Processes If Absolutely Necessary***

#### **Question:**

Is there a mission-critical reason why this machine must be an NIS client?

If the answer to this question is yes, proceed with the actions below.

#### **Action:**

```
chkconfig ypbind on
```

#### **Discussion:**

Unless this site must use NIS, it should really be avoided. While it can be very useful for transparently scaling the number of workstations, it's not well designed for security. Sun Microsystems is now phasing out NIS+ in favor of LDAP for naming services – NIS and NIS+ are now reaching end of life.

### ***3.11 Only Enable NIS Server Processes If Absolutely Necessary***

#### **Question:**

Is there a mission-critical reason why this machine must be an NIS server?

If the answer to this question is yes, proceed with the actions below.

#### **Action:**

```
chkconfig ypserv on  
chkconfig yppasswdd on
```

#### **Discussion:**

Unless this site must use NIS, it should be avoided. While it can be very useful for transparently scaling the number of workstations, it is not well designed for security.

### ***3.12 Only Enable RPC Portmap Process If Absolutely Necessary***

#### **Question:**

Are any of the following statements true?

- This machine is an NFS client or server

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- This machine is an NIS (YP) or NIS+ client or server
- The machine runs a third-party software application which is dependent on RPC support

If the answer to this question is yes, proceed with the actions below.

### **Action:**

```
chkconfig --level 345 portmap on
```

### **Discussion:**

RPC-based services typically use very weak or non-existent authentication and yet may share very sensitive information. Unless one of the services listed above is required on this machine, best to disable RPC-based tools completely. If there is uncertainty in whether or not a particular third-party application requires RPC services, consult with the application vendor.

## ***3.13 Only Enable `netfs` Script If Absolutely Necessary***

### **Question:**

Is this machine sharing files via the NFS, Novell Netware or Windows file sharing protocols?

If the answer to this question is yes, proceed with the actions below.

### **Action:**

```
chkconfig --level 345 netfs on
```

### **Discussion:**

If there are no network file sharing protocols being used, one can deactivate the netfs script. This script mounts network drives on the client. Though this is not a persistent daemon and thus not so dangerous, thinning out the `/etc/rc.d/rcN.d` directories makes the system much easier to audit.

## ***3.14 Only Enable Printer Daemon Processes If Absolutely Necessary***

### **Question:**

Is this system a print server, or is there a mission-critical reason why users must submit print jobs from this system?



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If the answer to this question is yes, proceed with the actions below.

### Action:

```
if [ -e /etc/init.d/cups ]; then
    chkconfig cups on
    sed -e 's/^\#User lp/User lp/' /etc/cups/cupsd.conf \
        -e 's/^\#Group sys/Group sys/' \
        /etc/cups/cupsd.conf-preCIS >/etc/cups/cupsd.conf
    chown lp:sys /etc/cups/cupsd.conf
    chmod 600 /etc/cups/cupsd.conf
fi
chkconfig hpoj on
chkconfig lpd on
diff /etc/cups/cupsd.conf-preCIS /etc/cups/cupsd.conf

# Following added to undo Bastille change:
# RHEL 2.1 uses lpr; RHEL 3 uses cups and symlinks to lpr
# if symlink exists, this is a cups system
if [ -L /usr/bin/lpr ]; then
    chmod 0755 /usr/bin/lpr* /usr/bin/lprm*
    chmod 0755 /usr/bin/lpq* /usr/bin/lpstat*
    chmod 04755 /usr/bin/lppasswd
else
    chmod 0755 /usr/bin/lpr /usr/bin/lprm /usr/bin/lpq
fi
chkconfig cups on
```

### Discussion:

If users will never print files from this machine and the system will never be used as a print server by other hosts on the network, then it is safe to disable the print daemon, lpd or cupsd. The Unix print servers have generally had a poor security record – be sure to keep up-to-date on vendor patches.

Note that this item also sets cupsd, when present, to run as a non-root user and group, namely user lp and group sys.

## ***3.15 Only Enable Web Server Processes If Absolutely Necessary***

### Question:

Is there a mission-critical reason why this system must run a Web server? Web Servers should be run on dedicated systems serving only as web server. Unfortunately web servers tend to be enabled on many systems that don't need the web service, and are

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often not properly secured and administered. If Apache (the default web server) is required, review and apply the CIS Apache benchmark available at [http://www.cisecurity.org/bench\\_apache.html](http://www.cisecurity.org/bench_apache.html). Also note that Red Hat Enterprise Linux uses piranha to administer the Linux Virtual Server software, which requires apache and php. If this is not a web server, and you are not using piranha, the answer is no.

If the answer to this question is yes, proceed with the actions below.

### **Action:**

*If Apache is used, download and apply appropriate recommendations from the CIS Apache Benchmark.*

*Please read the discussion before executing these commands and select the appropriate command.*

```
chkconfig apache on
chkconfig httpd on
chkconfig tux on
```

### **Discussion:**

Even if this machine is a web server, the local site may choose not to use the web server provided with Linux in favor of a locally developed and supported Web environment.

The TUX server is a new kernel-based web server, only available on the most recent Linux distributions, which gains performance while sacrificing the flexibility offered by a full-featured web server like Apache. Even with this performance advantage, for security reasons, services should not be placed in the kernel space – they should remain in the user space. When an exploit is found for Tux, and it is used against your server, it is much easier to maintain control over your systems if the kernel is not being impacted during the attack.

## ***3.16 Only Enable SNMP Processes If Absolutely Necessary***

### **Question:**

Are hosts at this site remotely monitored by a tool (e.g., HP OpenView, MRTG, Cricket) that relies on SNMP?

If the answer to this question is yes, proceed with the actions below.

### **Action:**

```
chkconfig snmpd on
```

**Discussion:**

If SNMP is used to monitor the hosts on this network, experts recommend changing the default community string used to access data via SNMP. On Red Hat Enterprise Linux systems, this parameter has already been changed to a reasonably secure setting in the file `/etc/snmp/snmpd.conf`:

```
com2sec notConfigUser default public
```

No further action is required.

Note: In a large Enterprise that relied heavily on SNMP, it was discovered during the Linux rollout that SNMP was not a critical service, and not having it enabled increased the security posture of the servers.

***3.17 Only Enable DNS Server Process If Absolutely Necessary***

**Question:**

Is this machine a DNS server, or name server, for this site?

If the answer to this question is yes, proceed with the actions below.

**Action:**

Download and following the appropriate configurations from the CIS BIND benchmark, then enable the BIND as follows.

```
chkconfig named on
```

**Discussion:**

Most of the machines in the organization do not need a DNS server running on the box. Unless this is one of the organization's name servers, it is safe to shut this down.

If this must be left active, please patch often and security harden the configuration according to the CIS BIND benchmark which provides detailed implementation and configurations recommendations. Two highly suggested configuration is to bind the DNS server program in a chroot environment, and run it as a non-root user. This significantly restricts the resources that the DNS server has access to on the system, reducing this set to the minimum required for the program to function properly. Carefully consider the consequences that if a name server is compromised then traffic that depends on the name service such as web, ftp and e-mail can be redirected to malicious servers.

Additionally, consider the use of Access Control Lists (ACL's) in `/etc/named.conf` to limit who can query your name server. For example, Internal name servers should not respond to outside requests. Large Enterprises run multiple name servers so this should

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not be an issue. However, smaller organizations may not be able to deploy both internal and external name servers and should instead use a reputable externally hosted DNS service. Details on how to accomplish this are provided in the CIS BIND benchmark, available at [http://www.cisecurity.org/bench\\_bind.html](http://www.cisecurity.org/bench_bind.html)

### ***3.18 Only Enable SQL Server Processes If Absolutely Necessary***

#### **Question:**

Is this machine an SQL (database) server?

If the answer to this question is yes, proceed with the actions below.

#### **Action:**

*Please read the discussion before executing these commands and select the appropriate command.*

```
chkconfig postgresql on
chkconfig mysqld on
```

#### **Discussion:**

If this machine does not need to run the mainstream database (SQL) servers Postgres or MySQL, it is safe to deactivate them. If you need to enable them, issue the command (above) for the database that you installed.

### ***3.19 Only Enable Webmin Processes If Absolutely Necessary***

#### **Question:**

Does the site absolutely need to administer the system through the remote webmin tool?

Proceed with actions below.

#### **Action – Yes, webmin is necessary:**

```
chkconfig webmin on
```

#### **Action – No, webmin is not necessary:**

```
rpm -e webmin
```

**Discussion:**

One can remotely administer a system through the relatively safe SSH remote shell system. Webmin, and other tools like it, can be dangerous as they have a history of bad authentication or session management. Red Hat Enterprise Linux does not include this tool – if it has been added after the installation, the organization should research and consider this decision carefully.

***3.20 Only Enable Squid Cache Server If Absolutely Necessary***

**Question:**

Do you use the squid web cache to speed up web transactions?

If the answer to this question is yes, proceed with the actions below.

**Action:**

```
chkconfig squid on
```

**Discussion:**

Squid can actually be beneficial to security, as it imposes a proxy between the client and server. On the other hand, if it is not being used, it should be deactivated and removed. This deactivation decreases the risk of system compromise should a security vulnerability later be discovered in Squid. Finally, if your site uses Squid, configure it carefully. Many Squid caches are badly configured to either allow outsider attackers to probe internal machines through the firewall or to use the cache to hide their true source IP address from their target hosts. Each site should configure Squid to not allow people outside their perimeter to use the cache without authentication of some sort. A better deployment for squid is on a server with no external-facing network interface (unless you are using it for a reverse web proxy, which is a very specific installation, and beyond the scope of this benchmark).

***3.21 Only Enable Kudzu Hardware Detection If Absolutely Necessary***

**Question:**

Does the site absolutely need to allow users at the console to add hardware to the system?

If the answer to this question is yes, then perform the action below.

**Action:**

```
chkconfig --level 345 kudzu on
```

## **Discussion:**

Kudzu is Red Hat's hardware detection program, which is normally set to run during system startup. It detects changes in hardware and, without demanding authentication of any sort, allows the user at the console to configure that hardware. This lack of authentication presents the primary danger – any user sitting at the console during a reboot can configure any new devices added to the system.

This configuration is an unnecessary risk for most sites, with the exception of those that need to allow users to easily make hardware changes without having a root password. Sites in the exception class might need to allow students to connect external hard drives, backup drives or other potentially common external devices.

If you deactivate this rc-script, Kudzu is still accessible. To run Kudzu after installing new hardware, run `/etc/rc.d/init.d/kudzu start` at the shell prompt while logged in as root.

## **4 Kernel Tuning**

### ***4.1 Network Parameter Modifications***

#### **Action:**

```
cat <<END_SCRIPT >> /etc/sysctl.conf
# Following 11 lines added by CISecurity Benchmark sec 4.1
net.ipv4.tcp_max_syn_backlog = 4096
net.ipv4.tcp_syncookies=1
net.ipv4.conf.all.rp_filter = 1
net.ipv4.conf.all.accept_source_route = 0
net.ipv4.conf.all.accept_redirects = 0
net.ipv4.conf.all.secure_redirects = 0
net.ipv4.conf.default.rp_filter = 1
net.ipv4.conf.default.accept_source_route = 0
net.ipv4.conf.default.accept_redirects = 0
net.ipv4.conf.default.secure_redirects = 0
net.ipv4.icmp_echo_ignore_broadcasts = 1
END_SCRIPT
chown root:root /etc/sysctl.conf
chmod 0600 /etc/sysctl.conf
diff /etc/sysctl.conf-preCIS /etc/sysctl.conf
```

#### **Discussion:**

For an explanation of some of these parameters, see

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/Documentation/networking/ip-sysctl.txt in your local copy of the kernel source or read the latest from the cross-referencing Linux site:

<http://lxr.linux.no/source/Documentation/networking/ip-sysctl.txt>.

See also SN.9 for additional security-related tunings that you may want to consider.

### ***4.2 Additional Network Parameter Modifications***

#### **Question:**

Is this system going to be used as a firewall or gateway to pass network traffic between different networks?

If the answer to this question is no, then perform the action below.

#### **Action:**

```
cat <<END_SCRIPT >> /etc/sysctl.conf
# Following 3 lines added by CISecurity Benchmark sec 4.2
net.ipv4.ip_forward = 0
net.ipv4.conf.all.send_redirects = 0
net.ipv4.conf.default.send_redirects = 0
END_SCRIPT
chown root:root /etc/sysctl.conf
chmod 0600 /etc/sysctl.conf
diff /etc/sysctl.conf-preCIS /etc/sysctl.conf
```

#### **Discussion:**

For an explanation of some of these parameters, see

/Documentation/networking/ip-sysctl.txt in your local copy of the kernel source or read the latest from the cross-referencing Linux site:

<http://lxr.linux.no/source/Documentation/networking/ip-sysctl.txt>.

## **5 Logging**

The items in this section cover enabling various different forms of system logging in order to keep track of activity on the system. Because it is often necessary to correlate log information from many different systems (particularly after a security incident) experts recommend establishing some form of time synchronization among systems and devices connected to the local network. The standard Internet protocol for time synchronization is the Network Time Protocol (NTP), which is supported by most network-ready devices.

More information on NTP can be found at <http://www.ntp.org> and

[http://www.ibiblio.org/pub/Linux/docs/HOWTO/otherformats/html\\_single/TimePrecision](http://www.ibiblio.org/pub/Linux/docs/HOWTO/otherformats/html_single/TimePrecision)



### 5.1 Capture Messages Sent To Syslog AUTHPRIV Facility

#### Action:

```
if [ `grep -v '^#' /etc/syslog.conf | \
    grep -c 'authpriv'` -eq 0 ]; then
    echo -e "authpriv.*\t\t\t\t/var/log/secure" \
        >> /etc/syslog.conf
fi
touch /var/log/secure
chown root:root /var/log/secure
chmod 600 /var/log/secure
diff /etc/syslog.conf-preCIS /etc/syslog.conf
```

#### Discussion:

The default installation of Red Hat Enterprise Linux already has this enabled. It is included in case it had been previously disabled.

Not all Linux distributions, especially the older ones, capture logging information which is sent to the LOG\_AUTHPRIV facilities. This is unfortunate, since a great deal of important security-related information is sent via these channels (e.g., network service startups, commands like `usermod` and `chage`, etc). The above action causes this information to be captured in the `/var/log/secure` file (which is only readable by the superuser). This file should be reviewed and archived on a regular basis.

### 5.2 Turn On Additional Logging For FTP Daemon

#### Action:

```
if [ -f /etc/ftpaccess ]; then
    cd /etc/xinetd.d
    awk '/server_args/ \
        { print "    server_args = -l -a -d" ; next };
        { print }' wu-ftp-preCIS > wu-ftp
    chown root:root wu-ftp
    chmod 644 wu-ftp
    diff /etc/ftpaccess-preCIS /etc/ftpaccess
fi

if [ -f /etc/vsftpd.conf ]; then
    FILE="/etc/vsftpd.conf"
else
    FILE="/etc/vsftpd/vsftpd.conf"
```



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```
fi
if [ -f $FILE ]; then
    awk '/^#?xferlog_std_format/ \
        { print "xferlog_std_format=NO"; next };
/^#?log_ftp_protocol/ \
        { print "log_ftp_protocol=YES"; next };
{ print }' ${FILE}-preCIS > ${FILE}
    if [ `egrep -c log_ftp_protocol ${FILE}` == 0 ]; then
        echo "log_ftp_protocol=YES" >> ${FILE}
    fi
    chmod 0600 $FILE
    chown root:root $FILE
    diff ${FILE}-preCIS $FILE
fi
```

### **Discussion:**

Red Hat Enterprise Linux already logs connections and all files transferred in WU-FTPd. Some installations might prefer vsftpd over WU-FTPd, and the above script reflects that preference.

The modifications above ensure that all commands sent to the server are logged. In WUFTPd, the action above also requires the server to log all security violations or policy boundary conditions and to ensure that file transfers are logged to syslog, in addition to the default `/var/log/xferlog`.

### **5.3 Confirm Permissions On System Log Files**

#### **Action:**

```
cd /var/log
chmod o-rwx boot.log* cron* dmesg ksyms* httpd/* \
maillog* messages* news/* pgsqll rpmpkgs* samba/* sa/* \
scrollkeeper.log secure* spooler* squid/* vbox/* wtmp
chmod o-rx boot.log* cron* maillog* messages* pgsqll \
secure* spooler* squid/* sa/*
chmod g-w boot.log* cron* dmesg httpd/* ksyms* \
maillog* messages* pgsqll rpmpkgs* samba/* sa/* \
scrollkeeper.log secure* spooler*
chmod g-rx boot.log* cron* maillog* messages* pgsqll \
secure* spooler*
chmod o-w gdm/ httpd/ news/ samba/ squid/ sa/ vbox/
chmod o-rx httpd/ samba/ squid/ sa/
chmod g-w gdm/ httpd/ news/ samba/ squid/ sa/ vbox/
chmod g-rx httpd/ samba/ sa/
chmod u-x kernel syslog loginlog
chown -R root:root .
```

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```
chgrp utmp wtmp
[ -e news ] && chown -R news:news news
[ -e pgsql ] && chown postgres:postgres pgsql
chown -R squid:squid squid
```

### **Discussion:**

It is critical to protect system log files from being modified by unauthorized individuals. Also, certain logs contain sensitive data that should only be available to the system administrator.

If you should add any of the services that affect the above logs, please revisit this section to ensure the logs have the correct/secure permissions.

Note: You may get some errors from `chmod` if the file does not exist.



### **5.4 Configure syslogd to Send Logs to a Remote LogHost**

*Note: Bastille configuration set to 'No' as this is system/site specific.*

### **Action:**

In the script below, replace `loghost` with the proper name (FQDN, if necessary) of your loghost.

```
printf "### Following lines added by CISecurity \
RHEL Benchmark Section 5.4\n\
kern.warning;*.err;authpriv.none\t@loghost\n\
*.info;mail.none;authpriv.none;cron.none\t@loghost\n\
*.emerg\t@loghost\n\
local7.*\t@loghost\n" >> /etc/syslog.conf
diff /etc/syslog.conf-preCIS /etc/syslog.conf
```

### **Discussion:**

Remote logging is essential in detecting intrusion and monitoring several servers operating in concert. An intruder – once he/she has obtained root – can edit the system logs to remove all traces of the attack. If the logs are stored off the machine, those logs can be analyzed for anomalies and used for prosecuting the attacker.

## 6 File/Directory Permissions/Access

### 6.1 Add 'nodev' Option To Appropriate Partitions In /etc/fstab

#### Action:

```
cp -p /etc/fstab /etc/fstab.tmp
awk '($3 ~ /^ext[23]$/ && $2 != "/" ) \
    { $4 = $4 ",nodev" }; \
    { print }' /etc/fstab.tmp > /etc/fstab
chown root:root /etc/fstab
chmod 0644 /etc/fstab
rm -f /etc/fstab.tmp
diff /etc/fstab-preCIS /etc/fstab
```

#### Discussion:

Placing "nodev" on these partitions prevents users from mounting unauthorized devices on any partitions that we know should not contain devices. There should be little need to mount devices on any partitions other than /dev.

One notable exception, of course, is the case where system programs are being placed into "chroot jails"- these often require that several devices be created in the chroot directory. If you are using chroot jails on your machines, you should be careful with the nodev option.

### 6.2 Add 'nosuid' and 'nodev' Option For Removable Media In /etc/fstab

#### Action:

```
cp -p /etc/fstab /etc/fstab.tmp
awk '($2 ~ /^\/m.*\/(floppy|cdrom)$/) && \
    ($4 !~ /,nodev,nosuid/) \
    { $4 = $4, "nodev,nosuid" }; \
    { print }' /etc/fstab.tmp > /etc/fstab
chown root:root /etc/fstab
chmod 0644 /etc/fstab
rm -f /etc/fstab.tmp
diff /etc/fstab-preCIS /etc/fstab
```

#### Additional Action – RedHat Enterprise Linux 3-4 and Fedora Core 3-5:

```
chattr +i /etc/fstab
```

## Discussion:

Removable media is one vector by which malicious software can be introduced onto the system. By forcing these file systems to be mounted with the `nosuid` option, the administrator prevents users from bringing set-UID programs onto the system via CDROMs and floppy disks. We also force these filesystems to mount with the `nodev` option, as explained in item 6.1.

If this machine has multiple CD-ROM or floppy drives, additional action must be taken. Simply add `nosuid` to the fourth field for the `/etc/fstab` lines that reference those drives.

Additional actions are required for RHEL3 and later and Fedora Core 3 and later. These operating system use the Hardware Abstraction Layer (HAL) Daemon software to update the filesystem description table (`/etc/fstab`) based on a series of SGML policies located in `/usr/share/hal/fdi/` using the program `fstab-sync`. Experience has shown HAL is still maturing and there are a lack of tools available to configure the SGML configuration files. Editing these SHML files manually is beyond the scope of this Benchmark. Therefore, once the desired changes are made to `/etc/fstab`, set it to be immutable (as discussed in the `fstab-sync` man page).

## 6.3 Disable User-Mounted Removable File Systems

### Question:

Is there a mission-critical reason to allow unprivileged users to mount CD-ROMs and floppy disk file systems on this system?

If the answer to this question is no, then perform the action below.

### Action:

```
cd /etc/security
CONS_PERM_FILE="console.perms"
DEF_FILE="console.perms.d/50-default.perms"
test -f $DEF_FILE && CONS_PERM_FILE="$DEF_FILE"
awk '($1 == "<console>") && ($3 !~ \
    /sound|fb|kbd|joystick|v4l|mainboard|gpm|scanner/) \
    { $1 = "#<console>" }; \
    { print }' ${CONS_PERM_FILE}-preCIS > $CONS_PERM_FILE
chown root:root $CONS_PERM_FILE
chmod 0600 $CONS_PERM_FILE
diff ${CONS_PERM_FILE}-preCIS $CONS_PERM_FILE
```

### **Discussion:**

In Red Hat Linux, the `pam_console` PAM module gives the user at console (the machine's true physical keyboard) temporarily enhanced privileges. This is configured through the `/etc/security/console.perms` file or `console.perms.d/50-default.perms`. Under the Red Hat-shipped settings, the console user is given ownership of the floppy and CD-ROM drive, along with a host of other devices. Many of these devices correspond to removable media and thus represent a security risk. This item disables the enhanced privileges on these devices. Be aware that allowing users to mount and access data from removable media drives makes it easier for malicious programs and data to be imported onto the network or data to be removed from the server.

### ***6.4 Verify `passwd`, `shadow`, and `group` File Permissions***

#### **Action:**

```
cd /etc
chown root:root passwd shadow group
chmod 644 passwd group
chmod 400 shadow
```

#### **Discussion:**

These are the default owners and access permissions for these files. It is worthwhile to periodically check these file permissions as there have been package defects that changed `/etc/shadow` permissions to 644. Tripwire (<http://www.tripwire.org/downloads/index.php>) and AIDE (<http://sourceforge.net/projects/aide>) – the successor to Tripwire – are excellent products for alerting you to changes in these files. Whereas AIDE is an improvement to Tripwire, it is still listed as Beta software, and may not be suitable for Enterprise Production systems.

### ***6.5 World-Writable Directories Should Have Their Sticky Bit Set***

#### **Action:**

The automated tool supplied with this benchmark will flag world-writable directories that do not have the sticky bit set.

Administrators who wish to obtain a list of these directories may execute the following commands:

```
for PART in `awk '($3 == "ext2" || $3 == "ext3") \
  { print $2 }' /etc/fstab`; do
  find $PART -xdev -type d \
```

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```
done \(\ -perm -0002 -a ! -perm -1000\) -print
```

There should be no entries returned.

### **Discussion:**

When the so-called "sticky bit" is set on a directory, then only the owner of a file may remove that file from the directory (as opposed to the usual behavior where anybody with write access to that directory may remove the file). Setting the sticky bit prevents users from overwriting each other's files, whether accidentally or maliciously, and is generally appropriate for most world-writable directories. However, consult appropriate vendor documentation before blindly applying the sticky bit to any world writable directories found in order to avoid breaking any application dependencies on a given directory.

### **6.6 Find Unauthorized World-Writable Files**

#### **Action:**

The automated testing tool supplied with this benchmark will flag unexpected world-writable files on the system.

Administrators who wish to obtain a list of the world-writable files currently installed on the system may run the following commands:

```
for PART in $(grep -v '^#' /etc/fstab |
  awk '($6 != "0") { print $2 }' ); do

  find $PART -xdev -type f \
  \(\ -perm -0002 -a ! -perm -1000\) -print
done
```

There should be no entries returned. If `grub.conf` shows up, its permissions will be adjusted in step 7.8.

#### **Discussion:**

Data in world-writable files can be modified and compromised by any user on the system. World-writable files may also indicate an incorrectly written script or program that could potentially be the cause of a larger compromise to the system's integrity.

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Generally removing write access for the "other" category (`chmod o-w <filename>`) is advisable, but always consult relevant vendor documentation in order to avoid breaking any application dependencies on a given file.

### ***6.7 Find Unauthorized SUID/SGID System Executables***

#### **Action:**

The automated testing tool supplied with this benchmark will flag unexpected set-UID and set-GID applications on the system.

Administrators who wish to obtain a list of the set-UID and set-GID programs currently installed on the system may run the following commands:

```
for PART in $(grep -v '^#' /etc/fstab | awk '($6 != "0") {
print $2 }'); do
    find $PART -xdev \( -perm -04000 -o -perm -02000 \) \
    -type f -print
done
```

#### **Discussion:**

The administrator should take care to ensure that no rogue set-UID programs have been introduced into the system. In addition, if possible, the administrator should attempt a Set-UID audit and reduction.

### ***6.8 Find All Unowned Files***

#### **Action:**

```
for PART in $(grep -v '^#' /etc/fstab | awk '($6 != "0") {
print $2 }'); do
    find $PART -xdev -nouser -o -nogroup -print
done
```

There should be no entries returned.

#### **Discussion:**

Do not allow any unowned files on your system. Unowned files may be an indication an intruder has accessed your system or improper package maintenance/installation.

Sometimes a package removal results in unowned files or directories related to this software as the user/group associated with that package is removed, but that user's files (i.e., files changed after the package was installed) are left behind. Another common cause is the installation of software that does not properly set file ownerships.

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Files in any NFS mounts may be ignored as the user ID mapping between systems may be out of sync. If your Enterprise uses a central user management system (NIS or LDAP), the presence of unowned files may indicate another problem and should be investigated.

### ***6.9 Disable USB Devices***

#### **Question:**

Is there a mission-critical reason to allow use of PCMCIA or USB-based devices on this system?

If the answer to this question is no, then perform the action below.

#### **Action:**

```
rpm -e pcmcia-cs
rpm -e kernel-pcmcia-cs
```

```
# All versions except RHEL 4 and Fedora Core 4:
rpm -e hotplug
```

#### **Action: RHEL 4 and Fedora Core 4 & 5**

```
DEF_KERN=$( grubby --default-kernel)
grubby --update-kernel=$DEF_KERN --args="nousb"
```

#### **Discussion:**

PCMCIA cards, USB drives and memory devices represent another attack vector against your systems. The prices for a 512MB or even 1GB USB memory device have become very affordable, and is enough storage to transport vast quantities of data off a system. Few servers have any need for PCMCIA or USB devices and this whole avenue should be disabled.

Another possible attack would be to have a bootable Linux system installed on the USB device. Most modern BIOS' allow booting from USB devices, so this would let a person with physical access to a server an extremely easy way take over a system and bypass some of the security you are setting up. See the discussion regarding floppy and CD-ROM drives in section 6.2.

For these reasons, you should also disable USB in the BIOS if possible.

Note: For RHEL4 and Fedora Core 4, hotplugger is required by udev, which is required by several other required packages, making very unlikely that you will be able to remove it. Therefore for new RedHat versions (RHEL4 and Fedora Core 4-5) the **nousb** kernel



boot argument should be to disable usb devices. The script above uses grubby to add the **nousb** kernel boot argument to the default kernel image. Adding **nousb** to other kernel images is also recommended. The `/etc/grub.conf` symbolic link may also be viewed or edited as well. The **nousb** argument is placed at the end of the lines starting with **kernel**, as shown below.

```
kernel /vmlinuz-2.6.xx_FC5 ro root=LABEL=/ rhgb quiet nousb
```

## 7 System Access, Authentication, and Authorization

### 7.1 Remove `.rhosts` Support In PAM Configuration Files

#### Action:

```
for FILE in /etc/pam.d/*; do
    grep -v rhosts_auth $FILE > ${FILE}.tmp
    mv -f ${FILE}.tmp $FILE
    chown root:root $FILE
    chmod 644 $FILE
done
```

#### Discussion:

Used in conjunction with the BSD-style "r-commands" (`rlogin`, `rsh`, `rcp`), the `.rhosts` files implement a weak form of authentication based on the network address or host name of the remote computer (which can be spoofed by a potential attacker to exploit the local system). Disabling `.rhosts` support helps prevent users from subverting the system's normal access control mechanisms.

If `.rhosts` support is required for some reason, some basic precautions should be taken when creating and managing `.rhosts` files. Never use the "+" wildcard character in `.rhosts` files. In fact, `.rhosts` entries should always specify a specific trusted host name along with the user name of the trusted account on that system (e.g., "`trustedhost alice`" and not just "`trustedhost`"). Avoid establishing trust relationships with systems outside of the organization's security perimeter and/or systems not controlled by the local administrative staff. Firewalls and other network security elements should actually block `rlogin/rsh/rcp` access from external hosts.

Finally, make sure that `.rhosts` files are only readable by the owner of the file (i.e., these files should be mode 600).

## 7.2 Create *ftusers* Files

### Action:

```
for NAME in `cut -d: -f1 /etc/passwd`; do
    if [ `id -u $NAME` -lt 500 ]; then
        echo $NAME >> /etc/ftusers
    fi
done
chown root:root /etc/ftusers
chmod 600 /etc/ftusers
[ -e /etc/ftusers-preCIS ] && \
    diff /etc/ftusers-preCIS /etc/ftusers

VSFTP_CONF="/etc/vsftpd/vsftpd.conf"
ALT_CONF="/etc/vsftpd/vsftpd.conf"
test -f $ALT_CONF && VSFTP_CONF=$ALT_CONF
if [ -e $VSFTP_CONF ] &&
    ! grep -q "^userlist_deny=NO" $VSFTP_CONF; then
    cp -fp /etc/ftusers /etc/vsftpd.ftusers
    [ -e /etc/vsftpd.ftusers-preCIS ] &&
        diff /etc/vsftpd.ftusers-preCIS /etc/vsftpd.ftusers
fi
```

### Discussion:

`/etc/ftusers` and `/etc/vsftpd.ftusers` contain a list of users who *are not* allowed to access the system via WU-FTPd and vsftpd, respectively. Generally, only normal users should ever access the system via FTP—there should be no reason for "system" type accounts to be transferring information via this mechanism. Certainly the root account should never be allowed to transfer files directly via FTP.

If vsftpd is used, it may be desirable to reverse the usage of the users file to be a list of users who ARE able to ftp to the server, instead of a list of users who are NOT able to ftp into the server. This provides greater control and safety in denying the ftp usage by default for users NOT listed. To reverse the meaning of the vsftpd users list file set `userlist_deny=NO` in the `vsftpd.conf` file. The script above attempts to check for the `userlist_deny` vsftpd setting and will not create or modify the default vsftpd user list file if the value is NO. It is important to carefully test your configuration after these changes to be sure that only the expected users are allowed to login via ftp.

### 7.3 Prevent X Server From Listening On Port 6000/tcp

#### Action:

```

if [ -e /etc/X11/xdm/Xservers ]; then
    cd /etc/X11/xdm
    awk '($1 !~ /^#/ && $3 == "/usr/X11R6/bin/X") \
        { $3 = $3 " -nolisten tcp" };
        { print }' Xservers-preCIS > Xservers
    chown root:root Xservers
    chmod 444 Xservers
    diff Xservers-preCIS Xservers
fi

if [ -e /etc/X11/gdm/gdm.conf ]; then
    cd /etc/X11/gdm
    awk -F= '($2 ~ /\X$/) \
        { printf("%s -nolisten tcp\n", $0); next };
        { print }' gdm.conf-preCIS > gdm.conf
    diff gdm.conf-preCIS gdm.conf
    chown root:root gdm.conf
    chmod 644 gdm.conf
fi


if [ -d /etc/X11/xinit ]; then
    cd /etc/X11/xinit
    if [ -e xserverrc ]; then
        awk '/X/ && !/^#/ \
            { print $0 " :0 -nolisten tcp \${@}"; next }; \
            { print }' xserverrc-preCIS > xserverrc
    else
        cat <<END > xserverrc
#!/bin/bash
exec X :0 -nolisten tcp \${@}
END
    fi
    chown root:root xserverrc
    chmod 755 xserverrc
    [ -e xserverrc-preCIS ] && \
        diff xserverrc-preCIS xserverrc
fi

```

#### Discussion:

X servers listen on port 6000/tcp for messages from remote clients running on other systems. However, X Windows uses a relatively insecure authentication protocol and an attacker who is able to gain unauthorized access to the local X server can easily

compromise the system. Invoking the "-nolisten tcp" option causes the X server not to listen on port 6000/tcp by default. This prevents authorized remote X clients from displaying windows on the local system as well. However, the forwarding of X events via SSH will still happen normally. This is the preferred and more secure method transmitting results from remote X clients in any event.



## 7.4 Restrict at/cron To Authorized Users

### Action:

```
cd /etc/
rm -f cron.deny at.deny
echo root > cron.allow
[ -e cron.allow-preCIS ] && \
    diff cron.allow-preCIS cron.allow
echo root > at.allow
[ -e at.allow-preCIS ] && \
    diff at.allow-preCIS at.allow
chown root:root cron.allow at.allow
chmod 400 cron.allow at.allow
```

### Discussion:

The `cron.allow` and `at.allow` files are a list of users who are allowed to run the `crontab` and `at` commands to submit jobs to be run at scheduled intervals. On many systems, only the system administrator needs the ability to schedule jobs. Note that even though a given user is not listed in `cron.allow`, cron jobs can still be run as that user. `cron.allow` only controls administrative access to the `crontab` command for scheduling and modifying cron jobs.

## 7.5 Restrict Permissions On crontab Files

### Action:

```
chown root:root /etc/crontab
chmod 400 /etc/crontab
chown -R root:root /var/spool/cron
chmod -R go-rwx /var/spool/cron
cd /etc
ls | grep cron | grep -v preCIS | xargs chown -R root:root
ls | grep cron | grep -v preCIS | xargs chmod -R go-rwx
```

### Discussion:

The system `crontab` files are accessed only by the `cron` daemon (which runs with

superuser privileges) and the `crontab` command (which is set-UID to root). Allowing unprivileged users to read or (even worse) modify system `crontab` files can create the potential for a local user on the system to gain elevated privileges.

## 7.6 Configure *xinetd* Access Control

### Action:

Insert the following line into the "defaults" block in `/etc/xinetd.conf`:

```
only_from      = <net>/<num_bits> <net>/<num_bits>
```

where each `<net>/<num_bits>` combination represents one network block in use by your organization. For example:

```
only_from      = 192.168.1.0/24
```

would restrict connections to only the 192.168.1.0/24 network, with the netmask 255.255.255.0.

Note: There are two `<TAB>`'s between the `only_from` and the `=` in the above lines.

### Discussion:

This item configures `xinetd` to use simple IP-based access control and log connections. Just as `xinetd`'s access control mechanisms are used to monitor illicit connection attempts, the popular PortSentry tool (<http://www.psonic.com/products/port Sentry.html>) can be used to monitor access attempts on unused ports. Note that running PortSentry may result in the CIS testing tools reporting "false positives" for "active" ports that are actually being held by the PortSentry daemon. Consider replacing the PortSentry daemon with PSAD, short for Port Scan Attack Detector, available from <http://www.cipherdyne.com/psad/>. Unlike PortSentry, PSAD doesn't have to hold open ports -- instead, it communicates directly with the kernel.

## 7.7 Restrict Root Logins To System Console

### Action:

```
rm -f /etc/securetty
echo console >> /etc/securetty
for i in `seq 1 11`; do
    echo vc/$i >> /etc/securetty
done
for i in `seq 1 6`; do
    echo tty$i >> /etc/securetty
```

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done

```
chown root:root /etc/securetty
chmod 400 /etc/securetty
diff /etc/securetty-preCIS /etc/securetty
```

### Discussion:

Anonymous root logins should never be allowed, except on the system console in emergency situations. At all other times, the administrator should access the system via an unprivileged account and use some authorized mechanism (such as the `su` command, or the freely-available `sudo` package) to gain additional privileges. These mechanisms provide at least some audit trail in the event of problems.

Many Enterprises – who use serial port concentrators to connect to a server in a data center without physically having to use the keyboard – consider the serial port a console. This is in keeping with the Unix server tradition of controlling headless Unix machines using a serial port console. Just like the virtual consoles, this one needs protected as well. If this applies to your organization, you may execute these lines:

```
echo ttyS0 >> /etc/securetty
echo ttyS1 >> /etc/securetty
```

Be advised that doing so will reduce your CIS Scoring Tool score and reduce your security posture.



### 7.8 Set LILO/GRUB Password

*Note: Bastille configuration set to 'No'*

#### Action (if you have an `/etc/lilo.conf` file):

1. Add the following lines to the beginning of `/etc/lilo.conf`

```
restricted
password=<password>
```

Replace `<password>` with an appropriate password for your organization.
2. Execute the following commands as root:

```
chown root:root /etc/lilo.conf
chmod 600 /etc/lilo.conf
lilo
```

#### Action (if you have an `/etc/grub.conf` file):

1. Add this line to `/etc/grub.conf` before the first uncommented line.

```
password <password>
```

Replace `<password>` with an appropriate password for your organization.

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2. Execute the following commands as root:

```
chown root:root /etc/grub.conf
chmod 600 /etc/grub.conf
```

### Discussion:

By default on most Linux systems, the boot loader prompt allows an attacker to subvert the normal boot process very easily. The action above will allow the system to boot normally, only requiring a password when the user attempts to modify the boot process by passing commands to LILO or GRUB. Make sure to replace <password> in the actions above with a good password.



### 7.9 Require Authentication For Single-User Mode

#### Action:

```
cd /etc
if [ "`grep -l sulogin inittab`" = "" ]; then
    awk '{ print }; /^id:[0123456sS]:initdefault:/ \
        { print "~~:S:wait:/sbin/sulogin" }' \
        inittab > inittab.tmp
    mv -f inittab.tmp inittab
    chown root:root inittab
    chmod 644 inittab
fi
diff inittab-preCIS inittab
```

#### Discussion:

By default on Red Hat Linux, you can enter single user mode simply by typing "linux single" at the LILO prompt or in the GRUB boot-editing menu. Some believe that this is left in to ease support of users with lost root passwords. In any case, it represents a clear security risk – authentication should always be required for root-level access. It should be noted that it is extremely difficult to prevent compromise by any attacker who has knowledge, tools, and full physical access to a system. This kind of measure simply increases the difficulty of compromise by requiring more of each of these factors.

These last two items have attempted to address concerns of physical/boot security. To make these preparations more complete, one should consider setting the BIOS to boot only from the main hard disk and locking this setting with a BIOS password. For more information on reducing the threat posed by an attacker with physical/boot access, consider the article "Anyone with a Screwdriver Can Break In," available at <http://www.bastille-linux.org/jay/anyone-with-a-screwdriver.html>.

Note: Even though this topic is addressed by Bastille, it performs a step not executed by Bastille and should be completed even if Bastille was used.

## 7.10 Restrict NFS Client Requests To Privileged Ports

### Action:

Add the `secure` option to all entries in the `/etc/exports` file. The following Perl code will perform this action automatically.

```
if [ -s /etc/exports ]; then
    perl -i.orig -pe \
    'next if (/^\s*#/ || /^\s*$/);
    ($res, @hst) = split(" ");
    foreach $ent (@hst) {
        undef(%set);
        ($optlist) = $ent =~ /\((.*?)\)/;
        foreach $opt (split(/,/, $optlist)) {
            $set{$opt} = 1;
        }
        delete($set{"insecure"});
        $set{"secure"} = 1;
        $ent =~ s/\(.*?)\//;
        $ent .= "(" . join(",", keys(%set)) . ")";
    }
    $hst[0] = "(secure) unless (@hst);
    $_ = "$res\t" . join(" ", @hst) . "\n";' \
/etc/exports
fi
diff /etc/exports-preCIS /etc/exports
```

### Discussion:

Setting the `secure` parameter causes the NFS server process on the local system to ignore NFS client requests that do not originate from the privileged port range (ports less than 1024). This should not hinder normal NFS operations but may block some automated NFS attacks that are run by unprivileged users.

## 7.11 Only Enable `syslog` To Accept Messages If Absolutely Necessary

### Question:

Is this machine a log server, or does it need to receive Syslog messages via the network from other systems?

If the answer to this question is yes, then perform the action below.



**Action:**

Read `syslog` manpage for the `-l`, `-r` and `-s` options.

Edit `/etc/init.d/syslog` and look for the line that says:

```
SYSLOGD_OPTIONS="-m 0"
```

and add the entries that are appropriate for your site. An example entry would look like this:

```
SYSLOGD_OPTIONS="-m 0 -l loghost -r -s mydomain.com"
```

**Discussion:**

By default the system logging daemon, `syslogd`, does not listen for log messages from other systems on network port 514/udp (Solaris, by contrast, does listen by default).

It is considered good practice to set up one or more machines as central "log servers" to aggregate log traffic from all machines at a site. However, unless a system is set up to be one of these "log server" systems, it should not be listening on 514/udp for incoming log messages as the protocol used to transfer these messages does not include any form of authentication, so a malicious outsider could simply barrage the local system's Syslog port with spurious traffic either as a denial-of-service attack on the system, or to fill up the local system's logging file systems so that subsequent attacks will not be logged.

## 8 User Accounts and Environment

Note that the items in this section are tasks that the local administrator should undertake on a regular, ongoing basis perhaps in an automated fashion via cron. The automated host-based scanning tools provided from the Center for Internet Security can be used for this purpose. These scanning tools are typically provided with this document, but are also available for free download from <http://www.CISecurity.org/>.

### 8.1 Block System Accounts

**Action:**

```
cd /etc
for NAME in `cut -d: -f1 /etc/passwd`; do
    MyUID=`id -u $NAME`
    if [ $MyUID -lt 500 -a $NAME != 'root' ]; then
        usermod -L -s /dev/null $NAME
    fi
done
```

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```
diff passwd-preCIS passwd
diff shadow-preCIS shadow
```

### **Discussion:**

These accounts are non-human system accounts that should be made less useful to an attacker by locking them and setting the shell to a shell not in /etc/shells. They can even be deleted if the machines does not use the daemon/service that each is responsible for, though it is safest to simply deactivate them as is done here. To deactivate them, lock the password and set the login shell to an invalid shell. /dev/null is a good choice because it is not a valid login shell, and should an attacker attempt to replace it with a copy of a valid shell the system will not operate properly.

## ***8.2 Verify That There Are No Accounts With Empty Password Fields***

### **Action:**

The command:

```
awk -F: '($2 == "") { print $1 }' /etc/shadow
```

should return no lines of output.

### **Discussion:**

An account with an empty password field means that anybody may log in as that user without providing a password at all. All accounts should have strong passwords or should be locked by using a password string like “! !”. By using “! !”, **passwd** will warn you if you try to unlock an account with an empty password.

## ***8.3 Set Account Expiration Parameters On Active Accounts***

### **Action:**

```
cd /etc
awk '($1 ~ /^PASS_MAX_DAYS/) { $2="90" }
     ($1 ~ /^PASS_MIN_DAYS/) { $2="7" }
     ($1 ~ /^PASS_WARN_AGE/) { $2="28" }
     ($1 ~ /^PASS_MIN_LEN/) { $2="6" }
     { print } ' login.defs-preCIS > login.defs
diff login.defs-preCIS login.defs

chown root:root login.defs
chmod 640 login.defs
diff login.defs-preCIS login.defs
```

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```
useradd -D -f 7
diff /etc/default/useradd-preCIS /etc/default/useradd

for NAME in `cut -d: -f1 /etc/passwd`; do
    uid=`id -u $NAME`
    if [ $uid -ge 500 -a $uid != 65534 ]; then
        chage -m 7 -M 90 -W 28 -I 7 $NAME
    fi
done
diff shadow-preCIS shadow
```

### **Discussion:**

It is a good idea to force users to change passwords on a regular basis. The commands above will set all active accounts (except system accounts) to force password changes every 90 days (-M 90), and then prevent password changes for seven days (-m 7) thereafter. Users will begin receiving warnings 28 days (-W 28) before their password expires. Once the password expired, the account will be locked out after 7 days (-I 7). Finally, the instructions above set a minimum password length of 6 characters.

These are recommended starting values. Some regulated industries require more restrictive values – ensure they comply with your Enterprise security policy.

### ***8.4 Verify No Legacy '+' Entries Exist In passwd, shadow, And group Files***

#### **Action:**

The command:

```
grep ^+: /etc/passwd /etc/shadow /etc/group
```

should return no lines of output.

#### **Discussion:**

'+' entries in various files used to be markers for systems to insert data from NIS maps at a certain point in a system configuration file. These entries may provide an avenue for attackers to gain privileged access on the system, and should be deleted if they exist.

### ***8.5 No '.' or Group/World-Writable Directory In Root's \$PATH***

#### **Action:**

The automated testing tool supplied with this benchmark will alert the administrator if action is required.

## CIS Red Hat Enterprise Linux Benchmark

To find '.' in \$PATH:

```
echo $PATH | egrep ' (^|:)(\.||$) '
```

To find group- or world-writable directories in \$PATH:

```
find `echo $PATH | tr ':' ' '` -type d \  
  \ ( -perm -002 -o -perm -020 \) -ls
```

These commands should produce no output.

### **Discussion:**

Including the current working directory (.) or other writable directory in root's executable path makes it likely that an attacker can gain superuser access by forcing an administrator operating as root to execute a Trojan horse program.

Note: You will receive an error if a directory specified in the path does not exist. For example, on a new RHEL4 build, the above find generated this error:

```
find: /root/bin: No such file or directory
```

You should investigate and correct the cause of such errors.

## ***8.6 User Home Directories Should Be Mode 750 or More Restrictive***

### **Action:**

```
for DIR in \  
  `awk -F: '($3 >= 500) { print $6 }' /etc/passwd`; do  
  chmod g-w $DIR  
  chmod o-rwx $DIR  
done
```

### **Discussion:**

Group or world-writable user home directories may enable malicious users to steal or modify other users' data or to gain another user's system privileges. Disabling "read" and "execute" access for users who are not members of the same group (the "other" access category) allows for appropriate use of discretionary access control by each user. While the above modifications are relatively benign, making global modifications to user home directories without alerting the user community can result in unexpected outages and unhappy users. Also consider special case home directories such as the sftp / ftp accounts used to transfer web content to a web server, typically need to be world readable (r) and searchable (x) as they contain document for the web server.

## ***8.7 No User Dot-Files Should Be World-Writable***

### **Action:**

```
for DIR in \  
  `awk -F: '($3 >= 500) { print $6 }' /etc/passwd`; do  
  for FILE in $DIR/[A-Za-z0-9]*; do  
    if [ ! -h "$FILE" -a -f "$FILE" ]; then  
      chmod go-w "$FILE"  
    fi  
  done  
done
```

### **Discussion:**

World-writable user configuration files may enable malicious users to steal or modify other users' data or to gain another user's system privileges. While the above modifications are relatively benign, making global modifications to user home directories without alerting the user community can result in unexpected outages and unhappy users.

## ***8.8 Remove User .netrc Files***

### **Action:**

```
find / -name .netrc
```

***Stop!!! Read the discussion before proceeding.***

```
for DIR in `cut -f6 -d: /etc/passwd`; do  
  if [ -e $DIR/.netrc ]; then  
    echo "Removing $DIR/.netrc"  
    rm -f $DIR/.netrc  
  fi  
done
```

### **Discussion:**

.netrc files may contain unencrypted passwords which may be used to attack other systems. While the above modifications are relatively benign, making global modifications to user home directories without alerting the user community can result in unexpected outages and unhappy users. If the first command returns any results, carefully evaluate the ramifications of removing those files before executing the remaining commands as you may end up impacting an application that has not had time to revise its architecture to a more secure design.

## 8.9 Set Default *umask* For Users

### Action:

```
cd /etc
for FILE in profile csh.login csh.cshrc bashrc; do
    if ! egrep -q 'umask.*77' $FILE ; then
        echo "umask 077" >> $FILE
    fi
    chown root:root $FILE
    chmod 444 $FILE
    diff ${FILE}-preCIS $FILE
done

cd /root
for FILE in .bash_profile .bashrc .cshrc .tcshrc; do
    if ! egrep -q 'umask.*77' $FILE ; then
        echo "umask 077" >> $FILE # See description
    fi
    chown root:root $FILE
    diff ${FILE}-preCIS $FILE
done
```

### Discussion:

With a default *umask* setting of 077 – a setting agreed to as part of the consensus process with DISA and NSA – files and directories created by users will not be readable by any other user on the system. The user creating the file has the discretion of making their files and directories readable by others via the *chmod* command. Users who wish to allow their files and directories to be readable by others by default may choose a different default *umask* by inserting the *umask* command into the standard shell configuration files (*.profile*, *.cshrc*, etc.) in their home directories. A *umask* of 027 would make files and directories readable by users in the same Unix group, while a *umask* of 022 would make files readable by every user on the system.

We adjust root's *umask* setting separately in this item, as root shells don't necessarily read the system-wide configuration files. For example, root sessions using *bash* doesn't get *umask* settings from */etc/profile*.

Note: This is been shown to cause problems with the installation of software packages where the installation script uses the default *umask* – the directories are owned by root with 700 permissions, and then the application and/or daemon cannot read its files. A simple fix to this problem is to manually issue a less restrictive *umask* (such as *umask 022*) for the shell session doing the installation, or place such a *umask* command in the beginning to a less restrictive value before the installation, or in the beginning of the installation script.

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There are of course special cases to consider, for example the recommended umask setting of 077 interferes with the sftp and ftp users who need to have the web files transferred be world readable and directories world searchable. Typically the umask setting needs to be 022 or occasionally 002 for sftp and ftp web transfer accounts. Typically the umask can be configured in the ftp server configuration file however for sftp users, a patch is required for the sftp server before umask control is available. The patch is available as part of the sftplogging patch <http://sftplogging.sourceforge.net/>

### ***8.10 Disable Core Dumps***

#### **Question:**

Do you have developers who need to debug crashed programs or send low-level debugging information to software developers/vendors?

If the answer to this question is no, then perform the action below.

#### **Action:**

```
cd /etc/security
cat <<END_ENTRIES >> limits.conf
# Following 2 lines added by CISecurity Benchmark sec 8.11
* soft core 0
* hard core 0
END_ENTRIES
diff limits.conf-preCIS limits.conf
```

#### **Discussion:**

Core dumps can consume large amounts of disk space and may contain sensitive data. On the other hand, developers using this system may require core files in order to aid in debugging. The `limits.conf` file can be used to grant core dump ability to individual users or groups of users.

### ***8.11 Limit Access To The Root Account From su***

#### **Action:**

**WARNING:** If you do not have immediate physical access to the server, ensure you have a user in the wheel group before running the below script. Failure to do so will prevent you from using `su` to become root.

```
cd /etc/pam.d/
awk '($1=="#auth" && $2=="required" && \
    $3~"pam_wheel.so") \'
```

## CIS Red Hat Enterprise Linux Benchmark

```
    { print "auth\t\trequired\t", $3, "\tuse_uid"; next };
    { print }' /etc/pam.d-preCIS/su > su
diff /etc/pam.d-preCIS/su su
```

### **Discussion:**

The `su` command allows you to become other users on the system. This is commonly used to become “root” and execute commands as the super-user. If you do not want certain users to `su` to root then uncomment the following line in `/etc/pam.d/su`:

```
auth    required    /lib/security/$ISA/pam_wheel.so  use_uid
```

Uncommenting this line allows only the users in the wheel group to become root by using the `su` command and entering the root password. All other users will receive a message stating the password is incorrect.

By limiting access to the root account, even if a user knows the root password, they will not be able to become root unless that user has physical access to the server's console, or they are added to the wheel group. This adds another layer of security to the system and prevents unauthorized system access.





## 9 Warning Banners

Presenting some sort of statutory warning message prior to the normal user logon may assist the prosecution of trespassers on the computer system. Changing some of these login banners also has the side effect of hiding OS version information and other detailed system information from attackers attempting to target specific attacks at a system (though there are other mechanisms available for acquiring this information). Guidelines published by the US Department of Defense require that warning messages include at least the name of the organization that owns the system, the fact that the system is subject to monitoring and that such monitoring is in compliance with local statutes, and that use of the system implies consent to such monitoring. Clearly, the organization's local legal counsel and/or site security administrator should review the content of all messages before any system modifications are made, as these warning messages are inherently site-specific.

More information (including citations of relevant case law) can be found at <http://www.usdoj.gov/criminal/cybercrime/s&sappendix2002.htm>.

### *9.1 Create Warnings For Network And Physical Access Services*

#### **Action:**

1. Edit the banner currently in `/etc/issue` – this was created by Bastille and may need to be changed for your Enterprise. Leave the words “its owner” as this will be replaced in the next step with the name of your organization.
2. Create banners for console access:

***Important: You need to change “The Company” in the text below to an appropriate value for your organization***

```
unalias cp mv
cd /etc
# Remove OS indicators from banners
for FILE in issue motd; do
    cp -f ${FILE} ${FILE}.tmp
    egrep -vi "red hat|kernel|fedora" ${FILE}.tmp > ${FILE}
    rm -f ${FILE}.tmp
done

# Change name of owner
# Remember to enter name of your company here:
COMPANYNAME="The Company"
cp -f issue issue.tmp
sed -e "s/its owner/${COMPANYNAME}/g" issue.tmp > issue
rm -f issue.tmp
diff issue-preCIS issue
```

## CIS Red Hat Enterprise Linux Benchmark

```
if [ "`grep -i authorized /etc/issue`" == "" ]; then
    echo "Authorized uses only. All activity may be \
monitored and reported." >> /etc/issue
fi
if [ "`grep -i authorized /etc/motd`" == "" ]; then
    echo "Authorized uses only. All activity may be \
monitored and reported." >> /etc/motd
fi
```

### 3. Create banners for network access:

```
cp -fp /etc/issue /etc/issue.net
if [ "`grep -i authorized /etc/issue.net`" == "" ]; then
    echo "Authorized uses only. All activity may be \
monitored and reported." >> /etc/issue.net
fi
diff issue.net-preCIS issue.net
```

### 4. Protect banner:

```
chown root:root /etc/motd /etc/issue /etc/issue.net
chmod 644 /etc/motd /etc/issue /etc/issue.net
```

## Discussion:

The contents of the `/etc/issue` file are displayed prior to the login prompt on the system's console and serial devices. `/etc/motd` is generally displayed after all successful logins, no matter where the user is logging in from, but is thought to be less useful because it only provides notification to the user after the machine has been accessed.

## 9.2 Create Warnings For GUI-Based Logins

### Action:

```
if [ -e /etc/X11/xdm/Xresources ]; then
    cd /etc/X11/xdm
    awk '/xlogin\*greeting:/ \
    { print "xlogin\*greeting: Authorized uses only!"; next };
    { print }' Xresources-preCIS > Xresources
    chown root:root Xresources
    chmod 644 Xresources
    diff Xresources-preCIS Xresources
fi

if [ -e /etc/X11/xdm/kdmrc ]; then
```

## CIS Red Hat Enterprise Linux Benchmark

```
cd /etc/X11/xdm
awk '/GreetString=/ \
{ print "GreetString=Authorized uses only!"; next };
{ print }' kdmrc-preCIS > kdmrc
chown root:root kdmrc
chmod 644 kdmrc
diff kdmrc-preCIS kdmrc
fi

if [ -e /etc/X11/gdm/gdm.conf ]; then
cd /etc/X11/gdm
cp -pf gdm.conf gdm.conf.tmp
awk '/^Greeter=/ && /gdmgreeter/ \
{ printf("#%s\n", $0); next };
/^#Greeter=/ && /gdmlogin/ \
{ $1 = "Greeter=gdmlogin" }; /Welcome=/ \
{ print "Welcome=Authorized uses only!"; next };
{ print }' gdm.conf.tmp > gdm.conf
rm -f gdm.conf.tmp
chown root:root gdm.conf
chmod 644 gdm.conf
diff gdm.conf-preCIS gdm.conf
fi
```

### Discussion:

The standard graphical login program for Red Hat Enterprise Linux is gdm, which requires the user to enter their username in one text box and their password in a second text box. The commands above set the warning message on xdm, kdm and gdm – in case something other than the default X login GUI was installed.

### ***9.3 Create "authorized only" Banners For vsftpd, proftpd, If Applicable***

#### **Action:**

```
cd /etc
if [ -d vsftpd ]; then
cd vsftpd
fi
if [ -e vsftpd.conf ]; then
echo "ftpd_banner=Authorized users only. All activity \
may be monitored and reported." >> vsftpd.conf
diff vsftpd.conf-preCIS vsftpd.conf
fi

if [ -e proftpd.conf ]; then
echo -e "DisplayConnect\t\t/etc/issue.net" >> proftpd.conf
echo -e "DisplayLogin\t\t/etc/motd" >> proftpd.conf
diff proftpd.conf-preCIS proftpd.conf
```

## CIS Red Hat Enterprise Linux Benchmark

fi

### **Discussion:**

This item configure's vsftpd and proftpd "authorized users only" banner messages.

### ***9.4 Reboot***

### **Action:**

init 6

### **Discussion:**

Whenever you make substantial changes to a system, reboot. Some System Administrators believe any change to the init scripts warrant a reboot to ensure the system comes up as expected. Hours of lost productivity with extensive troubleshooting (not to mention lost revenue) have occurred because a system did not start up as expected. The root cause was an init problem that would have been detected had the reboot taken place.

## 10 Anti-Virus Consideration

### *Anti-Virus Products*

Certain systems – such as mail servers and file servers – should have anti0virus software installed to protect the Windows clients that use the server. The following table summarizes the popular anti-virus offerings for the Linux platform. The Center for Internet security makes no endorsement for any product.

Vendor	Product
Sophos <a href="http://www.sophos.com/">http://www.sophos.com/</a>	Commercial
NAI Virus Scan	Commercial
ClamAV <a href="http://www.clamav.net/">http://www.clamav.net/</a>	Open Source
McAfee <a href="http://www.mcafee.com/">http://www.mcafee.com/</a>	Commercial
CyberSoft Vfind <a href="http://www.cyber.com/products/masterprice.html">http://www.cyber.com/products/masterprice.html</a>	
H+B edv (hbedv)	
f-prot Antivirus <a href="http://www.f-prot.com/products/corporate_users/unix/">http://www.f-prot.com/products/corporate_users/unix/</a>	Commercial
Trend Micro	Commercial
Computer Associates InoculateIT <a href="http://www.cai.com/">http://www.cai.com/</a>	Commercial

## 11 Remove Backup Files

### **Action:**

*Warning: Read discussion before performing this action.*

```
find / -xdev | grep preCIS | xargs rm -rf
```

### **Discussion:**

When you are certain your changes are successful, remove the backup files as they will have insecure contents and/or permissions/ownerships. By leaving these files on your system, an attacker can use the backup files as if they were the originals thereby defeating much of your efforts.

## Appendix A Additional Security Notes

The items in this section are security configuration settings that have been suggested by several other resources and system hardening tools. However, given the other settings in the benchmark document, the settings presented here provide relatively little incremental security benefit. Nevertheless, none of these settings should have a significant impact on the functionality of the system, and some sites may feel that the slight security enhancement of these settings outweighs the (sometimes minimal) administrative cost of performing them.

None of these settings will be checked by the automated scoring tool provided with the benchmark document. They are purely optional and may be applied or not at the discretion of local site administrators.

### *SN.1 Create Symlinks For Dangerous Files*

#### **Action:**

```
for FILE in /root/.rhosts /root/.shosts /etc/hosts.equiv \  
    /etc/shosts.equiv; do  
    rm -f $FILE  
    ln -s /dev/null $FILE  
done
```

#### **Discussion:**

The `/root/.rhosts`, `/root/.shosts`, and `/etc/hosts.equiv` files enable a weak form of access control (see the discussion of `.rhosts` files above). Attackers will often target these files as part of their exploit scripts. By linking these files to `/dev/null`, any data that an attacker writes to these files is simply discarded (though an astute attacker can still remove the link prior to writing their malicious data).

### *SN.2 Change Default Greeting String For `sendmail`*

#### **Action:**

```
cd /etc/mail  
awk '/O SmtgGreetingMessage=/ \  
    { print "O SmtgGreetingMessage=mailer ready"; next}  
    { print }' sendmail.cf > sendmail.cf.new  
mv -f sendmail.cf.new sendmail.cf  
chown root:bin sendmail.cf  
chmod 444 sendmail.cf
```

***Discussion:***

The default SMTP greeting string displays the version of the Sendmail software running on the remote system. Hiding this information is generally considered to be good practice, since it can help attackers target attacks at machines running a vulnerable version of Sendmail. However, the actions in the benchmark document completely disable Sendmail on the system, so changing this default greeting string is something of a moot point unless the machine happens to be an email server.

***SN.3 Enable TCP SYN Cookie Protection***

**Action:**

```
echo "echo 1 > /proc/sys/net/ipv4/tcp_syncookies" \  
>> /etc/rc.local
```

**Discussion:**

A "SYN Attack" is a denial of service (DoS) attack that consumes resources on your system forcing you to reboot. This particular attack is performed by beginning the TCP connection handshake (sending the SYN packet), and then never completing the process to open the connection. This leaves your system with several (hundreds or thousands) of half-open connections. This is a fairly simple attack and should be blocked.

***SN.4 Additional LILO/GRUB Security***

**Action:**

```
chattr +i /etc/lilo.conf  
chattr +i /boot/grub/menu.lst
```

**Discussion:**

Setting the immutable flag on the LILO and GRUB config files will prevent any changes (accidental or otherwise) to the lilo.conf or menu.lst files. If you wish to modify either file you will need to unset the immutable flag using the `chattr` command with `-i` instead of `+i`.

***SN.5 Evaluate Packages Associated With Startup Scripts***

**Question:**

How many of the startup scripts do you really need?

## CIS Red Hat Enterprise Linux Benchmark

Perform the action below.

### **Action:**

```
cd /etc/init.d  
ls
```

### **Discussion:**

The most effective way to get rid of the much of the unused software is to look in the startup directory `/etc/init.d` and evaluate which of these remaining services are not necessary. Use `rpm -qf <scriptname>` to determine the package it belongs to, use `rpm -qi <packagename>` to read about it, then use `rpm -e <packagename>` to remove it. For example, this server may not use Broadcom NIC drivers, and therefore will not need the `bcm5820` package. `rpm -qf bcm5820` shows us `bcm5820` belongs to `bcm5820-1.17-6`. `rpm -qi bcm5820` proves we do not need this package. `rpm -e bcm5820` takes care of it.

In some cases, you will not be able to remove a script/package – `kdcrotate` is a good example: it belongs to package `krb5-libs`, which is required by several packages, including `sendmail` and `nss_ldap`. In cases like this, you may just want to use `chkconfig <scriptname> off` to keep it from running.

Note that the default Red Hat Enterprise Linux installation has both `ipchains` and `iptables` – you should be able to remove `ipchains` with no adverse effects. You should also consider configuring `iptables` to act as a server-level firewall. There is controversy over this technique as some organizations feel all they need is the perimeter firewall and others feel the perimeter is just the first line of defense.

## ***SN.6 Evaluate Every Installed Package***

### **Question:**

How much unused software was installed on your system?

Perform the action below.

### **Action:**

See Discussion

### **Discussion:**

The default Red Hat Enterprise Linux installation includes many packages that are usually not necessary in an Enterprise server environment (`dosfstools`, for example).



## CIS Red Hat Enterprise Linux Benchmark

Computer Security Industry Best Practices recommend removing unused services and software to minimize attack vectors on a system. The following references suggest removing unused software:

- Common Sense Guide to Cyber Security for Small Businesses – Recommended Actions for Information Security, 1st Edition, March 2004, [http://www.us-cert.gov/reading\\_room/CSG-small-business.pdf](http://www.us-cert.gov/reading_room/CSG-small-business.pdf)
- IUP System Administrator Security Guidelines and Best Practices, <http://www.iup.edu/tsc/security/>;
- Security Engineering Awareness for Systems Engineers , <http://www.software.org/pub/externalpapers/SecEngAwareness.doc>.

This task can be performed fairly quickly by logging in twice and running

```
rpm -qa | sort | less
```

in one shell, and then using the other shell to remove the packages. You will find some packages are dependent upon others and you will have to remove several packages at once. In some cases, an unused package will be required by another useful package, and it will have to remain installed – for example, `dateconfig` relies upon `audiofile` (for RHEL 2,1). If the features of `dateconfig` are required, then `audiofile` will have to remain. One may think that the functionality of `dateconfig` is not necessary, however, the Red Hat Enterprise Linux documentation uses this tool to adjust the date, timezone and NTP settings of the server, and some Enterprises will have problems making system changes to servers without using the vendor-recommended tools.

Also note that if the service is disabled, the relevant software should be removed for the following reasons:

1. Less software to maintain and monitor for security issues.
2. The service cannot be inadvertently enabled by an errant administrator.
3. Minimize damage in an attack should the attacker gain (or already have) access to the server.

Removed software can always be reinstalled using the Enterprise procedures.

By using this methodology on a test server, a still functional basic server was produced with less than 230 packages installed (down from the original 350 packages) taking up under 350MB of disk storage. This was performed in under an hour..

### ***SN.7 Install and Configure sudo***

#### **Action:**

Using your Enterprise process, install `sudo`.

### **Discussion:**

`sudo` is a package that allows the System Administrator to delegate activities to groups of users. These activities are normally beyond the administrative capability of that user – restarting the web server, for example. If frequent web server configuration changes are taking place (or you have a bug and the web server keeps crashing), it becomes very cumbersome to continually engage the SysAdmin just to restart the web server. `sudo` allows the Administrator to delegate just that one task using root authority without allowing that group of users any other root capability.

Once `sudo` is installed, configure it using `visudo` – do not `vi` the config file. `visudo` has error checking built in. Experience has shown that if `/etc/sudoers` gets botched (from using `vi` without `visudo`'s error checking feature), recovery may become very difficult.

### ***SN.8 Lockout Accounts After 3 Failures***

#### **Action:**

```
printf \  
"auth      required      \  
/lib/security/pam_tally.so onerr=fail no_magic_root\  
account    required      \  
/lib/security/pam_tally.so deny=3 no_magic_root reset" \  
>> /etc/pam.d/system-auth
```

#### **Discussion:**

A system policy of locking out an account that fails several successive authentication attempts is an industry best practice, and is easily implemented in this Benchmark. The above value (`deny=3`) will cause the account to be locked out after 3 successive failed login attempts. This value is chosen as it is a common value used in some Federally-regulated industries – you are free to increase it if desired.

Note: The above command assumes account lockouts are not already implemented on the system. If they are already implemented, you will have to edit `/etc/pam.d/system-auth` manually.

To unlock a user that has been locked out, use the `faillog` command. For example, to unlock user `oracle`, issue this command:

```
faillog -u oracle -r
```

See also the discussion at <http://www.puschitz.com/SecuringLinux.shtml> **SN.9**

### ***Additional Kernel Tunings***

## CIS Red Hat Enterprise Linux Benchmark

### Action:

```
cat <<END_SCRIPT >> /etc/sysctl.conf
# Following 2 lines added by CISecurity Benchmark sec SN.9
net.ipv4.tcp_max_orphans = 256
net.ipv4.conf.all.log_martians = 1
END_SCRIPT
chown root:root /etc/sysctl.conf
chmod 0600 /etc/sysctl.conf
```

### Discussion:

Before implementing these changes, please review them with your environment in mind. The above value for `tcp_max_orphans` is much lower than the default 16,384, and may be too low, depending on the server's use and environment.

Also be aware that logging all martians may generate an excessive amount of logs, especially on multi-homed servers with at least one network interface on a hostile network (i.e, your border firewalls). You should ensure you have plenty of log space available as well as sending your logs to a remote logging host.



### *SN.10 Remove All Compilers and Assemblers*

*Note: Bastille configuration set to remove c compiler only.*

### Question:

Is there a mission-critical reason to have a compiler or assembler on this machine?

If the answer is no, perform the action below.

### Action:

Remove the following packages if they exist on your system:

```
gcc gcc3 gcc3-c++ gcc3-g77 gcc3-java gcc3-objc
gcc-c++ gcc-chill gcc-g77 gcc-java gcc-objc bin86
dev86 nasm
```

The following command will help you identify the packages installed on your system:

```
rpm -qa | egrep "^gcc|java|bin86|dev86|nasm"
```

### Discussion:

C compilers pose a credible threat to production systems and should not be installed. Compilers should be installed on select development systems – those systems that have a Business need for a compiler – and the resulting output binaries deployed onto other

development and production systems using the existing Enterprise change processes.

Note: Some failed dependencies may result when removing compilers and assemblers. Remove gcc's dependencies first before removing gcc.

### ***SN.11 Verify That No Unauthorized UID 0 Accounts Exists***

#### **Action:**

The command:

```
getent passwd | awk -F: '$3 == "0" { print $1 }'
```

should return only the word "root", unless additional uid 0 accounts have been specifically authorized. Having multiple uid 0 accounts are acceptable if the accounts are authorized, but not recommended for some situations; see the discussion for more detail.

#### **Discussion:**

Any account with UID 0 has superuser privileges on the system. The preferred and best practice for administrators obtaining superuser privileges, is to login with an unprivileged account in the wheel group, and then use sudo for the operations that require root level access. The sudo software is typically installed by default with Red Hat Linux distributions; for details see the sudo(8), sudoers(5) and visudo(8) man pages or <http://www.sudo.ws/>

Given that sudo is best practice, there is still the recognized occasional need for direct administrative console access as provided for in item 7.7 *"Restrict Root Logins To System Console"* . For these situations, having multiple uid 0 accounts may be used by experienced administrators to provide individually assigned superuser passwords to eliminate or reduce usage of a shared root password, and to increase accountability. However some tools and situations do not always handle multiple uid 0 accounts as expected or desired, therefore testing is required. Specifically when booting to single user mode Item 7.9 *"Require Authentication For Single-User Mode"* the system will prompt for the "root" password, and none of the other uid 0 passwords will work. Also most of the GUI X-windows administration tools, if run by a non-privileged user, will prompt for the "root" password. There may be other applications or tools that behave unexpectedly, so testing is required.

## Appendix B File Backup Script

```
#!/bin/bash

# Create /root/do-restore.sh
cat <<EOF > /root/do-restore.sh
#!/bin/bash

# This script restores the files changed by the CISecurity
# Linux Benchmark do-backup.sh script.
unalias rm mv cp

sed -n "31,9999p" /root/do-restore.sh | while read LINE; do
    FILE=`echo \$LINE | awk '{print \$1}'`
    PERMS=`echo \$LINE | awk '{print \$2}'`
    echo "Restoring \$FILE with \$PERMS permissions"
    [ -f \${FILE}-preCIS ] && /bin/cp -p \${FILE}-preCIS \${FILE}
    /bin/chmod \${PERMS} \${FILE}
    [ -f \${FILE}-preCIS ] && /bin/rm \${FILE}-preCIS
done

echo "Completed file restoration - restoring directories"
for DIR in \
    /etc/xinetd.d    /etc/rc.d \
    /var/spool/cron /etc/cron.* \
    /etc/pam.d      /etc/skel
do
    if [ -d \${DIR}-preCIS ]; then
        echo "Restoring \${DIR}"
        /bin/cp -pr \${DIR}-preCIS \${DIR}
        /bin/rm -rf \${DIR}-preCIS
    fi
done

echo "If you installed Bastille, please run "
echo "/usr/sbin/RevertBastille and examine its list of changed files."
exit 0
```

## CIS Red Hat Enterprise Linux Benchmark

```
### END OF SCRIPT. DYNAMIC DATA FOLLOWS. ###
EOF
/bin/chmod 700 /root/do-restore.sh

echo "Backing up individual files"

for FILE in \
/etc/ssh/ssh_config /etc/ssh/sshd_config /etc/hosts.deny \
/etc/hosts.allow /etc/init.d/functions /etc/sysconfig/sendmail \
/etc/inittab /etc/sysctl.conf /etc/syslog.conf /etc/ftpaccess \
/etc/vsftpd.conf /etc/vsftpd/vsftpd.conf /etc/vsftpd.ftputers \
/etc/proftpd.conf /etc/ftputers /etc/syslog.conf /etc/fstab \
/etc/passwd /etc/shadow /etc/security/console.perms \
/etc/security/console.perms.d/50-default.perms \
/etc/X11/xdm/Xservers /etc/X11/gdm/gdm.conf \
/etc/X11/xinit/xserverrc /etc/cron.deny /etc/at.deny /etc/crontab \
/etc/securetty /etc/lilo.conf /etc/grub.conf /etc/exports \
/etc/init.d/syslog /etc/profile /etc/csh.login /etc/csh.cshrc \
/etc/bashrc /root/.bash_profile /root/.bashrc /root/.cshrc \
/root/.tcshrc /etc/security/limits.conf /etc/issue /etc/motd \
/etc/issue.net /etc/X11/xdm/Xresources /etc/X11/xdm/kdmrc \
/etc/login.defs /etc/default/useradd /etc/login.defs-preCIS \
/etc/at.allow /etc/at.deny /etc/cron.allow /etc/cron.deny; do
    if [ -f ${FILE} ]; then
        # Backup file
        /bin/cp -p ${FILE} ${FILE}-preCIS
        # Add it to the do-restore script
        echo ${FILE} `find ${FILE} -printf "%m"` >> /root/do-restore.sh
    fi
done

echo "Completed file backups - backing up directories"

for DIR in \
/etc/xinetd.d /etc/rc.d \
/var/spool/cron /etc/cron.* \
```

## CIS Red Hat Enterprise Linux Benchmark

```
    /etc/pam.d      /etc/skel
do
    echo ${DIR}
    [ -d ${DIR} ] && /bin/cp -pr ${DIR} ${DIR}-preCIS
done

echo "Recording log permissions"
find /var/log -printf "%h/%f %m\n" >> /root/do-restore.sh

echo "Backup complete."
```

## Appendix C Bastille Configuration

Here is the recommended Bastille configuration.

Note: Bastille has the ability to set the GRUB/LILO boot passwords but it is not used here to ensure the password is unique to the Enterprise implementing this Benchmark. Setting this password is covered in section 7.8 of the Benchmark.

Points to note where the CISecurity Benchmark differ from Bastille'e defaults:

### **Q: What umask would you like to set for users on the system? 027**

Q: Would you like to disable indexes? **Yes**

Q: Would you like to disable the gcc and/or g++ compiler? **Yes**

Q: May we activate LauS? **No** (Note: There is no default answer for this question)

Q: Would you like to deactivate the HP OfficeJet (hpoj) script on this machine? **Yes**  
(Note: There is no default answer for this question)

Q: Would you like to deactivate the ISDN script on this machine? **Yes** (Note: There is no default answer for this question)

Q: Would you like to deactivate kudzu's run at boot? **Yes** (Note: There is no default answer for this question)

Q: Would you like to run sendmail via cron to process the queue? **Yes**

Note that use of host-based firewalls may interfere with existing Enterprise practices and the Level 1 benchmark makes no recommendation for enabling or disabling the host-based packet filter.

### ***CIS Bastille Configuration File***

Note that this configuration file is also provided in the archive containing the PDF version of this document and the CIS scoring tool.

```
file: bastille.CIS.conf
# Q: Would you like to restrict the use of cron to administrative
accounts? [Y]
AccountSecurity.cronuser="Y"
# Q: Would you like to enforce password aging? [Y]
AccountSecurity.passwdage="Y"
# Q: Should Bastille disable clear-text r-protocols that use IP-based
authentication? [Y]
AccountSecurity.protectrhost="Y"
# Q: Should Bastille ask you for extraneous accounts to delete?
```



## CIS Red Hat Enterprise Linux Benchmark

```
AccountSecurity.removeaccounts="Y"
# Q: Which extraneous accounts should Bastille delete (space-separated)
?
AccountSecurity.removeaccounts_list="games gopher"
# Q: Should Bastille ask you for extraneous groups to delete?
AccountSecurity.removegroups="N"
# Q: Should we disallow root login on tty's 1-6? [N]
AccountSecurity.rootttylogins="N"
# Q: What umask would you like to set for users on the system? [077]
AccountSecurity.umask="027"
# Q: Do you want to set the default umask? [Y]
AccountSecurity.umaskyn="Y"
# Q: Would you like to disable indexes? [N]
Apache.apacheindex="Y"
# Q: Would you like to deactivate the Apache web server? [Y]
Apache.apacheoff="Y"
# Q: Would you like to bind the Web server to listen only to the
localhost? [N]
Apache.bindapachelocal="N"
# Q: Would you like to bind the web server to a particular interface?
[N]
Apache.bindapachenic="N"
# Q: Would you like to disable CGI scripts, at least for now? [Y]
Apache.cgi="Y"
# Q: Would you like to deactivate server-side includes? [Y]
Apache.ssi="Y"
# Q: Would you like to deactivate the following of symbolic links? [Y]
Apache.symmlink="Y"
# Q: Would you like to reduce the LILO delay time to zero? [N]
BootSecurity.lilodelay="N"
# Q: Do you ever boot Linux from the hard drive? [Y]
BootSecurity.lilosub_drive="Y"
# Q: Would you like to write the LILO changes to a boot floppy? [N]
BootSecurity.lilosub_floppy="N"
# Q: Would you like to password protect single-user mode? [Y]
BootSecurity.passsum="Y"
# Q: Would you like to password-protect the GRUB prompt? [N]
BootSecurity.protectgrub="N"
```

## CIS Red Hat Enterprise Linux Benchmark

```
# Q: Would you like to password-protect the LILO prompt? [N]
BootSecurity.protectlilo="N"
# Q: Would you like to disable CTRL-ALT-DELETE rebooting? [N]
BootSecurity.secureinittab="N"
# Q: Should we restrict console access to a small group of user
accounts? [N]
ConfigureMiscPAM.consolelogin="N"
# Q: Would you like to put limits on system resource usage? [N]
ConfigureMiscPAM.limitsconf="N"
# Q: Would you like to chroot named and set it to run as a non-root
user? [N]
DNS.chrootbind="N"
# Q: Would you like to deactivate named, at least for now? [Y]
DNS.namedoff="Y"
# Q: Would you like to disable the gcc and/or g++ compiler? [N]
DisableUserTools.compiler="Y"
# Q: Would you like to disable anonymous download? [N]
FTP.anonftp="N"
# Q: Would you like to disable user privileges on the FTP daemon? [N]
FTP.userftp="N"
# Q: Would you like to set more restrictive permissions on the
administration utilities? [N]
FilePermissions.generalperms_1_1="N"
# Q: Would you like to disable SUID status for XFree86? [N]
FilePermissions.suidXFree86="N"
# Q: Would you like to disable SUID status for Xwrapper? [N]
FilePermissions.suidXwrapper="N"
# Q: Would you like to disable SUID status for at? [Y]
FilePermissions.suidat="Y"
# Q: Would you like to disable SUID status for cardctl? [Y]
FilePermissions.suidcard="Y"
# Q: Would you like to disable SUID status for DOSEMU? [Y]
FilePermissions.suiddos="Y"
# Q: Would you like to disable SUID status for dump and restore? [Y]
FilePermissions.suiddump="Y"
# Q: Would you like to disable SUID status for mount/umount?
FilePermissions.suidmount="Y"
# Q: Would you like to disable SUID status for news server tools? [Y]
```

## CIS Red Hat Enterprise Linux Benchmark

```
FilePermissions.suidnews="Y"
# Q: Would you like to disable SUID status for ping? [Y]
FilePermissions.suidping="N"
# Q: Would you like to disable SUID status for printing utilities? [N]
FilePermissions.suidprint="N"
# Q: Would you like to disable the r-tools? [Y]
FilePermissions.suidrtool="Y"
# Q: Would you like to disable SUID status for traceroute? [Y]
FilePermissions.suidtrace="Y"
# Q: Would you like to disable SUID status for usernetctl? [Y]
FilePermissions.suidusernetctl="Y"
# Q: Would you like to run the packet filtering script? [N]
Firewall.ip_intro="N"
# Q: May we activate LAuS?
Logging.laus="N"
# Q: Would you like to add additional logging? [Y]
Logging.morelogging="Y"
# Q: Would you like to set up process accounting? [N]
Logging.pacct="N"
# Q: Do you have a remote logging host? [N]
Logging.remotelog="N"
# Q: Would you like to disable acpid and/or apmd? [Y]
MiscellaneousDaemons.apmd="Y"
# Q: Would you like to disable the DHCP daemon? [Y]
MiscellaneousDaemons.dhcpd="Y"
# Q: Would you like to deactivate gated? [Y]
MiscellaneousDaemons.disable_gated="Y"
# Q: Would you like to deactivate the HP OfficeJet (hpoj) script on
this machine?
MiscellaneousDaemons.disable_hpoj="Y"
# Q: Would you like to deactivate the ISDN script on this machine?
MiscellaneousDaemons.disable_isdn="Y"
# Q: Would you like to deactivate kudzu's run at boot?
MiscellaneousDaemons.disable_kudzu="Y"
# Q: Would you like to deactivate routed? [Y]
MiscellaneousDaemons.disable_routed="Y"
# Q: Would you like to disable GPM? [Y]
```

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```
MiscellaneousDaemons.gpm="Y"
# Q: Would you like to disable the news server daemon? [Y]
MiscellaneousDaemons.innd="Y"
# Q: Would you like to deactivate NIS client programs? [Y]
MiscellaneousDaemons.nis_client="Y"
# Q: Would you like to deactivate NIS server programs? [Y]
MiscellaneousDaemons.nis_server="Y"
# Q: Would you like to disable PCMCIA services? [Y]
MiscellaneousDaemons.pcmcia="Y"
# Q: Would you like to deactivate NFS and Samba? [Y]
MiscellaneousDaemons.remotefs="Y"
# Q: Would you like to disable SNMPD? [Y]
MiscellaneousDaemons.snmpd="Y"
# Q: Would you like to disable printing? [N]
Printing.printing="N"
# Q: Would you like to disable printing? [N]
Printing.printing_cups="N"
# Q: Would you like to disable CUPS' legacy LPD support? [N]
Printing.printing_cups_lpd_legacy="N"
# Q: Would you like to display "Authorized Use" messages at log-in
time? [Y]
SecureInetd.banners="Y"
# Q: Should Bastille ensure inetd's FTP service does not run on this
system? [y]
SecureInetd.deactivate_ftp="Y"
# Q: Should Bastille ensure the telnet service does not run on this
system? [y]
SecureInetd.deactivate_telnet="Y"
# Q: Who is responsible for granting authorization to use this machine?
SecureInetd.owner="its owner"
# Q: Would you like to set a default-deny on TCP Wrappers and xinetd?
[N]
SecureInetd.tcpd_default_deny="N"
# Q: Would you like to run sendmail via cron to process the queue? [N]
Sendmail.sendmailcron="Y"
# Q: Do you want to stop sendmail from running in daemon mode? [Y]
Sendmail.sendmaildaemon="Y"
# Q: Would you like to disable the VRFY and EXPN sendmail commands? [Y]
```

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```
Sendmail.vrfyexpn="Y"
```

```
# Q: Would you like to install TMPDIR/TMP scripts? [N]
```

```
TMPDIR.tmpdir="N"
```

## **Appendix D: Change History**

### **July 29, 2003- Version 1.1.0**

- Covered Red Hat 7.0

### **January 17, 2005 - Version 1.0.1**

- Renumbered version
- Major overhaul to update to Fedora Core and RHEL
- Corrected minor errors
- Added new capability for the do-backup.sh script where it creates a restore script
- Integrated Bastille Linux into the Benchmark

### **January 17, 2005 - Version 1.0.2**

- Minor updates

### **February 17, 2005 - Version 1.0.3**

- Minor updates

### **December 10, 2005 - Version 1.0.4**

- Added revision history
- Revised to incorporate minor corrections in text and scripts
- Updated due to enhancements in Bastille Linux
- Updated and validated on RHEL 4 and Fedora Core 4
- Section 2.2 – Added example
- Section 3.6 – Changed the shell for service accounts to /sbin/nologin from /dev/null
- Section 6.2 – Added discussion and command for HAL daemon
- Section 8.3 – Added code and discussion to disable inactive accounts
- Section 8.12 – Moved to Security Notes (SN.10) and section 8.13 renumbered to 8.12.
- Section 9.4 – Added reboot requirement

**August 2006 - Version 1.0.5**

- Section 1.1 Apply Latest OS Patches -- Added up2date and yum actions.
- Section 1.2 Enable System Accounting -- Added up2date and yum action
- Section 2.1 Disable Standard Services -- Added `ekrb5-telnet`.
- Section 2.4 Only Enable FTP If Absolutely Necessary -- Added discussion text for ftp servers configuration, including usage relevant for a web server.
- Section 3.15 Only Enable Web Server Processes If Absolutely Necessary -- Added text to the question, and an action to reference to the CIS Apache Benchmark if appropriate.
- Section 3.17 Only Enable DNS Server Process If Absolutely Necessary -- Added action to reference the CIS BIND Benchmark, and additional discussion text.
- Section 3.3 Disable `sendmail` Server, If Possible (Fixed script to disable daemon)
- Section 3.6 Addition daemons disabled (some may be FC5 specific) -- Added the following:
  - `avahi-daemon` – used for zero config.
  - `cups-config-daemon` - Cups configuration daemon
  - `hidd` - Bluetooth Human Interface Device Daemon.
  - `hplip` - HP Linux Imaging and Printing (HPLIP)
  - `messagebus` - daemon which broadcasts notifications of system events and other messages. See <http://www.freedesktop.org/software/dbus>

The portion of the script that was locking the service accounts was deleted as it doesn't fit this context, and item 8.1 does a better job of disabling these same accounts.

- Section 6.3 Disable User-Mounted Removable File Systems -- The script was modified to work on FC4 and FC5 which has move the device perms for the console to `console.perms.d/50-default.perms`
- Section 6.9 Disable USB Devices -- Provided a more workable solution for disabling USB devices for recent releases (FC4 FC5 and RHEL4) by using `nousb` kernel boot argument. This is likely to work on older releases, but it wasn't tested.
- Section 7.2 Create `ftpusers` Files -- For `vsftp` users added check for different path, and for `userlist_deny` which may reverse the meaning of the list.
- Section 7.7 Restrict Root Logins To System Console -- Script was incorrectly duplicating existing entries on all platforms, so that it would be ineffective. Also the

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order was changed to match the default order for RHEL4, FC4 and FC5, so that the diff would be minimized.

- Section 8.1 Block System Accounts -- Change shell to /dev/null as recommend in the discussion instead of using /sbin/nologin, and dropped reference to 3.6.
- Section 8.6 User Home Directories Should Be Mode 750 or More Restrictive -- Added discussion of special case home directories such as sftp/ftp accounts for web servers.
- Section 8.9 Set Default umask For Users -- Added discussion text for umask settings for ftp and sftp accounts.
- Section 8.11 Limit Access To The Root Account From su -- Fixed the script to also work with FC5, no path is now used for the pam\_wheel.so entry in FC5.
- Section 9.3 Create "authorized only" Banners For vsftpd, proftpd, If Applicable -- Added script for proftpd banners, since it is also widely used.
- Verify That No Unauthorized UID 0 Accounts Exists item moved to appendix.



## References

### **The Center for Internet Security**

*Free benchmark documents and security tools for various OS platforms and applications:*

<http://www.cisecurity.org/>

### **Red Hat Software**

*Patches and related documentation:*

<https://www.redhat.com/security/>

*Red Hat Update Manager tools:*

up2date:

<https://rhn.redhat.com/help/latest-up2date.pxt>

<https://rhn.redhat.com/>

yum: <http://www.linuxgazette.com/node/view/8835>

HAL:

<http://www.redhat.com/magazine/003jan05/features/hal/>

### **Other Misc Documentation**

*Various documentation on Linux security issues:*

<https://www.redhat.com/security/>

*Primary source for information on NTP*

<http://www.ntp.org/>

*Information on MIT Kerberos:*

<http://web.mit.edu/kerberos/www/>

*Apache "Security Tips" document:*

[http://httpd.apache.org/docs-2.0/misc/security\\_tips.html](http://httpd.apache.org/docs-2.0/misc/security_tips.html)

*Information on Sendmail and DNS:*

<http://www.sendmail.org/>

<http://www.deer-run.com/~hal/dns-sendmail/DNSandSendmail.pdf>

*OpenSSH (secure encrypted network logins):*

<http://www.openssh.org>

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*TCP Wrappers source distribution:*

[ftp.porcupine.org](ftp://ftp.porcupine.org)

*PortSentry and Logcheck (port and log monitoring tools):*

<http://sourceforge.net/projects/sentrytools/>

*Swatch (log monitoring tool):*

<http://www.oit.ucsb.edu/~eta/swatch/>

*Open Source Sendmail (email server) distributions:*

<ftp://ftp.sendmail.org/>

*LPRng (Open Source replacement printing system for Unix):*

<http://www.lprng.org/>

*sudo (provides fine-grained access controls for superuser activity):*

<http://www.courtesan.com/sudo/>

*Tripwire – file modification utility*

<http://www.tripwire.org>