

# CIS Debian Linux 8 Benchmark

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# Overview

This document provides prescriptive guidance for establishing a secure configuration posture for Debian Linux 8 systems running on x86 and x64 platforms.

**This will be the final release of the CIS Debian Linux 8 Benchmark. Debian Linux 8 will reach end-of-life on June 30, 2020.**

Many lists are included including filesystem types, services, clients, and network protocols. Not all items in these lists are guaranteed to exist on all distributions and additional similar items may exist which should be considered in addition to those explicitly mentioned.

The guidance within broadly assumes that operations are being performed as the root user. Non-root users may not be able to access certain areas of the system, especially after remediation has been performed. It is advisable to verify root users path integrity and the integrity of any programs being run prior to execution of commands and scripts included in this benchmark.

To obtain the latest version of this guide, please visit <http://benchmarks.cisecurity.org>. If you have questions, comments, or have identified ways to improve this guide, please write us at [feedback@cisecurity.org](mailto:feedback@cisecurity.org).

## Intended Audience

This benchmark is intended for system and application administrators, security specialists, auditors, help desk, and platform deployment personnel who plan to develop, deploy, assess, or secure solutions that incorporate Debian Linux on a x86 or x64 platform.

## Consensus Guidance

This benchmark was created using a consensus review process comprised of subject matter experts. Consensus participants provide perspective from a diverse set of backgrounds including consulting, software development, audit and compliance, security research, operations, government, and legal.

Each CIS benchmark undergoes two phases of consensus review. The first phase occurs during initial benchmark development. During this phase, subject matter experts convene to discuss, create, and test working drafts of the benchmark. This discussion occurs until consensus has been reached on benchmark recommendations. The second phase begins after the benchmark has been published. During this phase, all feedback provided by the Internet community is reviewed by the consensus team for incorporation in the benchmark. If you are interested in participating in the consensus process, please visit <https://workbench.cisecurity.org/>.

## Typographical Conventions

The following typographical conventions are used throughout this guide:

Convention	Meaning
<code>Stylized Monospace font</code>	Used for blocks of code, command, and script examples. Text should be interpreted exactly as presented.
Monospace font	Used for inline code, commands, or examples. Text should be interpreted exactly as presented.
<i>&lt;italic font in brackets&gt;</i>	Italic texts set in angle brackets denote a variable requiring substitution for a real value.
<i>Italic font</i>	Used to denote the title of a book, article, or other publication.
<b>Note</b>	Additional information or caveats

## Assessment Status

An assessment status is included for every recommendation. The assessment status indicates whether the given recommendation can be automated or requires manual steps to implement. Both statuses are equally important and are determined and supported as defined below:

### Automated

Represents recommendations for which assessment of a technical control can be fully automated and validated to a pass/fail state. Recommendations will include the necessary information to implement automation.

### Manual

Represents recommendations for which assessment of a technical control cannot be fully automated and requires all or some manual steps to validate that the configured state is set as expected. The expected state can vary depending on the environment.

## Profile Definitions

The following configuration profiles are defined by this Benchmark:

- **Level 1 - Server**

Items in this profile intend to:

- be practical and prudent;
- provide a clear security benefit; and
- not inhibit the utility of the technology beyond acceptable means.

This profile is intended for servers.

- **Level 2 - Server**

This profile extends the "Level 1 - Server" profile. Items in this profile exhibit one or more of the following characteristics:

- are intended for environments or use cases where security is paramount.
- acts as defense in depth measure.
- may negatively inhibit the utility or performance of the technology.

This profile is intended for servers.

- **Level 1 - Workstation**

Items in this profile intend to:

- be practical and prudent;
- provide a clear security benefit; and
- not inhibit the utility of the technology beyond acceptable means.

This profile is intended for workstations.

- **Level 2 - Workstation**

This profile extends the "Level 1 - Workstation" profile. Items in this profile exhibit one or more of the following characteristics:

- are intended for environments or use cases where security is paramount.
- acts as defense in depth measure.
- may negatively inhibit the utility or performance of the technology.

This profile is intended for workstations.

## Acknowledgements

This benchmark exemplifies the great things a community of users, vendors, and subject matter experts can accomplish through consensus collaboration. The CIS community thanks the entire consensus team with special recognition to the following individuals who contributed greatly to the creation of this guide:

This benchmark is based upon previous Linux benchmarks published and would not be possible without the contributions provided over the history of all of these benchmarks. The CIS community thanks everyone who has contributed to the Linux benchmarks.

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## Recommendations

### ***1 Initial Setup***

Items in this section are advised for all systems, but may be difficult or require extensive preparation after the initial setup of the system.

## 1.1 Filesystem Configuration

Directories that are used for system-wide functions can be further protected by placing them on separate partitions. This provides protection for resource exhaustion and enables the use of mounting options that are applicable to the directory's intended use. Users' data can be stored on separate partitions and have stricter mount options. A user partition is a filesystem that has been established for use by the users and does not contain software for system operations.

The recommendations in this section are easier to perform during initial system installation. If the system is already installed, it is recommended that a full backup be performed before repartitioning the system.

**Note:** If you are repartitioning a system that has already been installed, make sure the data has been copied over to the new partition, unmount it and then remove the data from the directory that was in the old partition. Otherwise it will still consume space in the old partition that will be masked when the new filesystem is mounted. For example, if a system is in single-user mode with no filesystems mounted and the administrator adds a lot of data to the `/tmp` directory, this data will still consume space in `/` once the `/tmp` filesystem is mounted unless it is removed first.

### ***1.1.1 Disable unused filesystems***

A number of uncommon filesystem types are supported under Linux. Removing support for unneeded filesystem types reduces the local attack surface of the system. If a filesystem type is not needed it should be disabled. Native Linux file systems are designed to ensure that built-in security controls function as expected. Non-native filesystems can lead to unexpected consequences to both the security and functionality of the system and should be used with caution. Many filesystems are created for niche use cases and are not maintained and supported as the operating systems are updated and patched. Users of non-native filesystems should ensure that there is attention and ongoing support for them, especially in light of frequent operating system changes.

Standard network connectivity and Internet access to cloud storage may make the use of non-standard filesystem formats to directly attach heterogeneous devices much less attractive.

**Note:** This should not be considered a comprehensive list of filesystems. You may wish to consider additions to those listed here for your environment.

### *1.1.1.1 Ensure mounting of cramfs filesystems is disabled (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `cramfs` filesystem type is a compressed read-only Linux filesystem embedded in small footprint systems. A `cramfs` image can be used without having to first decompress the image.

#### **Rationale:**

Removing support for unneeded filesystem types reduces the local attack surface of the server. If this filesystem type is not needed, disable it.

#### **Audit:**

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v cramfs
install /bin/true

# lsmod | grep cramfs
<No output>
```

#### **Remediation:**

Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/cramfs.conf`







and add the following line:

```
install cramfs /bin/true
```

Run the following command to unload the `cramfs` module:

```
# rmmod cramfs
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v7	<b><u>13 Data Protection</u></b> Data Protection			

### *1.1.1.2 Ensure mounting of freevxfs filesystems is disabled (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `freevxfs` filesystem type is a free version of the Veritas type filesystem. This is the primary filesystem type for HP-UX operating systems.

#### **Rationale:**

Removing support for unneeded filesystem types reduces the local attack surface of the system. If this filesystem type is not needed, disable it.

#### **Audit:**

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v freevxfs
install /bin/true
# lsmod | grep freevxfs
<No output>
```

#### **Remediation:**

Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/freevxfs.conf`







and add the following line:

```
install freevxfs /bin/true
```

Run the following command to unload the `freevxfs` module:

```
# rmmod freevxfs
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.1.1.3 Ensure mounting of jffs2 filesystems is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `jffs2` (journaling flash filesystem 2) filesystem type is a log-structured filesystem used in flash memory devices.

#### Rationale:

Removing support for unneeded filesystem types reduces the local attack surface of the system. If this filesystem type is not needed, disable it.

#### Audit:

Run the following commands and verify that `jffs2` is not in the output:

```
# modprobe -n -v jffs2 | egrep '(jffs2|install)'  
install /bin/true  
  
# lsmod | grep jffs2  
<No output>
```

#### Remediation:

Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/jffs2.conf`

and add the following line:







```
install jffs2 /bin/true
```

Run the following command to unload the `jffs2` module:

```
# rmmod jffs2
```



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

#### 1.1.1.4 Ensure mounting of hfs filesystems is disabled (Automated)

##### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

##### Description:

The `hfs` filesystem type is a hierarchical filesystem that allows you to mount Mac OS filesystems.

##### Rationale:

Removing support for unneeded filesystem types reduces the local attack surface of the system. If this filesystem type is not needed, disable it.

##### Audit:

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v hfs
install /bin/true
# lsmod | grep hfs
<No output>
```

##### Remediation:

Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/hfs.conf`







and add the following line:

```
install hfs /bin/true
```

Run the following command to unload the `hfs` module:

```
# rmmod hfs
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### *1.1.1.5 Ensure mounting of hfsplus filesystems is disabled (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `hfsplus` filesystem type is a hierarchical filesystem designed to replace `hfs` that allows you to mount Mac OS filesystems.

#### **Rationale:**

Removing support for unneeded filesystem types reduces the local attack surface of the system. If this filesystem type is not needed, disable it.

#### **Audit:**

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v hfsplus
install /bin/true
# lsmod | grep hfsplus
<No output>
```

#### **Remediation:**

Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/hfsplus.conf`







and add the following line:

```
install hfsplus /bin/true
```

Run the following command to unload the `hfsplus` module:

```
# rmmod hfsplus
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>2.3 Address Unauthorized Software</u> Ensure that unauthorized software is either removed from use on enterprise assets or receives a documented exception. Review monthly, or more frequently.			
v7	<u>5.1 Establish Secure Configurations</u> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<u>13 Data Protection</u> Data Protection			

### 1.1.1.6 Ensure mounting of squashfs filesystems is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `squashfs` filesystem type is a compressed read-only Linux filesystem embedded in small footprint systems (similar to `cramfs`). A `squashfs` image can be used without having to first decompress the image.

#### Rationale:

Removing support for unneeded filesystem types reduces the local attack surface of the system. If this filesystem type is not needed, disable it.

#### Audit:

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v squashfs
install /bin/true
# lsmod | grep squashfs
<No output>
```

#### Remediation:

Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/squashfs.conf`




and add the following line:

```
install squashfs /bin/true
```

Run the following command to unload the `squashfs` module:

```
# rmmod squashfs
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>13 <u>Data Protection</u></b> Data Protection			
v6	<b>13 <u>Data Protection</u></b> Data Protection			

### *1.1.1.7 Ensure mounting of udf filesystems is disabled (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `udf` filesystem type is the universal disk format used to implement ISO/IEC 13346 and ECMA-167 specifications. This is an open vendor filesystem type for data storage on a broad range of media. This filesystem type is necessary to support writing DVDs and newer optical disc formats.

#### **Rationale:**

Removing support for unneeded filesystem types reduces the local attack surface of the system. If this filesystem type is not needed, disable it.

#### **Audit:**

Run the following commands and verify that `udf` is not in the output:

```
# modprobe -n -v udf | egrep '(udf|install)'
install /bin/true

# lsmod | grep udf
<No output>
```

#### **Remediation:**

Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/udf.conf`

and add the following line:







```
install udf /bin/true
```

Run the following command to unload the `udf` module:

```
# rmmod udf
```



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### *1.1.2 Ensure /tmp is configured (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `/tmp` directory is a world-writable directory used for temporary storage by all users and some applications.

#### **Rationale:**

Since the `/tmp` directory is intended to be world-writable, there is a risk of resource exhaustion if it is not bound to a separate partition. In addition, making `/tmp` its own file system allows an administrator to set the `noexec` option on the mount, making `/tmp` useless for an attacker to install executable code. It would also prevent an attacker from establishing a hardlink to a system `setuid` program and wait for it to be updated. Once the program was updated, the hardlink would be broken and the attacker would have his own copy of the program. If the program happened to have a security vulnerability, the attacker could continue to exploit the known flaw.

This can be accomplished by either mounting `tmpfs` to `/tmp`, or creating a separate partition for `/tmp`.

#### **Impact:**

Since the `/tmp` directory is intended to be world-writable, there is a risk of resource exhaustion if it is not bound to a separate partition.

Running out of `/tmp` space is a problem regardless of what kind of filesystem lies under it, but in a default installation a disk-based `/tmp` will essentially have the whole disk available, as it only creates a single `/` partition. On the other hand, a RAM-based `/tmp` as with `tmpfs` will almost certainly be much smaller, which can lead to applications filling up the filesystem much more easily.

`/tmp` utilizing `tmpfs` can be resized using the `size={size}` parameter on the Options line on the `tmp.mount` file

## Audit:

Run the following command and verify output shows `/tmp` is mounted:

```
# mount | grep /tmp
tmpfs on /tmp type tmpfs (rw,nosuid,nodev,noexec,relatime)
```

Run the following command and verify that tmpfs has been mounted to, or a system partition has been created for `/tmp`

```
# systemctl is-enabled tmp.mount
enabled
```

## Remediation:

Configure `/etc/fstab` as appropriate.

```
example:
tmpfs    /tmp     tmpfs    defaults,rw,nosuid,nodev,noexec,relatime 0 0
```

or

Run the following commands to enable systemd `/tmp` mounting:

```
systemctl unmask tmp.mount
systemctl enable tmp.mount
```

Edit `/etc/systemd/system/local-fs.target.wants/tmp.mount` to configure the `/tmp` mount:

```
[Mount]
What=tmpfs
Where=/tmp
Type=tmpfs
Options=mode=1777,strictatime,noexec,nodev,nosuid
```







## References:

1. AJ Lewis, "LVM HOWTO", <http://tldp.org/HOWTO/LVM-HOWTO/>
2. <https://www.freedesktop.org/wiki/Software/systemd/APIFileSystems/>

## Additional Information:

If an entry for `/tmp` exists in `/etc/fstab` it will take precedence over entries in the `tmp.mount` file

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.1.3 Ensure nodev option set on /tmp partition (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `nodev` mount option specifies that the filesystem cannot contain special devices.

#### Rationale:

Since the `/tmp` filesystem is not intended to support devices, set this option to ensure that users cannot attempt to create block or character special devices in `/tmp`.

#### Audit:

If a `/tmp` partition exists run the following command and verify that the `nodev` option is set on `/tmp`:

```
# mount | grep /tmp
tmpfs on /tmp type tmpfs (rw,nosuid,nodev,noexec,relatime)
```

#### Remediation:

If using the `/etc/fstab` for configuring `/tmp` do the following:

Edit the `/etc/fstab` file and add `nodev` to the fourth field (mounting options) for the `/tmp` partition. See the `fstab(5)` manual page for more information.

Run the following command to remount `/tmp`:

```
# mount -o remount,nodev /tmp
```

If using `systemd tmp.mount` for configuring `/tmp` do the following:

Edit `/etc/systemd/system/local-fs.target.wants/tmp.mount` and add the `nodev` option to the `Options` line

Example:

```
[Mount]
What=tmpfs
Where=/tmp
Type=tmpfs
Options=mode=1777,strictatime,noexec,nodev,nosuid
```




Run the following command to remount `/tmp`:

```
# mount -o remount,nosuid /tmp
```

### Additional Information:

If the `/etc/fstab` includes `/tmp` it will take precedence over the `tmp.mount` file

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>13 <u>Data Protection</u></b> Data Protection			

### 1.1.4 Ensure nosuid option set on /tmp partition (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `nosuid` mount option specifies that the filesystem cannot contain `setuid` files.

#### Rationale:

Since the `/tmp` filesystem is only intended for temporary file storage, set this option to ensure that users cannot create `setuid` files in `/tmp`.

#### Audit:

If a `/tmp` partition exists run the following command and verify that the `nosuid` option is set on `/tmp`:

```
# mount | grep /tmp
tmpfs on /tmp type tmpfs (rw,nosuid,nodev,noexec,relatime)
```

#### Remediation:

If using the `/etc/fstab` for configuring `/tmp` do the following:

Edit the `/etc/fstab` file and add `nosuid` to the fourth field (mounting options) for the `/tmp` partition. See the `fstab(5)` manual page for more information.

Run the following command to remount `/tmp`:

```
# mount -o remount,nosuid /tmp
```

If using `systemd tmp.mount` for configuring `/tmp` do the following:

Edit `/etc/systemd/system/local-fs.target.wants/tmp.mount` and add the `nosuid` option to the `Options` line

Example:

```
[Mount]
What=tmpfs
Where=/tmp
Type=tmpfs
Options=mode=1777,strictatime,noexec,nodev,nosuid
```







Run the following command to remount `/tmp`:

```
# mount -o remount,nosuid /tmp
```

### Additional Information:

If the `/etc/fstab` includes `/tmp` it will take precedence over the `tmp.mount` file

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>13 <u>Data Protection</u></b> Data Protection			



### *1.1.5 Ensure separate partition exists for /var (Automated)*

#### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

#### **Description:**

The `/var` directory is used by daemons and other system services to temporarily store dynamic data. Some directories created by these processes may be world-writable.

#### **Rationale:**

Since the `/var` directory may contain world-writable files and directories, there is a risk of resource exhaustion if it is not bound to a separate partition.

#### **Impact:**

Resizing filesystems is a common activity in cloud-hosted servers. Separate filesystem partitions may prevent successful resizing, or may require the installation of additional tools solely for the purpose of resizing operations. The use of these additional tools may introduce their own security considerations.

#### **Audit:**

Run the following command and verify output shows `/var` is mounted:

```
# mount | grep /var  
/dev/xvdgl on /var type ext4 (rw,relatime,data=ordered)
```

#### **Remediation:**







For new installations, during installation create a custom partition setup and specify a separate partition for `/var`.

For systems that were previously installed, create a new partition and configure `/etc/fstab` as appropriate.

#### **References:**

1. AJ Lewis, "LVM HOWTO", <http://tldp.org/HOWTO/LVM-HOWTO/>

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.1.6 Ensure separate partition exists for /var/tmp (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

The `/var/tmp` directory is a world-writable directory used for temporary storage by all users and some applications.

#### Rationale:

Since the `/var/tmp` directory is intended to be world-writable, there is a risk of resource exhaustion if it is not bound to a separate partition. In addition, making `/var/tmp` its own file system allows an administrator to set the `noexec` option on the mount, making `/var/tmp` useless for an attacker to install executable code. It would also prevent an attacker from establishing a hardlink to a system `setuid` program and wait for it to be updated. Once the program was updated, the hardlink would be broken and the attacker would have his own copy of the program. If the program happened to have a security vulnerability, the attacker could continue to exploit the known flaw.

#### Impact:

Resizing filesystems is a common activity in cloud-hosted servers. Separate filesystem partitions may prevent successful resizing, or may require the installation of additional tools solely for the purpose of resizing operations. The use of these additional tools may introduce their own security considerations.

#### Audit:

Run the following command and verify output shows `/var/tmp` is mounted:







```
# mount | grep /var/tmp  
<device> on /var/tmp type ext4 (rw,nosuid,nodev,noexec,relatime)
```

#### Remediation:

For new installations, during installation create a custom partition setup and specify a separate partition for `/var/tmp`.

For systems that were previously installed, create a new partition and configure `/etc/fstab` as appropriate.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.1.7 Ensure nodev option set on /var/tmp partition (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `nodev` mount option specifies that the filesystem cannot contain special devices.

#### Rationale:

Since the `/var/tmp` filesystem is not intended to support devices, set this option to ensure that users cannot attempt to create block or character special devices in `/var/tmp`.

#### Audit:

If a `/var/tmp` partition exists run the following command and verify that the `nodev` option is set on `/var/tmp`.

```
# mount | grep /var/tmp  
tmpfs on /var/tmp type tmpfs (rw,nosuid,nodev,noexec,relatime)
```







#### Remediation:

Edit the `/etc/fstab` file and add `nodev` to the fourth field (mounting options) for the `/var/tmp` partition. See the `fstab(5)` manual page for more information.

Run the following command to remount `/var/tmp`:

```
# mount -o remount,nodev /var/tmp
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.1.8 Ensure nosuid option set on /var/tmp partition (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `nosuid` mount option specifies that the filesystem cannot contain `setuid` files.

#### Rationale:

Since the `/var/tmp` filesystem is only intended for temporary file storage, set this option to ensure that users cannot create `setuid` files in `/var/tmp`.

#### Audit:

If a `/var/tmp` partition exists run the following command and verify that the `nosuid` option is set on `/var/tmp`.

```
# mount | grep /var/tmp  
tmpfs on /var/tmp type tmpfs (rw,nosuid,nodev,noexec,relatime)
```







#### Remediation:

Edit the `/etc/fstab` file and add `nosuid` to the fourth field (mounting options) for the `/var/tmp` partition. See the `fstab(5)` manual page for more information.

Run the following command to remount `/var/tmp`:

```
# mount -o remount,nosuid /var/tmp
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			



### 1.1.9 Ensure noexec option set on /var/tmp partition (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `noexec` mount option specifies that the filesystem cannot contain executable binaries.

#### Rationale:

Since the `/var/tmp` filesystem is only intended for temporary file storage, set this option to ensure that users cannot run executable binaries from `/var/tmp`.

#### Audit:

If a `/var/tmp` partition exists run the following command and verify that the `noexec` option is set on `/var/tmp`.

```
# mount | grep /var/tmp  
tmpfs on /var/tmp type tmpfs (rw,nosuid,nodev,noexec,relatime)
```







#### Remediation:

Edit the `/etc/fstab` file and add `noexec` to the fourth field (mounting options) for the `/var/tmp` partition. See the `fstab(5)` manual page for more information.

Run the following command to remount `/var/tmp`:

```
# mount -o remount,noexec /var/tmp
```

**CIS Controls:**

<b>Controls Version</b>	<b>Control</b>	<b>IG 1</b>	<b>IG 2</b>	<b>IG 3</b>
v8	<u>2.3 Address Unauthorized Software</u> Ensure that unauthorized software is either removed from use on enterprise assets or receives a documented exception. Review monthly, or more frequently.			
v7	<u>2.6 Address unapproved software</u> Ensure that unauthorized software is either removed or the inventory is updated in a timely manner			
v6	<u>2 Inventory of Authorized and Unauthorized Software</u> Inventory of Authorized and Unauthorized Software			

### *1.1.10 Ensure separate partition exists for /var/log (Automated)*

#### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

#### **Description:**

The `/var/log` directory is used by system services to store log data .

#### **Rationale:**

There are two important reasons to ensure that system logs are stored on a separate partition: protection against resource exhaustion (since logs can grow quite large) and protection of audit data.

#### **Impact:**

Resizing filesystems is a common activity in cloud-hosted servers. Separate filesystem partitions may prevent successful resizing, or may require the installation of additional tools solely for the purpose of resizing operations. The use of these additional tools may introduce their own security considerations.

#### **Audit:**

Run the following command and verify output shows `/var/log` is mounted:

```
# mount | grep /var/log  
<device> on /var/log type ext4 (rw,relatime,data=ordered)
```

#### **Remediation:**

For new installations, during installation create a custom partition setup and specify a separate partition for `/var/log`.

For systems that were previously installed, create a new partition and configure `/etc/fstab` as appropriate.

#### **References:**

1. AJ Lewis, "LVM HOWTO", <http://tldp.org/HOWTO/LVM-HOWTO/>

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.3 <u>Ensure Adequate Audit Log Storage</u></b> Ensure that logging destinations maintain adequate storage to comply with the enterprise's audit log management process.		●	●
v7	<b>6.4 <u>Ensure adequate storage for logs</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated.		●	●
v6	<b>6.3 <u>Ensure Audit Logging Systems Are Not Subject To Loss (i.e. rotation/archive)</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated on a regular basis, so that log files will not fill up between log rotation intervals. The logs must be archived and digitally signed on a periodic basis.			

### *1.1.11 Ensure separate partition exists for /var/log/audit (Automated)*

#### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

#### **Description:**

The auditing daemon, `auditd`, stores log data in the `/var/log/audit` directory.

#### **Rationale:**

There are two important reasons to ensure that data gathered by `auditd` is stored on a separate partition: protection against resource exhaustion (since the `audit.log` file can grow quite large) and protection of audit data. The audit daemon calculates how much free space is left and performs actions based on the results. If other processes (such as `syslog`) consume space in the same partition as `auditd`, it may not perform as desired.

#### **Impact:**

Resizing filesystems is a common activity in cloud-hosted servers. Separate filesystem partitions may prevent successful resizing, or may require the installation of additional tools solely for the purpose of resizing operations. The use of these additional tools may introduce their own security considerations.

#### **Audit:**

Run the following command and verify output shows `/var/log/audit` is mounted:

```
# mount | grep /var/log/audit  
<device> on /var/log/audit type ext4 (rw,relatime,data=ordered)
```

#### **Remediation:**





For new installations, during installation create a custom partition setup and specify a separate partition for `/var/log/audit`.

For systems that were previously installed, create a new partition and configure `/etc/fstab` as appropriate.

#### **References:**

1. AJ Lewis, "LVM HOWTO", <http://tldp.org/HOWTO/LVM-HOWTO/>

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.3 <u>Ensure Adequate Audit Log Storage</u></b> Ensure that logging destinations maintain adequate storage to comply with the enterprise's audit log management process.			
v7	<b>6.4 <u>Ensure adequate storage for logs</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated.			
v6	<b>6.3 <u>Ensure Audit Logging Systems Are Not Subject To Loss (i.e. rotation/archive)</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated on a regular basis, so that log files will not fill up between log rotation intervals. The logs must be archived and digitally signed on a periodic basis.			

### *1.1.12 Ensure separate partition exists for /home (Automated)*

#### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

#### **Description:**

The `/home` directory is used to support disk storage needs of local users.

#### **Rationale:**

If the system is intended to support local users, create a separate partition for the `/home` directory to protect against resource exhaustion and restrict the type of files that can be stored under `/home`.

#### **Impact:**

Resizing filesystems is a common activity in cloud-hosted servers. Separate filesystem partitions may prevent successful resizing, or may require the installation of additional tools solely for the purpose of resizing operations. The use of these additional tools may introduce their own security considerations.

#### **Audit:**

Run the following command and verify output shows `/home` is mounted:

```
# mount | grep /home  
<device> on /home type ext4 (rw,nodev,relatime,data=ordered)
```

#### **Remediation:**







For new installations, during installation create a custom partition setup and specify a separate partition for `/home`.

For systems that were previously installed, create a new partition and configure `/etc/fstab` as appropriate.

#### **References:**

1. AJ Lewis, "LVM HOWTO", <http://tldp.org/HOWTO/LVM-HOWTO/>

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			



### 1.1.13 Ensure nodev option set on /home partition (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `nodev` mount option specifies that the filesystem cannot contain special devices.

#### Rationale:

Since the user partitions are not intended to support devices, set this option to ensure that users cannot attempt to create block or character special devices.

#### Audit:

If a `/home` partition exists run the following command and verify that the `nodev` option is set on `/home`.

```
# mount | grep /home  
<device> on /home type ext4 (rw,nodev,relatime,data=ordered)
```

#### Remediation:







Edit the `/etc/fstab` file and add `nodev` to the fourth field (mounting options) for the `/home` partition. See the `fstab(5)` manual page for more information.

```
# mount -o remount,nodev /home
```

#### Additional Information:

The actions in this recommendation refer to the `/home` partition, which is the default user partition that is defined in many distributions. If you have created other user partitions, it is recommended that the Remediation and Audit steps be applied to these partitions as well.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			
v6	<b><u>15.1 Ensure Wireless Devices Have Standard Secure Configurations</u></b> Ensure that each wireless device connected to the network matches an authorized configuration and security profile, with a documented owner of the connection and a defined business need. Organizations should deny access to those wireless devices that do not have such a configuration and profile.			

### *1.1.14 Ensure nodev option set on /dev/shm partition (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `nodev` mount option specifies that the filesystem cannot contain special devices.

#### **Rationale:**

Since the `/run/shm` filesystem is not intended to support devices, set this option to ensure that users cannot attempt to create special devices in `/dev/shm` partitions.

#### **Audit:**

Run the following command and verify that the `nodev` option is set on `/dev/shm`.

```
# mount | grep /dev/shm  
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev,noexec,relatime)
```







#### **Remediation:**

Edit the `/etc/fstab` file and add `nodev` to the fourth field (mounting options) for the `/dev/shm` partition. See the `fstab(5)` manual page for more information.

Run the following command to remount `/dev/shm`:

```
# mount -o remount,nodev /dev/shm
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.1.15 Ensure nosuid option set on /dev/shm partition (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `nosuid` mount option specifies that the filesystem cannot contain `setuid` files.

#### Rationale:

Setting this option on a file system prevents users from introducing privileged programs onto the system and allowing non-root users to execute them.

#### Audit:

Run the following command and verify that the `nosuid` option is set on `/dev/shm`.

```
# mount | grep /dev/shm  
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev,noexec,relatime)
```







#### Remediation:

Edit the `/etc/fstab` file and add `nosuid` to the fourth field (mounting options) for the `/dev/shm` partition. See the `fstab(5)` manual page for more information.

Run the following command to remount `/dev/shm`:

```
# mount -o remount,nosuid /dev/shm
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.1.16 Ensure noexec option set on /dev/shm partition (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `noexec` mount option specifies that the filesystem cannot contain executable binaries.

#### Rationale:

Setting this option on a file system prevents users from executing programs from shared memory. This deters users from introducing potentially malicious software on the system.

#### Audit:

Run the following command and verify that the `noexec` option is set on `/run/shm`.

```
# mount | grep /dev/shm
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev,noexec,relatime)
```







#### Remediation:

Edit the `/etc/fstab` file and add `noexec` to the fourth field (mounting options) for the `/dev/shm` partition. See the `fstab(5)` manual page for more information.

Run the following command to remount `/dev/shm`:

```
# mount -o remount,noexec /dev/shm
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>2.3 Address Unauthorized Software</u></b> Ensure that unauthorized software is either removed from use on enterprise assets or receives a documented exception. Review monthly, or more frequently.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			



### *1.1.17 Ensure nodev option set on removable media partitions (Manual)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `nodev` mount option specifies that the filesystem cannot contain special devices.

#### **Rationale:**

Removable media containing character and block special devices could be used to circumvent security controls by allowing non-root users to access sensitive device files such as `/dev/kmem` or the raw disk partitions.

#### **Audit:**







Run the following command and verify that the `nodev` option is set on all removable media partitions.

```
# mount
```

#### **Remediation:**

Edit the `/etc/fstab` file and add `nodev` to the fourth field (mounting options) of all removable media partitions. Look for entries that have mount points that contain words such as `floppy` or `cdrom`. See the `fstab(5)` manual page for more information.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### *1.1.18 Ensure nosuid option set on removable media partitions (Manual)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `nosuid` mount option specifies that the filesystem cannot contain `setuid` files.

#### **Rationale:**

Setting this option on a file system prevents users from introducing privileged programs onto the system and allowing non-root users to execute them.

#### **Audit:**







Run the following command and verify that the `nosuid` option is set on all removable media partitions.

```
# mount
```

#### **Remediation:**

Edit the `/etc/fstab` file and add `nosuid` to the fourth field (mounting options) of all removable media partitions. Look for entries that have mount points that contain words such as `floppy` or `cdrom`. See the `fstab(5)` manual page for more information.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### *1.1.19 Ensure noexec option set on removable media partitions (Manual)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

The `noexec` mount option specifies that the filesystem cannot contain executable binaries.

#### **Rationale:**

Setting this option on a file system prevents users from executing programs from the removable media. This deters users from being able to introduce potentially malicious software on the system.

#### **Audit:**







Run the following command and verify that the `noexec` option is set on all removable media partitions.

```
# mount
```

#### **Remediation:**

Edit the `/etc/fstab` file and add `noexec` to the fourth field (mounting options) of all removable media partitions. Look for entries that have mount points that contain words such as `floppy` or `cdrom`. See the `fstab(5)` manual page for more information.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>2.3 Address Unauthorized Software</u> Ensure that unauthorized software is either removed from use on enterprise assets or receives a documented exception. Review monthly, or more frequently.			
v7	<u>2.6 Address unapproved software</u> Ensure that unauthorized software is either removed or the inventory is updated in a timely manner			
v6	<u>8 Malware Defenses</u> Malware Defenses			

## *1.1.20 Ensure sticky bit is set on all world-writable directories (Automated)*

### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

### **Description:**

Setting the sticky bit on world writable directories prevents users from deleting or renaming files in that directory that are not owned by them.

### **Rationale:**

This feature prevents the ability to delete or rename files in world writable directories (such as `/tmp`) that are owned by another user.

### **Audit:**

Run the following command to verify no world writable directories exist without the sticky bit set:

```
# df --local -P | awk {'if (NR!=1) print $6'} | xargs -I '{}' find '{}' -xdev -type d \( -perm -0002 -a ! -perm -1000 \) 2>/dev/null
```

No output should be returned.

### **Remediation:**







Run the following command to set the sticky bit on all world writable directories:

```
# df --local -P | awk {'if (NR!=1) print $6'} | xargs -I '{}' find '{}' -xdev -type d -perm -0002 2>/dev/null | xargs chmod a+t
```

### **Additional Information:**

Some distributions may not support the `--local` option to `df`.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			



### 1.1.21 Disable Automounting (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 2 - Workstation

#### Description:

`autofs` allows automatic mounting of devices, typically including CD/DVDs and USB drives.

#### Rationale:

With automounting enabled anyone with physical access could attach a USB drive or disc and have its contents available in system even if they lacked permissions to mount it themselves.

#### Impact:

The use portable hard drives is very common for workstation users. If your organization allows the use of portable storage or media on workstations and physical access controls to workstations is considered adequate there is little value add in turning off automounting.

#### Audit:

Run the following command to verify `autofs` is not enabled:

```
# systemctl is-enabled autofs
disabled
```

Verify result is not "enabled".

#### Remediation:












Run the following command to disable `autofs`:

```
# systemctl disable autofs
```

### Additional Information:

This control should align with the tolerance of the use of portable drives and optical media in the organization. On a server requiring an admin to manually mount media can be part of defense-in-depth to reduce the risk of unapproved software or information being introduced or proprietary software or information being exfiltrated. If admins commonly use flash drives and Server access has sufficient physical controls, requiring manual mounting may not increase security.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>10.3 <u>Disable Autorun and Autoplay for Removable Media</u></b> Disable autorun and autoplay auto-execute functionality for removable media.			
v8	<b>10.4 <u>Configure Automatic Anti-Malware Scanning of Removable Media</u></b> Configure anti-malware software to automatically scan removable media.			
v7	<b>8.4 <u>Configure Anti-Malware Scanning of Removable Devices</u></b> Configure devices so that they automatically conduct an anti-malware scan of removable media when inserted or connected.			
v7	<b>8.5 <u>Configure Devices Not To Auto-run Content</u></b> Configure devices to not auto-run content from removable media.			
v6	<b>8.3 <u>Limit Use Of External Devices (i.e. USB)</u></b> Limit use of external devices to those with an approved, documented business need. Monitor for use and attempted use of external devices. Configure laptops, workstations, and servers so that they will not auto-run content from removable media, like USB tokens (i.e., "thumb drives"), USB hard drives, CDs/DVDs, FireWire devices, external serial advanced technology attachment devices, and mounted network shares. Configure systems so that they automatically conduct an anti-malware scan of removable media when inserted.			

## ***1.2 Configure Software Updates***

Debian Linux uses apt to install and update software packages. Patch management procedures may vary widely between enterprises. Large enterprises may choose to install a local updates server that can be used in place of Debian's servers, whereas a single deployment of a system may prefer to get updates directly. Updates can be performed automatically or manually, depending on the site's policy for patch management. Many large enterprises prefer to test patches on a non-production system before rolling out to production.

For the purpose of this benchmark, the requirement is to ensure that a patch management system is configured and maintained. The specifics on patch update procedures are left to the organization.

### *1.2.1 Ensure package manager repositories are configured (Manual)*

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

Systems need to have package manager repositories configured to ensure they receive the latest patches and updates.

**Rationale:**

If a system's package repositories are misconfigured important patches may not be identified or a rogue repository could introduce compromised software.

**Audit:**













Run the following command and verify package repositories are configured correctly:

```
<span># apt-cache policy</span>
```

**Remediation:**

Configure your package manager repositories according to site policy.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>7.3 Perform Automated Operating System Patch Management</u></b> Perform operating system updates on enterprise assets through automated patch management on a monthly, or more frequent, basis.			
v8	<b><u>7.4 Perform Automated Application Patch Management</u></b> Perform application updates on enterprise assets through automated patch management on a monthly, or more frequent, basis.			
v7	<b><u>3.4 Deploy Automated Operating System Patch Management Tools</u></b> Deploy automated software update tools in order to ensure that the operating systems are running the most recent security updates provided by the software vendor.			
v7	<b><u>3.5 Deploy Automated Software Patch Management Tools</u></b> Deploy automated software update tools in order to ensure that third-party software on all systems is running the most recent security updates provided by the software vendor.			
v6	<b><u>4.5 Use Automated Patch Management And Software Update Tools</u></b> Deploy automated patch management tools and software update tools for operating system and software/applications on all systems for which such tools are available and safe. Patches should be applied to all systems, even systems that are properly air gapped.			

### 1.2.2 Ensure GPG keys are configured (Manual)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

Most packages managers implement GPG key signing to verify package integrity during installation.

**Rationale:**

It is important to ensure that updates are obtained from a valid source to protect against spoofing that could lead to the inadvertent installation of malware on the system.

**Audit:**













Run the following command and verify GPG keys are configured correctly for your package manager:

```
<span># apt-key list</span>
```

**Remediation:**

Update your package manager GPG keys in accordance with site policy.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>7.3 Perform Automated Operating System Patch Management</u></b> Perform operating system updates on enterprise assets through automated patch management on a monthly, or more frequent, basis.			
v8	<b><u>7.4 Perform Automated Application Patch Management</u></b> Perform application updates on enterprise assets through automated patch management on a monthly, or more frequent, basis.			
v7	<b><u>3.4 Deploy Automated Operating System Patch Management Tools</u></b> Deploy automated software update tools in order to ensure that the operating systems are running the most recent security updates provided by the software vendor.			
v7	<b><u>3.5 Deploy Automated Software Patch Management Tools</u></b> Deploy automated software update tools in order to ensure that third-party software on all systems is running the most recent security updates provided by the software vendor.			
v6	<b><u>4.5 Use Automated Patch Management And Software Update Tools</u></b> Deploy automated patch management tools and software update tools for operating system and software/applications on all systems for which such tools are available and safe. Patches should be applied to all systems, even systems that are properly air gapped.			

## ***1.3 Filesystem Integrity Checking***

AIDE is a file integrity checking tool, similar in nature to Tripwire. While it cannot prevent intrusions, it can detect unauthorized changes to configuration files by alerting when the files are changed. When setting up AIDE, decide internally what the site policy will be concerning integrity checking. Review the AIDE quick start guide and AIDE documentation before proceeding.



### *1.3.1 Ensure AIDE is installed (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

AIDE takes a snapshot of filesystem state including modification times, permissions, and file hashes which can then be used to compare against the current state of the filesystem to detect modifications to the system.

#### **Rationale:**

By monitoring the filesystem state compromised files can be detected to prevent or limit the exposure of accidental or malicious misconfigurations or modified binaries.

#### **Audit:**

Run the following command and verify AIDE is installed:

```
# dpkg -s aide
```

#### **Remediation:**

Run the following command to install AIDE:

```
# apt-get install aide aide-common
```

Configure AIDE as appropriate for your environment. Consult the AIDE documentation for options.

Initialize AIDE:

```
# aideinit
```

#### **References:**

1. AIDE stable manual: <http://aide.sourceforge.net/stable/manual.html>

## Additional Information:

The prelinking feature can interfere with AIDE because it alters binaries to speed up their start up times. Run `prelink -ua` to restore the binaries to their prelinked state, thus avoiding false positives from AIDE.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.14 <u>Log Sensitive Data Access</u></b> Log sensitive data access, including modification and disposal.			●
v7	<b>14.9 <u>Enforce Detail Logging for Access or Changes to Sensitive Data</u></b> Enforce detailed audit logging for access to sensitive data or changes to sensitive data (utilizing tools such as File Integrity Monitoring or Security Information and Event Monitoring).			●
v6	<b>3.5 <u>Use File Integrity Tools For Critical System Files</u></b> Use file integrity checking tools to ensure that critical system files (including sensitive system and application executables, libraries, and configurations) have not been altered. The reporting system should: have the ability to account for routine and expected changes; highlight and alert on unusual or unexpected alterations; show the history of configuration changes over time and identify who made the change (including the original logged-in account in the event of a user ID switch, such as with the su or sudo command). These integrity checks should identify suspicious system alterations such as: owner and permissions changes to files or directories; the use of alternate data streams which could be used to hide malicious activities; and the introduction of extra files into key system areas (which could indicate malicious payloads left by attackers or additional files inappropriately added during batch distribution processes).			

### 1.3.2 Ensure filesystem integrity is regularly checked (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Periodic checking of the filesystem integrity is needed to detect changes to the filesystem.

#### Rationale:

Periodic file checking allows the system administrator to determine on a regular basis if critical files have been changed in an unauthorized fashion.

#### Audit:

Run the following commands to determine if there is a `cron` job scheduled to run the aide check.

```
# crontab -u root -l | grep aide
# grep -r aide /etc/cron.* /etc/crontab
```

Ensure a cron job in compliance with site policy is returned.

#### Remediation:

Run the following command:

```
# crontab -u root -e
```

Add the following line to the crontab:

```
0 5 * * * /usr/bin/aide --config /etc/aide/aide.conf --check
```

#### Additional Information:

The checking in this recommendation occurs every day at 5am. Alter the frequency and time of the checks in compliance with site policy.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.14 Log Sensitive Data Access</b> Log sensitive data access, including modification and disposal.			●
v7	<b>14.9 Enforce Detail Logging for Access or Changes to Sensitive Data</b> Enforce detailed audit logging for access to sensitive data or changes to sensitive data (utilizing tools such as File Integrity Monitoring or Security Information and Event Monitoring).			●
v6	<b>3.5 Use File Integrity Tools For Critical System Files</b> Use file integrity checking tools to ensure that critical system files (including sensitive system and application executables, libraries, and configurations) have not been altered. The reporting system should: have the ability to account for routine and expected changes; highlight and alert on unusual or unexpected alterations; show the history of configuration changes over time and identify who made the change (including the original logged-in account in the event of a user ID switch, such as with the su or sudo command). These integrity checks should identify suspicious system alterations such as: owner and permissions changes to files or directories; the use of alternate data streams which could be used to hide malicious activities; and the introduction of extra files into key system areas (which could indicate malicious payloads left by attackers or additional files inappropriately added during batch distribution processes).			

## ***1.4 Secure Boot Settings***

The recommendations in this section focus on securing the bootloader and settings involved in the boot process directly.

### 1.4.1 Ensure permissions on bootloader config are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The grub configuration file contains information on boot settings and passwords for unlocking boot options. The grub configuration is usually `grub.cfg` stored in `/boot/grub.`

#### Rationale:

Setting the permissions to read and write for root only prevents non-root users from seeing the boot parameters or changing them. Non-root users who read the boot parameters may be able to identify weaknesses in security upon boot and be able to exploit them.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other`:

```
# stat /boot/grub/grub.cfg
Access: (0600/-rw-----)  Uid: (   0/   root)  Gid: (   0/   root)
```

#### Remediation:







Run the following commands to set permissions on your grub configuration:

```
# chown root:root /boot/grub/grub.cfg
# chmod og-rwx /boot/grub/grub.cfg
```

#### Additional Information:

This recommendation is designed around the grub bootloader, if LILO or another bootloader is in use in your environment enact equivalent settings.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## 1.4.2 Ensure bootloader password is set (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Setting the boot loader password will require that anyone rebooting the system must enter a password before being able to set command line boot parameters

### Rationale:

Requiring a boot password upon execution of the boot loader will prevent an unauthorized user from entering boot parameters or changing the boot partition. This prevents users from weakening security (e.g. turning off SELinux at boot time).

### Audit:

Run the following commands and verify output matches:

```
# grep "^set superusers" /boot/grub/grub.cfg
set superusers="<username>"

# grep "^password" /boot/grub/grub.cfg
password_pbkdf2 <username> <encrypted-password>
```

### Remediation:

Create an encrypted password with `grub-mkpasswd-pbkdf2`:

```
# grub-mkpasswd-pbkdf2
Enter password: <password>
Reenter password: <password>
Your PBKDF2 is <encrypted-password>
```

Add the following into `/etc/grub.d/00_header` or a custom `/etc/grub.d` configuration file:

```
cat <<EOF
set superusers="<username>"
password_pbkdf2 <username> <encrypted-password>
EOF
```

Run the following command to update the `grub2` configuration:







```
# update-grub
```



### Additional Information:

This recommendation is designed around the grub bootloader, if LILO or another bootloader is in use in your environment enact equivalent settings.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### *1.4.3 Ensure authentication required for single user mode (Automated)*

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

Single user mode is used for recovery when the system detects an issue during boot or by manual selection from the bootloader.

**Rationale:**

Requiring authentication in single user mode prevents an unauthorized user from rebooting the system into single user to gain root privileges without credentials.

**Audit:**

Perform the following to determine if a password is set for the `root` user:

```
# grep ^root:[*\!]: /etc/shadow
```







No results should be returned.

**Remediation:**

Run the following command and follow the prompts to set a password for the `root` user:

```
# passwd root
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## ***1.5 Additional Process Hardening***

### 1.5.1 Ensure core dumps are restricted (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

A core dump is the memory of an executable program. It is generally used to determine why a program aborted. It can also be used to glean confidential information from a core file. The system provides the ability to set a soft limit for core dumps, but this can be overridden by the user.

#### Rationale:

Setting a hard limit on core dumps prevents users from overriding the soft variable. If core dumps are required, consider setting limits for user groups (see `limits.conf(5)`). In addition, setting the `fs.suid_dumpable` variable to 0 will prevent setuid programs from dumping core.

#### Audit:

Run the following commands and verify output matches:

```
# grep "hard core" /etc/security/limits.conf /etc/security/limits.d/*
* hard core 0

# sysctl fs.suid_dumpable
fs.suid_dumpable = 0

# grep "fs.suid_dumpable" /etc/sysctl.conf /etc/sysctl.d/*
fs.suid_dumpable = 0
```

## Remediation:

Add the following line to `/etc/security/limits.conf` or a `/etc/security/limits.d/*` file:

```
* hard core 0
```




Set the following parameter in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
fs.suid_dumpable = 0
```

Run the following command to set the active kernel parameter:

```
# sysctl -w fs.suid_dumpable=0
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>13 <u>Data Protection</u></b> Data Protection			
v6	<b>13 <u>Data Protection</u></b> Data Protection			

## 1.5.2 Ensure XD/NX support is enabled (Manual)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Recent processors in the x86 family support the ability to prevent code execution on a per memory page basis. Generically and on AMD processors, this ability is called No Execute (NX), while on Intel processors it is called Execute Disable (XD). This ability can help prevent exploitation of buffer overflow vulnerabilities and should be activated whenever possible. Extra steps must be taken to ensure that this protection is enabled, particularly on 32-bit x86 systems. Other processors, such as Itanium and POWER, have included such support since inception and the standard kernel for those platforms supports the feature.

### Rationale:

Enabling any feature that can protect against buffer overflow attacks enhances the security of the system.

### Audit:

Run the following command and verify your kernel has identified and activated NX/XD protection.

```
# dmesg | grep NX
NX (Execute Disable) protection: active
```

### Remediation:

On 32 bit systems install a kernel with PAE support, no installation is required on 64 bit systems:





If necessary configure your bootloader to load the new kernel and reboot the system.

You may need to enable NX or XD support in your bios.

### Additional Information:

Ensure your system supports the XD or NX bit and has PAE support before implementing this recommendation as this may prevent it from booting if these are not supported by your hardware.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>10.5 Enable Anti-Exploitation Features</u></b></p> <p>Enable anti-exploitation features on enterprise assets and software, where possible, such as Microsoft® Data Execution Prevention (DEP), Windows® Defender Exploit Guard (WDEG), or Apple® System Integrity Protection (SIP) and Gatekeeper™.</p>			
v7	<p><b><u>8.3 Enable Operating System Anti-Exploitation Features/ Deploy Anti-Exploit Technologies</u></b></p> <p>Enable anti-exploitation features such as Data Execution Prevention (DEP) or Address Space Layout Randomization (ASLR) that are available in an operating system or deploy appropriate toolkits that can be configured to apply protection to a broader set of applications and executables.</p>			
v6	<p><b><u>8.4 Enable Anti-exploitation Features (i.e. DEP, ASLR, EMET)</u></b></p> <p>Enable anti-exploitation features such as Data Execution Prevention (DEP), Address Space Layout Randomization (ASLR), virtualization/containerization, etc. For increased protection, deploy capabilities such as Enhanced Mitigation Experience Toolkit (EMET) that can be configured to apply these protections to a broader set of applications and executables.</p>			



### 1.5.3 Ensure address space layout randomization (ASLR) is enabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Address space layout randomization (ASLR) is an exploit mitigation technique which randomly arranges the address space of key data areas of a process.

#### Rationale:

Randomly placing virtual memory regions will make it difficult to write memory page exploits as the memory placement will be consistently shifting.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl kernel.randomize_va_space
kernel.randomize_va_space = 2

# grep "kernel.randomize_va_space" /etc/sysctl.conf /etc/sysctl.d/*
kernel.randomize_va_space = 2
```

#### Remediation:





Set the following parameter in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
kernel.randomize_va_space = 2
```

Run the following command to set the active kernel parameter:

```
# sysctl -w kernel.randomize_va_space=2
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>10.5 Enable Anti-Exploitation Features</u></b></p> <p>Enable anti-exploitation features on enterprise assets and software, where possible, such as Microsoft® Data Execution Prevention (DEP), Windows® Defender Exploit Guard (WDEG), or Apple® System Integrity Protection (SIP) and Gatekeeper™.</p>			
v7	<p><b><u>8.3 Enable Operating System Anti-Exploitation Features/ Deploy Anti-Exploit Technologies</u></b></p> <p>Enable anti-exploitation features such as Data Execution Prevention (DEP) or Address Space Layout Randomization (ASLR) that are available in an operating system or deploy appropriate toolkits that can be configured to apply protection to a broader set of applications and executables.</p>			
v6	<p><b><u>8.4 Enable Anti-exploitation Features (i.e. DEP, ASLR, EMET)</u></b></p> <p>Enable anti-exploitation features such as Data Execution Prevention (DEP), Address Space Layout Randomization (ASLR), virtualization/containerization, etc. For increased protection, deploy capabilities such as Enhanced Mitigation Experience Toolkit (EMET) that can be configured to apply these protections to a broader set of applications and executables.</p>			

### 1.5.4 Ensure prelink is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

`prelink` is a program that modifies ELF shared libraries and ELF dynamically linked binaries in such a way that the time needed for the dynamic linker to perform relocations at startup significantly decreases.

#### Rationale:

The prelinking feature can interfere with the operation of AIDE, because it changes binaries. Prelinking can also increase the vulnerability of the system if a malicious user is able to compromise a common library such as `libc`.

#### Audit:

Run the following command and verify `prelink` is not installed:

```
# dpkg -s prelink
```

#### Remediation:

Run the following command to restore binaries to normal:

```
# prelink -ua
```

Run the following command to uninstall `prelink`:

```
# apt-get remove prelink
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.14 Log Sensitive Data Access</b> Log sensitive data access, including modification and disposal.			●
v7	<b>14.9 Enforce Detail Logging for Access or Changes to Sensitive Data</b> Enforce detailed audit logging for access to sensitive data or changes to sensitive data (utilizing tools such as File Integrity Monitoring or Security Information and Event Monitoring).			●
v6	<b>3.5 Use File Integrity Tools For Critical System Files</b> Use file integrity checking tools to ensure that critical system files (including sensitive system and application executables, libraries, and configurations) have not been altered. The reporting system should: have the ability to account for routine and expected changes; highlight and alert on unusual or unexpected alterations; show the history of configuration changes over time and identify who made the change (including the original logged-in account in the event of a user ID switch, such as with the su or sudo command). These integrity checks should identify suspicious system alterations such as: owner and permissions changes to files or directories; the use of alternate data streams which could be used to hide malicious activities; and the introduction of extra files into key system areas (which could indicate malicious payloads left by attackers or additional files inappropriately added during batch distribution processes).			

## ***1.6 Mandatory Access Control***

Mandatory Access Control (MAC) provides an additional layer of access restrictions to processes on top of the base Discretionary Access Controls. By restricting how processes can access files and resources on a system the potential impact from vulnerabilities in the processes can be reduced.

**Impact:** Mandatory Access Control limits the capabilities of applications and daemons on a system, while this can prevent unauthorized access the configuration of MAC can be complex and difficult to implement correctly preventing legitimate access from occurring.

**Note:** Apparmor is the default MAC provided with Debian systems.

## 1.6.1 Configure SELinux

SELinux provides a Mandatory Access Control (MAC) system that greatly augments the default Discretionary Access Control (DAC) model. Under SELinux, every process and every object (files, sockets, pipes) on the system is assigned a security context, a label that includes detailed type information about the object. The kernel allows processes to access objects only if that access is explicitly allowed by the policy in effect. The policy defines transitions, so that a user can be allowed to run software, but the software can run under a different context than the user's default. This automatically limits the damage that the software can do to files accessible by the calling user. The user does not need to take any action to gain this benefit. For an action to occur, both the traditional DAC permissions must be satisfied as well as the SELinux MAC rules. The action will not be allowed if either one of these models does not permit the action. In this way, SELinux rules can only make a system's permissions more restrictive and secure. SELinux requires a complex policy to allow all the actions required of a system under normal operation. Three such policies have been available for use with Debian and are included with the system: `default`, `mls`, and `src`. These are described as follows:

- `default`: targeted rules developed and maintained by Debian. Consists mostly of Type Enforcement (TE) rules, and a small number of Role-Based Access Control (RBAC) rules. Targeted restricts the actions of many types of programs, but leaves interactive users largely unaffected.
- `mls`: implements Multi-Level Security (MLS), which introduces even more kinds of labels (sensitivity and category) and rules that govern access based on these.
- `src`: Custom policy, built from source, as an alternative to standard SELinux strict and targeted policies

This section provides guidance for the configuration of the `default` policy.

**Note:** This section only applies if SELinux is in use on the system. Recommendations for AppArmor are also included, and additional Mandatory Access Control systems exist beyond these two. AppArmor is the standard MAC system for Debian systems.

## References:

1. NSA SELinux resources:
  1. <http://www.nsa.gov/research/selinux>
  2. <http://www.nsa.gov/research/selinux/list.shtml>
2. Fedora SELinux resources:
  1. FAQ: <http://docs.fedoraproject.org/selinux-faq>
  2. User Guide: <http://docs.fedoraproject.org/selinux-user-guide>
  3. Managing Services Guide: <http://docs.fedoraproject.org/selinux-managing-confined-services-guide>
3. SELinux Project web page and wiki:
  1. <http://www.selinuxproject.org>
4. Chapters 43-45 of Red Hat Enterprise Linux 5: Deployment Guide (Frank Mayer, Karl MacMillan and David Caplan),
5. SELinux by Example: Using Security Enhanced Linux (Prentice Hall, August 6, 2006)

### *1.6.1.1 Ensure SELinux is not disabled in bootloader configuration (Automated)*

#### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

#### **Description:**

Configure SELINUX to be enabled at boot time and verify that it has not been overwritten by the grub boot parameters.

#### **Rationale:**

SELinux must be enabled at boot time in your grub configuration to ensure that the controls it provides are not overridden.

#### **Audit:**

Run the following command and verify that no linux line has the `selinux=0` or `enforcing=0` parameters set:

```
# grep "^s*linux" /boot/grub/grub.cfg
```

#### **Remediation:**

Edit `/etc/default/grub` and remove all instances of `selinux=0` and `enforcing=0` from all `CMDLINE_LINUX` parameters:

```
GRUB_CMDLINE_LINUX_DEFAULT="quiet"  
GRUB_CMDLINE_LINUX=""
```

Run the following command to update the `grub2` configuration:







```
# update-grub
```

#### **Additional Information:**

This recommendation is designed around the grub bootloader, if LILO or another bootloader is in use in your environment enact equivalent settings.



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

### 1.6.1.2 Ensure the SELinux state is enforcing (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

Set SELinux to enable when the system is booted.

#### Rationale:

SELinux must be enabled at boot time in to ensure that the controls it provides are in effect at all times.

#### Audit:

Run the following commands and ensure output matches:

```
# grep SELINUX=enforcing /etc/selinux/config
SELINUX=enforcing







# sestatus
SELinux status: enabled
Current mode: enforcing
Mode from config file: enforcing
```

#### Remediation:

Edit the `/etc/selinux/config` file to set the SELINUX parameter:

```
SELINUX=enforcing
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

### 1.6.1.3 Ensure SELinux policy is configured (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

Configure SELinux to meet or exceed the default targeted policy, which constrains daemons and system software only.

#### Rationale:

Security configuration requirements vary from site to site. Some sites may mandate a policy that is stricter than the default policy, which is perfectly acceptable. This item is intended to ensure that at least the default recommendations are met.

#### Audit:

Run the following commands and ensure output matches "default" or "mls":

```
# grep SELINUXTYPE= /etc/selinux/config
SELINUXTYPE=default

# sestatus
Policy from config file: default
```

#### Remediation:







Edit the `/etc/selinux/config` file to set the SELINUXTYPE parameter:

```
SELINUXTYPE=default
```

#### Additional Information:

If your organization requires stricter policies, ensure that they are set in the `/etc/selinux/config` file.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

#### 1.6.1.4 Ensure no unconfined daemons exist (Automated)

##### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

##### Description:

Daemons that are not defined in SELinux policy will inherit the security context of their parent process.

##### Rationale:

Since daemons are launched and descend from the `init` process, they will inherit the security context label `initrc\_t`. This could cause the unintended consequence of giving the process more permission than it requires.

##### Audit:

Run the following command and verify not output is produced:

```
# ps -eZ | egrep "initrc" | egrep -vw "tr|ps|egrep|bash|awk" | tr ':' ' ' |  
awk '{ print $NF }'
```







##### Remediation:

Investigate any unconfined daemons found during the audit action. They may need to have an existing security context assigned to them or a policy built for them.

##### Additional Information:

Occasionally certain daemons such as backup or centralized management software may require running unconfined. Any such software should be carefully analyzed and documented before such an exception is made.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

## 1.6.2 Configure AppArmor

AppArmor provides a Mandatory Access Control (MAC) system that greatly augments the default Discretionary Access Control (DAC) model. Under AppArmor MAC rules are applied by file paths instead of by security contexts as in other MAC systems. As such it does not require support in the filesystem and can be applied to network mounted filesystems for example. AppArmor security policies define what system resources applications can access and what privileges they can do so with. This automatically limits the damage that the software can do to files accessible by the calling user. The user does not need to take any action to gain this benefit. For an action to occur, both the traditional DAC permissions must be satisfied as well as the AppArmor MAC rules. The action will not be allowed if either one of these models does not permit the action. In this way, AppArmor rules can only make a system's permissions more restrictive and secure.

**Note:** This section only applies if AppArmor is in use on the system. Recommendations for SELinux are also included, and additional Mandatory Access Control systems exist beyond these two.

### References:

1. AppArmor Documentation: <http://wiki.apparmor.net/index.php/Documentation>
2. Ubuntu AppArmor Documentation: <https://help.ubuntu.com/community/AppArmor>
3. SUSE AppArmor Documentation: <https://www.suse.com/documentation/apparmor/>



### *1.6.2.1 Ensure AppArmor is enabled in the bootloader configuration (Automated)*

#### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

#### **Description:**

Configure AppArmor to be enabled at boot time and verify that it has not been overwritten by the bootloader boot parameters.

#### **Rationale:**

AppArmor must be enabled at boot time in your bootloader configuration to ensure that the controls it provides are not overridden.

#### **Audit:**

Run the following command and verify that all linux lines have the `apparmor=1` and `security=apparmor` parameters set:

```
# grep "^s*linux" /boot/grub/grub.cfg
```

#### **Remediation:**

edit `/etc/default/grub` and add the `apparmor=1` and `security=apparmor` parameters to the `GRUB_CMDLINE_LINUX=` line

```
GRUB_CMDLINE_LINUX="apparmor=1 security=apparmor"
```







update the grub configuration

```
# update-grub
```

#### **Additional Information:**

This recommendation is designed around the grub bootloader, if LILO or another bootloader is in use in your environment enact equivalent settings.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

### 1.6.2.2 Ensure all AppArmor Profiles are enforcing (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

AppArmor profiles define what resources applications are able to access.

#### Rationale:

Security configuration requirements vary from site to site. Some sites may mandate a policy that is stricter than the default policy, which is perfectly acceptable. This item is intended to ensure that any policies that exist on the system are activated.

#### Audit:

Run the following command and verify that profiles are loaded, no profiles are in complain mode, and no processes are unconfined:

```
# apparmor_status
apparmor module is loaded.
17 profiles are loaded.
17 profiles are in enforce mode.
  /bin/ping
  /sbin/klogd
  /sbin/syslog-ng
  /sbin/syslogd
  /usr/lib/PolicyKit/polkit-explicit-grant-helper
  /usr/lib/PolicyKit/polkit-grant-helper
  /usr/lib/PolicyKit/polkit-grant-helper-pam
  /usr/lib/PolicyKit/polkit-read-auth-helper
  /usr/lib/PolicyKit/polkit-resolve-exe-helper
  /usr/lib/PolicyKit/polkit-revoke-helper
  /usr/lib/PolicyKit/polkitd
  /usr/sbin/avahi-daemon
  /usr/sbin/identd
  /usr/sbin/mdnsd
  /usr/sbin/nscd
  /usr/sbin/ntpd
  /usr/sbin/traceroute
0 profiles are in complain mode.
1 processes have profiles defined.
1 processes are in enforce mode :
  /usr/sbin/nscd (3979)
0 processes are in complain mode.
0 processes are unconfined but have a profile defined.
```







## Remediation:

Run the following command to set all profiles to enforce mode:

```
# aa-enforce /etc/apparmor.d/*
```

Any unconfined processes may need to have a profile created or activated for them and then be restarted.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>14.6 <u>Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b>14.4 <u>Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

### 1.6.3 Ensure SELinux or AppArmor are installed (Automated)

**Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

**Description:**

SELinux and AppArmor provide Mandatory Access Controls.

**Rationale:**

Without a Mandatory Access Control system installed only the default Discretionary Access Control system will be available.

**Audit:**

Run the following commands and verify either SELinux or AppArmor is installed:

```
# dpkg -s selinux
# dpkg -s apparmor
```

**Remediation:**




Run one of the following commands to install SELinux or apparmor:

```
# apt-get install selinux-basics
```

Or

```
# apt-get install apparmor apparmor-profiles apparmor-utils
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

## **1.7 Warning Banners**

Presenting a warning message prior to the normal user login may assist in 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 exploits at a system.

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. It is important that the organization's legal counsel 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.justice.gov/criminal/cybercrime/>

**Note:** The text provided in the remediation actions for these items is intended as an example only. Please edit to include the specific text for your organization as approved by your legal department.

### ***1.7.1 Command Line Warning Banners***

The `/etc/motd`, `/etc/issue`, and `/etc/issue.net` files govern warning banners for standard command line logins for both local and remote users.



### 1.7.1.1 Ensure message of the day is configured properly (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The contents of the `/etc/motd` file are displayed to users after login and function as a message of the day for authenticated users.

Unix-based systems have typically displayed information about the OS release and patch level upon logging in to the system. This information can be useful to developers who are developing software for a particular OS platform. If `mingetty(8)` supports the following options, they display operating system information: `\m` - machine architecture `\r` - operating system release `\s` - operating system name `\v` - operating system version

#### Rationale:

Warning messages inform users who are attempting to login to the system of their legal status regarding the system and must include the name of the organization that owns the system and any monitoring policies that are in place. Displaying OS and patch level information in login banners also has the side effect of providing detailed system information to attackers attempting to target specific exploits of a system. Authorized users can easily get this information by running the "`uname -a`" command once they have logged in.

#### Audit:

Run the following command and verify that the contents match site policy:

```
# cat /etc/motd
```







Run the following command and verify no results are returned:

```
# egrep -i '(\v|\r|\m|\s|Debian)' /etc/motd
```

#### Remediation:

Edit the `/etc/motd` file with the appropriate contents according to your site policy, remove any instances of `\m`, `\r`, `\s`, or `\v`.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.7.1.2 Ensure local login warning banner is configured properly (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The contents of the `/etc/issue` file are displayed to users prior to login for local terminals.

Unix-based systems have typically displayed information about the OS release and patch level upon logging in to the system. This information can be useful to developers who are developing software for a particular OS platform. If `mingetty(8)` supports the following options, they display operating system information: `\m` - machine architecture `\r` - operating system release `\s` - operating system name `\v` - operating system version

#### Rationale:

Warning messages inform users who are attempting to login to the system of their legal status regarding the system and must include the name of the organization that owns the system and any monitoring policies that are in place. Displaying OS and patch level information in login banners also has the side effect of providing detailed system information to attackers attempting to target specific exploits of a system. Authorized users can easily get this information by running the "`uname -a`" command once they have logged in.

#### Audit:

Run the following command and verify that the contents match site policy:

```
# cat /etc/issue
```

Run the following command and verify no results are returned:







```
# egrep -i '(\v|r|m|s|Debian)' /etc/issue
```

## Remediation:

Edit the `/etc/issue` file with the appropriate contents according to your site policy, remove any instances of `\m`, `\r`, `\s`, or `\v`:

```
# echo "Authorized uses only. All activity may be monitored and reported." > /etc/issue
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.7.1.3 Ensure remote login warning banner is configured properly (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The contents of the `/etc/issue.net` file are displayed to users prior to login for remote connections from configured services.

Unix-based systems have typically displayed information about the OS release and patch level upon logging in to the system. This information can be useful to developers who are developing software for a particular OS platform. If `mingetty(8)` supports the following options, they display operating system information: `\m` - machine architecture `\r` - operating system release `\s` - operating system name `\v` - operating system version

#### Rationale:

Warning messages inform users who are attempting to login to the system of their legal status regarding the system and must include the name of the organization that owns the system and any monitoring policies that are in place. Displaying OS and patch level information in login banners also has the side effect of providing detailed system information to attackers attempting to target specific exploits of a system. Authorized users can easily get this information by running the "`uname -a`" command once they have logged in.

#### Audit:

Run the following command and verify that the contents match site policy:

```
# cat /etc/issue.net
```

Run the following command and verify no results are returned:







```
# egrep -i '(\v|\r|\m|\s|Debian)' /etc/issue.net
```

## Remediation:

Edit the `/etc/issue.net` file with the appropriate contents according to your site policy, remove any instances of `\m`, `\r`, `\s`, or `\v`:

```
# echo "Authorized uses only. All activity may be monitored and reported." > /etc/issue.net
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

### 1.7.1.4 Ensure permissions on /etc/motd are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The contents of the `/etc/motd` file are displayed to users after login and function as a message of the day for authenticated users.

#### Rationale:

If the `/etc/motd` file does not have the correct ownership it could be modified by unauthorized users with incorrect or misleading information.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and Access is `644`:







```
# stat /etc/motd
Access: (0644/-rw-r--r--)  Uid: (   0/   root)   Gid: (   0/   root)
```

#### Remediation:

Run the following commands to set permissions on `/etc/motd`:

```
# chown root:root /etc/motd
# chmod 644 /etc/motd
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			



### 1.7.1.5 Ensure permissions on /etc/issue are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The contents of the `/etc/issue` file are displayed to users prior to login for local terminals.

#### Rationale:

If the `/etc/issue` file does not have the correct ownership it could be modified by unauthorized users with incorrect or misleading information.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` is `644`:







```
# stat /etc/issue
Access: (0644/-rw-r--r--)  Uid: (    0/    root)   Gid: (    0/    root)
```

#### Remediation:

Run the following commands to set permissions on `/etc/issue`:

```
# chown root:root /etc/issue
# chmod 644 /etc/issue
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### 1.7.1.6 Ensure permissions on /etc/issue.net are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The contents of the `/etc/issue.net` file are displayed to users prior to login for remote connections from configured services.

#### Rationale:

If the `/etc/issue.net` file does not have the correct ownership it could be modified by unauthorized users with incorrect or misleading information.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` is `644`:







```
# stat /etc/issue.net
Access: (0644/-rw-r--r--)  Uid: (   0/   root)   Gid: (   0/   root)
```

#### Remediation:

Run the following commands to set permissions on `/etc/issue.net`:

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

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## 1.7.2 Ensure GDM login banner is configured (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

GDM is the GNOME Display Manager which handles graphical login for GNOME based systems.

### Rationale:

Warning messages inform users who are attempting to login to the system of their legal status regarding the system and must include the name of the organization that owns the system and any monitoring policies that are in place.

### Audit:

If GDM is installed on the system verify that the `/etc/gdm3/greeter.dconf-defaults` file exists and contains the following:

```
[org/gnome/login-screen]
banner-message-enable=true
banner-message-text='
```

### Remediation:

Edit or create the file `/etc/gdm3/greeter.dconf-defaults` and add the following:







```
[org/gnome/login-screen]
banner-message-enable=true
banner-message-text='Authorized uses only. All activity may be monitored and
reported.'
```

### Additional Information:

Additional options and sections may appear in the `/etc/dconf/db/gdm.d/01-banner-message` file.

If a different GUI login service is in use, consult your documentation and apply an equivalent banner.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## *1.8 Ensure updates, patches, and additional security software are installed (Manual)*

### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

### **Description:**

Periodically patches are released for included software either due to security flaws or to include additional functionality.

### **Rationale:**

Newer patches may contain security enhancements that would not be available through the latest full update. As a result, it is recommended that the latest software patches be used to take advantage of the latest functionality. As with any software installation, organizations need to determine if a given update meets their requirements and verify the compatibility and supportability of any additional software against the update revision that is selected.

### **Audit:**

Run the following command and verify there are no updates or patches to install:

```
# apt-get -s upgrade
```













### **Remediation:**

Use your package manager to update all packages on the system according to site policy.

### **Additional Information:**

Site policy may mandate a testing period before install onto production systems for available updates.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>7.3 Perform Automated Operating System Patch Management</u></b> Perform operating system updates on enterprise assets through automated patch management on a monthly, or more frequent, basis.			
v8	<b><u>7.4 Perform Automated Application Patch Management</u></b> Perform application updates on enterprise assets through automated patch management on a monthly, or more frequent, basis.			
v7	<b><u>3.4 Deploy Automated Operating System Patch Management Tools</u></b> Deploy automated software update tools in order to ensure that the operating systems are running the most recent security updates provided by the software vendor.			
v7	<b><u>3.5 Deploy Automated Software Patch Management Tools</u></b> Deploy automated software update tools in order to ensure that third-party software on all systems is running the most recent security updates provided by the software vendor.			
v6	<b><u>4.5 Use Automated Patch Management And Software Update Tools</u></b> Deploy automated patch management tools and software update tools for operating system and software/applications on all systems for which such tools are available and safe. Patches should be applied to all systems, even systems that are properly air gapped.			



## ***2 Services***

While applying system updates and patches helps correct known vulnerabilities, one of the best ways to protect the system against as yet unreported vulnerabilities is to disable all services that are not required for normal system operation. This prevents the exploitation of vulnerabilities discovered at a later date. If a service is not enabled, it cannot be exploited. The actions in this section of the document provide guidance on some services which can be safely disabled and under which circumstances, greatly reducing the number of possible threats to the resulting system. Additionally some services which should remain enabled but with secure configuration are covered as well as insecure service clients.

## ***2.1 inetd Services***

inetd is a super-server daemon that provides internet services and passes connections to configured services. While not commonly used inetd and any unneeded inetd based services should be disabled if possible.

**Note:** Both inetd and xinetd are available to run these services. The audit procedures for these services will check both methods of activation.

### 2.1.1 Ensure xinetd is not installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The eXtended InterNET Daemon (`xinetd`) is an open source super daemon that replaced the original `inetd` daemon. The `xinetd` daemon listens for well known services and dispatches the appropriate daemon to properly respond to service requests.

#### Rationale:

If there are no `xinetd` services required, it is recommended that the daemon be disabled.

#### Audit:

Run the following command to verify `xinetd` is not installed:





```
# dpkg -s xinetd
```

#### Remediation:

Run the following command to disable `xinetd`:

```
# apt-get remove xinetd
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.8 <u>Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b>9.2 <u>Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 2.1.2 Ensure inetd is not installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `inetd` daemon listens for well known services and dispatches the appropriate daemon to properly respond to service requests.

#### Rationale:

If there are no `inetd` services required, it is recommended that the daemon be removed.

#### Audit:

Run the following commands and verify `openbsd-inetd` and `inetutils-inetd` are not installed:





```
dpkg -s openbsd-inetd
dpkg -s inetutils-inetd
```

#### Remediation:

Run the following commands to uninstall `openbsd-inetd` and `inetutils-inetd`:

```
apt-get remove openbsd-inetd
apt-get remove inetutils-inetd
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## ***2.2 Special Purpose Services***

This section describes services that are installed on systems that specifically need to run these services. If any of these services are not required, it is recommended that they be disabled or deleted from the system to reduce the potential attack surface.

### ***2.2.1 Time Synchronization***

It is recommended that physical systems and virtual guests lacking direct access to the physical host's clock be configured to synchronize their time using a service such as NTP or chrony.



### 2.2.1.1 Ensure time synchronization is in use (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

System time should be synchronized between all systems in an environment. This is typically done by establishing an authoritative time server or set of servers and having all systems synchronize their clocks to them.

#### Rationale:

Time synchronization is important to support time sensitive security mechanisms like Kerberos and also ensures log files have consistent time records across the enterprise, which aids in forensic investigations.

#### Audit:

On physical systems or virtual systems where host based time synchronization is not available run the following commands and verify either NTP or chrony is installed:

```
# dpkg -s ntp
# dpkg -s chrony
```

On virtual systems where host based time synchronization is available consult your virtualization software documentation and verify that host based synchronization is in use.





#### Remediation:

On physical systems or virtual systems where host based time synchronization is not available install NTP or chrony using one of the following commands:

```
# apt-get install ntp
# apt-get install chrony
```

On virtual systems where host based time synchronization is available consult your virtualization software documentation and setup host based synchronization.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.4 <u>Standardize Time Synchronization</u></b> Standardize time synchronization. Configure at least two synchronized time sources across enterprise assets, where supported.			
v7	<b>6.1 <u>Utilize Three Synchronized Time Sources</u></b> Use at least three synchronized time sources from which all servers and network devices retrieve time information on a regular basis so that timestamps in logs are consistent.			
v6	<b>6.1 <u>Use At Least Two Synchronized Time Sources For All Servers And Network Equipment</u></b> Include at least two synchronized time sources from which all servers and network equipment retrieve time information on a regular basis so that timestamps in logs are consistent.			

### 2.2.1.2 Ensure ntp is configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

`ntp` is a daemon which implements the Network Time Protocol (NTP). It is designed to synchronize system clocks across a variety of systems and use a source that is highly accurate. More information on NTP can be found at <http://www.ntp.org>. `ntp` can be configured to be a client and/or a server.

This recommendation only applies if `ntp` is in use on the system.

#### Rationale:

If `ntp` is in use on the system proper configuration is vital to ensuring time synchronization is working properly.

#### Audit:

Run the following command and verify output matches:

```
# grep "^restrict" /etc/ntp.conf
restrict -4 default kod nomodify notrap nopeer noquery
restrict -6 default kod nomodify notrap nopeer noquery
```

The `-4` in the first line is optional and options after `default` can appear in any order.

Additional restriction lines may exist.

Run the following command and verify remote server is configured properly:

```
# egrep "^(server|pool)" /etc/ntp.conf
server <remote-server>
```

Multiple servers may be configured.

Verify that `ntp` is configured to run as the `ntp` user by running the following command:

```
# grep "RUNASUSER=ntp" /etc/init.d/ntp
RUNASUSER=ntp
```

## Remediation:

Add or edit restrict lines in `/etc/ntp.conf` to match the following:

```
restrict -4 default kod nomodify notrap nopeer noquery  
restrict -6 default kod nomodify notrap nopeer noquery
```





Add or edit server or pool lines to `/etc/ntp.conf` as appropriate:

```
server <remote-server>
```

Configure `ntp` to run as the `ntp` user by adding or editing the `/etc/init.d/ntp` file:

```
RUNASUSER=ntp
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.4 <u>Standardize Time Synchronization</u></b> Standardize time synchronization. Configure at least two synchronized time sources across enterprise assets, where supported.			
v7	<b>6.1 <u>Utilize Three Synchronized Time Sources</u></b> Use at least three synchronized time sources from which all servers and network devices retrieve time information on a regular basis so that timestamps in logs are consistent.			
v6	<b>6.1 <u>Use At Least Two Synchronized Time Sources For All Servers And Network Equipment</u></b> Include at least two synchronized time sources from which all servers and network equipment retrieve time information on a regular basis so that timestamps in logs are consistent.			

### 2.2.1.3 Ensure chrony is configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

`chrony` is a daemon which implements the Network Time Protocol (NTP) is designed to synchronize system clocks across a variety of systems and use a source that is highly accurate. More information on `chrony` can be found at <http://chrony.tuxfamily.org/>. `chrony` can be configured to be a client and/or a server.

#### Rationale:

If `chrony` is in use on the system proper configuration is vital to ensuring time synchronization is working properly.

This recommendation only applies if `chrony` is in use on the system.

#### Audit:

Run the following command and verify remote server is configured properly:

```
# egrep "^(server|pool)" /etc/chrony/chrony.conf  
server <remote-server>
```





Multiple servers may be configured.

#### Remediation:

Add or edit server or pool lines to `/etc/chrony/chrony.conf` as appropriate:

```
server <remote-server>
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.4 <u>Standardize Time Synchronization</u></b> Standardize time synchronization. Configure at least two synchronized time sources across enterprise assets, where supported.			
v7	<b>6.1 <u>Utilize Three Synchronized Time Sources</u></b> Use at least three synchronized time sources from which all servers and network devices retrieve time information on a regular basis so that timestamps in logs are consistent.			
v6	<b>6.1 <u>Use At Least Two Synchronized Time Sources For All Servers And Network Equipment</u></b> Include at least two synchronized time sources from which all servers and network equipment retrieve time information on a regular basis so that timestamps in logs are consistent.			

### 2.2.2 Ensure X Window System is not installed (Automated)

**Profile Applicability:**

- Level 1 - Server

**Description:**

The X Window System provides a Graphical User Interface (GUI) where users can have multiple windows in which to run programs and various add on. The X Windows system is typically used on workstations where users login, but not on servers where users typically do not login.

**Rationale:**

Unless your organization specifically requires graphical login access via X Windows, remove it to reduce the potential attack surface.

**Audit:**

Run the following command and verify X Windows System is not installed:






```
dpkg -l xserver-xorg*
```

**Remediation:**

Run the following command to remove the X Windows System packages:

```
apt-get remove xserver-xorg*
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b><u>2.6 Address unapproved software</u></b> Ensure that unauthorized software is either removed or the inventory is updated in a timely manner			
v6	<b><u>2 Inventory of Authorized and Unauthorized Software</u></b> Inventory of Authorized and Unauthorized Software			



### 2.2.3 Ensure Avahi Server is not enabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Avahi is a free zeroconf implementation, including a system for multicast DNS/DNS-SD service discovery. Avahi allows programs to publish and discover services and hosts running on a local network with no specific configuration. For example, a user can plug a computer into a network and Avahi automatically finds printers to print to, files to look at and people to talk to, as well as network services running on the machine.

#### Rationale:

Automatic discovery of network services is not normally required for system functionality. It is recommended to disable the service to reduce the potential attack surface.

#### Audit:

Run the following command to verify `avahi-daemon` is not enabled:

```
# systemctl is-enabled avahi-daemon
disabled
```





Verify result is not "enabled".

#### Remediation:

Run the following command to disable `avahi-daemon`:

```
# systemctl disable avahi-daemon
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## 2.2.4 Ensure CUPS is not enabled (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 2 - Workstation

### Description:

The Common Unix Print System (CUPS) provides the ability to print to both local and network printers. A system running CUPS can also accept print jobs from remote systems and print them to local printers. It also provides a web based remote administration capability.

### Rationale:

If the system does not need to print jobs or accept print jobs from other systems, it is recommended that CUPS be disabled to reduce the potential attack surface.

### Impact:

Disabling CUPS will prevent printing from the system, a common task for workstation systems.

### Audit:

Run the following command to verify `cups` is not enabled:

```
# systemctl is-enabled cups
disabled
```

Verify result is not "enabled".

### Remediation:





Run the following command to disable `cups`:

```
# systemctl disable cups
```

### References:

1. More detailed documentation on CUPS is available at the project homepage at <http://www.cups.org>.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## 2.2.5 Ensure DHCP Server is not enabled (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The Dynamic Host Configuration Protocol (DHCP) is a service that allows machines to be dynamically assigned IP addresses.

### Rationale:

Unless a system is specifically set up to act as a DHCP server, it is recommended that this service be disabled to reduce the potential attack surface.

### Audit:

Run the following commands to verify dhcpd is not enabled:

```
# systemctl is-enabled isc-dhcp-server
disabled
# systemctl is-enabled isc-dhcp-server6
disabled
```

Verify both results are not "enabled".

### Remediation:





Run the following commands to disable dhcpd:

```
# systemctl disable isc-dhcp-server
# systemctl disable isc-dhcp-server6
```

### References:

1. More detailed documentation on DHCP is available at <http://www.isc.org/software/dhcp>.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>9.1 Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## 2.2.6 Ensure LDAP server is not enabled (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The Lightweight Directory Access Protocol (LDAP) was introduced as a replacement for NIS/YP. It is a service that provides a method for looking up information from a central database.

### Rationale:

If the system will not need to act as an LDAP server, it is recommended that the software be disabled to reduce the potential attack surface.

### Audit:

Run the following command to verify `slapd` is not enabled:

```
# systemctl is-enabled slapd
disabled
```

Verify result is not "enabled".

### Remediation:





Run the following command to disable `slapd`:

```
# systemctl disable slapd
```

### References:

1. For more detailed documentation on OpenLDAP, go to the project homepage at <http://www.openldap.org>.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>9.1 Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			



## 2.2.7 Ensure NFS and RPC are not enabled (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The Network File System (NFS) is one of the first and most widely distributed file systems in the UNIX environment. It provides the ability for systems to mount file systems of other servers through the network.

### Rationale:

If the system does not export NFS shares or act as an NFS client, it is recommended that these services be disabled to reduce remote attack surface.

### Audit:

Run the following command to verify `nfs` is not enabled:

```
# systemctl is-enabled nfs-server
disabled
```

Verify result is not "enabled".

Run the following command to verify `rpcbind` is not enabled:

```
# systemctl is-enabled rpcbind
disabled
```





Verify result is not "enabled".

### Remediation:

Run the following commands to disable `nfs` and `rpcbind`:

```
# systemctl disable nfs-server
# systemctl disable rpcbind
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## 2.2.8 Ensure DNS Server is not enabled (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The Domain Name System (DNS) is a hierarchical naming system that maps names to IP addresses for computers, services and other resources connected to a network.

### Rationale:

Unless a system is specifically designated to act as a DNS server, it is recommended that the package be deleted to reduce the potential attack surface.

### Audit:

Run the following command to verify `named` is not enabled:

```
# systemctl is-enabled bind9  
disabled
```





Verify result is not "enabled".

### Remediation:

Run the following command to disable `named`:

```
# systemctl disable bind9
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>9.1 Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 2.2.9 Ensure FTP Server is not enabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The File Transfer Protocol (FTP) provides networked computers with the ability to transfer files.

#### Rationale:

FTP does not protect the confidentiality of data or authentication credentials. It is recommended sftp be used if file transfer is required. Unless there is a need to run the system as a FTP server (for example, to allow anonymous downloads), it is recommended that the package be deleted to reduce the potential attack surface.

#### Audit:

Run the following command to verify `vsftpd` is not enabled:

```
# systemctl is-enabled vsftpd
disabled
```

Verify result is not "enabled".

#### Remediation:





Run the following command to disable `vsftpd`:

```
# systemctl disable vsftpd
```

#### Additional Information:

Additional FTP servers also exist and should be audited.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### *2.2.10 Ensure HTTP server is not enabled (Automated)*

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

HTTP or web servers provide the ability to host web site content.

**Rationale:**

Unless there is a need to run the system as a web server, it is recommended that the package be deleted to reduce the potential attack surface.

**Audit:**

Run the following command to verify `apache2` is not enabled:

```
# systemctl is-enabled apache2  
disabled
```





Verify result is not "enabled".

**Remediation:**

Run the following command to disable `apache2`:

```
# systemctl disable apache2
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>9.1 Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			



### 2.2.11 Ensure IMAP and POP3 server is not installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

`exim` is an open source IMAP and POP3 server for Linux based systems.

#### Rationale:

Unless POP3 and/or IMAP servers are to be provided by this system, it is recommended that the package be removed to reduce the potential attack surface.

#### Audit:

Run the following command to verify `exim` is not installed:

```
# dpkg -s exim4
```

Verify result is:

```
dpkg-query: package 'exim4' is not installed and no information is available
Use dpkg --info (= dpkg-deb --info) to examine archive files,
and dpkg --contents (= dpkg-deb --contents) to list their contents.
```

#### Remediation:





Run the following commands to remove `exim`:

```
# apt-get remove exim4
# apt-get purge exim4
```

#### Additional Information:

Several IMAP/POP3 servers exist and can use other service names. `dovecot` and `cyrus-imap` are example services that provide a mail server. These and other services should also be audited.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## 2.2.12 Ensure Samba is not enabled (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The Samba daemon allows system administrators to configure their Linux systems to share file systems and directories with Windows desktops. Samba will advertise the file systems and directories via the Small Message Block (SMB) protocol. Windows desktop users will be able to mount these directories and file systems as letter drives on their systems.

### Rationale:

If there is no need to mount directories and file systems to Windows systems, then this service can be deleted to reduce the potential attack surface.

### Audit:

Run the following command to verify `smbd` is not enabled:

```
# systemctl is-enabled smbd  
disabled
```





Verify result is not "enabled".

### Remediation:

Run the following command to disable `smbd`:

```
# systemctl disable smbd
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>9.1 Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 2.2.13 Ensure HTTP Proxy Server is not enabled (Automated)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

Squid is a standard proxy server used in many distributions and environments.

**Rationale:**

If there is no need for a proxy server, it is recommended that the squid proxy be deleted to reduce the potential attack surface.

**Audit:**

Run the following command to verify `squid` is not enabled:

```
# systemctl is-enabled squid  
disabled
```





Verify result is not "enabled".

**Remediation:**

Run the following command to disable `squid`:

```
# systemctl disable squid
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>9.1 Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## 2.2.14 Ensure SNMP Server is not enabled (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The Simple Network Management Protocol (SNMP) server is used to listen for SNMP commands from an SNMP management system, execute the commands or collect the information and then send results back to the requesting system.

### Rationale:

The SNMP server can communicate using SNMP v1, which transmits data in the clear and does not require authentication to execute commands. Unless absolutely necessary, it is recommended that the SNMP service not be used. If SNMP is required the server should be configured to disallow SNMP v1.

### Audit:

Run the following command to verify `snmpd` is not enabled:

```
# systemctl is-enabled snmpd
disabled
```

Verify result is not "enabled".

### Remediation:





Run the following command to disable `snmpd`:

```
# systemctl disable snmpd
```

### Additional Information:

Additional methods of disabling a service exist. Consult your distribution documentation for appropriate methods.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			



## 2.2.15 Ensure mail transfer agent is configured for local-only mode (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Mail Transfer Agents (MTA), such as sendmail and Postfix, are used to listen for incoming mail and transfer the messages to the appropriate user or mail server. If the system is not intended to be a mail server, it is recommended that the MTA be configured to only process local mail.

### Rationale:

The software for all Mail Transfer Agents is complex and most have a long history of security issues. While it is important to ensure that the system can process local mail messages, it is not necessary to have the MTA's daemon listening on a port unless the server is intended to be a mail server that receives and processes mail from other systems.

### Audit:

Run the following command and verify that the MTA is not listening on any non-loopback address ( 127.0.0.1 or ::1 ):

```
# netstat -an | grep LIST | grep ":25[[:space:]]"  
tcp 0 0 127.0.0.1:25 0.0.0.0:* LISTEN
```

### Remediation:

Edit `/etc/postfix/main.cf` and add the following line to the RECEIVING MAIL section. If the line already exists, change it to look like the line below:

```
inet_interfaces = loopback-only
```





Restart postfix:

```
# systemctl restart postfix
```

### Additional Information:

This recommendation is designed around the postfix mail server, depending on your environment you may have an alternative MTA installed such as sendmail. If this is the case consult the documentation for your installed MTA to configure the recommended state.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## 2.2.16 Ensure rsync service is not enabled (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The `rsyncd` service can be used to synchronize files between systems over network links.

### Rationale:

The `rsyncd` service presents a security risk as it uses unencrypted protocols for communication.

### Audit:

Run the following command to verify `rsync` is not enabled:

```
# systemctl is-enabled rsync
disabled
```





Verify result is not "enabled".

### Remediation:

Run the following command to disable `rsync`:

```
# systemctl disable rsync
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 2.2.17 Ensure NIS Server is not enabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The Network Information Service (NIS) (formally known as Yellow Pages) is a client-server directory service protocol for distributing system configuration files. The NIS server is a collection of programs that allow for the distribution of configuration files.

#### Rationale:

The NIS service is inherently an insecure system that has been vulnerable to DOS attacks, buffer overflows and has poor authentication for querying NIS maps. NIS generally been replaced by such protocols as Lightweight Directory Access Protocol (LDAP). It is recommended that the service be disabled and other, more secure services be used

#### Audit:

Run the following command to verify `nis` is not enabled:

```
# systemctl is-enabled nis
disabled
```





Verify result is not "enabled".

#### Remediation:

Run the following command to disable `nis`:

```
# systemctl disable nis
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<u>9.1 Limit Open Ports, Protocols, and Services</u> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## ***2.3 Service Clients***

A number of insecure services exist. While disabling the servers prevents a local attack against these services, it is advised to remove their clients unless they are required.

**Note:** This should not be considered a comprehensive list of insecure service clients. You may wish to consider additions to those listed here for your environment.

### 2.3.1 Ensure NIS Client is not installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The Network Information Service (NIS), formerly known as Yellow Pages, is a client-server directory service protocol used to distribute system configuration files. The NIS client (`yypbind`) was used to bind a machine to an NIS server and receive the distributed configuration files.

#### Rationale:

The NIS service is inherently an insecure system that has been vulnerable to DOS attacks, buffer overflows and has poor authentication for querying NIS maps. NIS generally has been replaced by such protocols as Lightweight Directory Access Protocol (LDAP). It is recommended that the service be removed.

#### Impact:

Many insecure service clients are used as troubleshooting tools and in testing environments. Uninstalling them can inhibit capability to test and troubleshoot. If they are required it is advisable to remove the clients after use to prevent accidental or intentional misuse.

#### Audit:

Run the following command and verify `nis` is not installed:

```
dpkg -s nis
```

#### Remediation:

Run the following command to uninstall `nis`:

```
apt-get remove nis
```



**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.		●	●
v7	<b><u>2.6 Address unapproved software</u></b> Ensure that unauthorized software is either removed or the inventory is updated in a timely manner	●	●	●
v6	<b><u>2 Inventory of Authorized and Unauthorized Software</u></b> Inventory of Authorized and Unauthorized Software			

### 2.3.2 Ensure rsh client is not installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `rsh` package contains the client commands for the `rsh` services.

#### Rationale:

These legacy clients contain numerous security exposures and have been replaced with the more secure SSH package. Even if the server is removed, it is best to ensure the clients are also removed to prevent users from inadvertently attempting to use these commands and therefore exposing their credentials. Note that removing the `rsh` package removes the clients for `rsh`, `rcp` and `rlogin`.

#### Impact:

Many insecure service clients are used as troubleshooting tools and in testing environments. Uninstalling them can inhibit capability to test and troubleshoot. If they are required it is advisable to remove the clients after use to prevent accidental or intentional misuse.

#### Audit:

Run the following commands and verify `rsh` is not installed:





```
dpkg -s rsh-client  
dpkg -s rsh-redone-client
```

#### Remediation:

Run the following command to uninstall `rsh`:

```
apt-get remove rsh-client rsh-redone-client
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<u>4.5 Use Multifactor Authentication For All Administrative Access</u> Use multi-factor authentication and encrypted channels for all administrative account access.			
v6	<u>3.4 Use Only Secure Channels For Remote System Administration</u> Perform all remote administration of servers, workstation, network devices, and similar equipment over secure channels. Protocols such as telnet, VNC, RDP, or others that do not actively support strong encryption should only be used if they are performed over a secondary encryption channel, such as SSL, TLS or IPSEC.			

### 2.3.3 Ensure talk client is not installed (Automated)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

The `talk` software makes it possible for users to send and receive messages across systems through a terminal session. The `talk` client, which allows initialization of talk sessions, is installed by default.

**Rationale:**

The software presents a security risk as it uses unencrypted protocols for communication.

**Impact:**

Many insecure service clients are used as troubleshooting tools and in testing environments. Uninstalling them can inhibit capability to test and troubleshoot. If they are required it is advisable to remove the clients after use to prevent accidental or intentional misuse.

**Audit:**

Run the following command and verify `talk` is not installed:

```
dpkg -s talk
```

**Remediation:**

Run the following command to uninstall `talk`:

```
apt-get remove talk
```

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.8 <u>Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.		●	●
v7	<b>2.6 <u>Address unapproved software</u></b> Ensure that unauthorized software is either removed or the inventory is updated in a timely manner	●	●	●
v6	<b>2 <u>Inventory of Authorized and Unauthorized Software</u></b> Inventory of Authorized and Unauthorized Software			

### 2.3.4 Ensure telnet client is not installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `telnet` package contains the `telnet` client, which allows users to start connections to other systems via the telnet protocol.

#### Rationale:

The `telnet` protocol is insecure and unencrypted. The use of an unencrypted transmission medium could allow an unauthorized user to steal credentials. The `ssh` package provides an encrypted session and stronger security and is included in most Linux distributions.

#### Impact:

Many insecure service clients are used as troubleshooting tools and in testing environments. Uninstalling them can inhibit capability to test and troubleshoot. If they are required it is advisable to remove the clients after use to prevent accidental or intentional misuse.

#### Audit:

Run the following command and verify `telnet` is not installed:





```
# dpkg -s telnet
```

#### Remediation:

Run the following command to uninstall `telnet`:

```
# apt-get remove telnet
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></p> <p>Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.</p>			
v7	<p><u>4.5 Use Multifactor Authentication For All Administrative Access</u></p> <p>Use multi-factor authentication and encrypted channels for all administrative account access.</p>			
v6	<p><u>3.4 Use Only Secure Channels For Remote System Administration</u></p> <p>Perform all remote administration of servers, workstation, network devices, and similar equipment over secure channels. Protocols such as telnet, VNC, RDP, or others that do not actively support strong encryption should only be used if they are performed over a secondary encryption channel, such as SSL, TLS or IPSEC.</p>			

### 2.3.5 Ensure LDAP client is not installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The Lightweight Directory Access Protocol (LDAP) was introduced as a replacement for NIS/YP. It is a service that provides a method for looking up information from a central database.

#### Rationale:

If the system will not need to act as an LDAP client, it is recommended that the software be removed to reduce the potential attack surface.

#### Impact:

Removing the LDAP client will prevent or inhibit using LDAP for authentication in your environment.

#### Audit:

Run the following command and verify `ldap-utils` is not installed:

```
# dpkg -s ldap-utils
```

#### Remediation:

Uninstall `ldap-utils` using the appropriate package manager or manual installation:

```
# apt-get remove ldap-utils
```



**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.8 <u>Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.		●	●
v7	<b>2.6 <u>Address unapproved software</u></b> Ensure that unauthorized software is either removed or the inventory is updated in a timely manner	●	●	●
v6	<b>2 <u>Inventory of Authorized and Unauthorized Software</u></b> Inventory of Authorized and Unauthorized Software			

### ***3 Network Configuration***

This section provides guidance on for securing the network configuration of the system through kernel parameters, access list control, and firewall settings.

### ***3.1 Network Parameters (Host Only)***

The following network parameters are intended for use if the system is to act as a host only. A system is considered host only if the system has a single interface, or has multiple interfaces but will not be configured as a router.

### 3.1.1 Ensure IP forwarding is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `net.ipv4.ip_forward` and `net.ipv6.conf.all.forwarding` flags are used to tell the system whether it can forward packets or not.

#### Rationale:

Setting the flags to 0 ensures that a system with multiple interfaces (for example, a hard proxy), will never be able to forward packets, and therefore, never serve as a router.

#### Audit:

Run the following command and verify output matches:

```
# sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 0

# grep "net\.ipv4\.ip_forward" /etc/sysctl.conf /etc/sysctl.d/*
net.ipv4.ip_forward = 0

# sysctl net.ipv6.conf.all.forwarding
net.ipv6.conf.all.forwarding = 0

# grep "net\.ipv6\.conf\.all\.forwarding" /etc/sysctl.conf /etc/sysctl.d/*
net.ipv6.conf.all.forwarding = 0
```

#### Remediation:







Set the following parameter in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.ip_forward = 0
net.ipv6.conf.all.forwarding = 0
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.ip_forward=0
# sysctl -w net.ipv6.conf.all.forwarding=0
# sysctl -w net.ipv4.route.flush=1
# sysctl -w net.ipv6.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b></p> <p>Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.</p>			
v7	<p><b><u>5.1 Establish Secure Configurations</u></b></p> <p>Maintain documented, standard security configuration standards for all authorized operating systems and software.</p>			
v6	<p><b><u>3 Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b></p> <p>Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</p>			
v6	<p><b><u>11 Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b></p> <p>Secure Configurations for Network Devices such as Firewalls, Routers and switches</p>			

### 3.1.2 Ensure packet redirect sending is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

ICMP Redirects are used to send routing information to other hosts. As a host itself does not act as a router (in a host only configuration), there is no need to send redirects.

#### Rationale:

An attacker could use a compromised host to send invalid ICMP redirects to other router devices in an attempt to corrupt routing and have users access a system set up by the attacker as opposed to a valid system.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.conf.all.send_redirects
net.ipv4.conf.all.send_redirects = 0

# sysctl net.ipv4.conf.default.send_redirects
net.ipv4.conf.default.send_redirects = 0

# grep "net\.ipv4\.conf\.all\.send_redirects" /etc/sysctl.conf
/etc/sysctl.d/*
net.ipv4.conf.all.send_redirects = 0

# grep "net\.ipv4\.conf\.default\.send_redirects" /etc/sysctl.conf
/etc/sysctl.d/*
net.ipv4.conf.default.send_redirects= 0
```

## Remediation:







Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.conf.all.send_redirects = 0
net.ipv4.conf.default.send_redirects = 0
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.conf.all.send_redirects=0
# sysctl -w net.ipv4.conf.default.send_redirects=0
# sysctl -w net.ipv4.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>3 <u>Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b>11 <u>Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			

### ***3.2 Network Parameters (Host and Router)***

The following network parameters are intended for use on both host only and router systems. A system acts as a router if it has at least two interfaces and is configured to perform routing functions.



### *3.2.1 Ensure source routed packets are not accepted (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

In networking, source routing allows a sender to partially or fully specify the route packets take through a network. In contrast, non-source routed packets travel a path determined by routers in the network. In some cases, systems may not be routable or reachable from some locations (e.g. private addresses vs. Internet routable), and so source routed packets would need to be used.

#### **Rationale:**

Setting `net.ipv4.conf.all.accept_source_route`, `net.ipv4.conf.default.accept_source_route`, `net.ipv6.conf.all.accept_source_route` and `net.ipv6.conf.default.accept_source_route` to 0 disables the system from accepting source routed packets. Assume this system was capable of routing packets to Internet routable addresses on one interface and private addresses on another interface. Assume that the private addresses were not routable to the Internet routable addresses and vice versa. Under normal routing circumstances, an attacker from the Internet routable addresses could not use the system as a way to reach the private address systems. If, however, source routed packets were allowed, they could be used to gain access to the private address systems as the route could be specified, rather than rely on routing protocols that did not allow this routing.

## Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.conf.all.accept_source_route
net.ipv4.conf.all.accept_source_route = 0

# sysctl net.ipv4.conf.default.accept_source_route
net.ipv4.conf.default.accept_source_route = 0

# grep "net\.ipv4\.conf\.all\.accept_source_route" /etc/sysctl.conf
/etc/sysctl.d/*

net.ipv4.conf.all.accept_source_route= 0

# grep "net\.ipv4\.conf\.default\.accept_source_route" /etc/sysctl.conf
/etc/sysctl.d/*

net.ipv4.conf.default.accept_source_route= 0

# sysctl net.ipv6.conf.all.accept_source_route
net.ipv6.conf.all.accept_source_route = 0

# sysctl net.ipv6.conf.default.accept_source_route
net.ipv6.conf.default.accept_source_route = 0

# grep "net\.ipv6\.conf\.all\.accept_source_route" /etc/sysctl.conf
/etc/sysctl.d/*

net.ipv4.conf.all.accept_source_route= 0

# grep "net\.ipv6\.conf\.default\.accept_source_route" /etc/sysctl.conf
/etc/sysctl.d/*

net.ipv6.conf.default.accept_source_route= 0
```

## Remediation:







Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.conf.all.accept_source_route = 0
net.ipv4.conf.default.accept_source_route = 0
net.ipv6.conf.all.accept_source_route = 0
net.ipv6.conf.default.accept_source_route = 0
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.conf.all.accept_source_route=0
# sysctl -w net.ipv4.conf.default.accept_source_route=0
# sysctl -w net.ipv6.conf.all.accept_source_route=0
# sysctl -w net.ipv6.conf.default.accept_source_route=0
# sysctl -w net.ipv4.route.flush=1
# sysctl -w net.ipv6.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>3 Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b><u>11 Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			

### *3.2.2 Ensure ICMP redirects are not accepted (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

ICMP redirect messages are packets that convey routing information and tell your host (acting as a router) to send packets via an alternate path. It is a way of allowing an outside routing device to update your system routing tables. By setting `net.ipv4.conf.all.accept_redirects` to 0, the system will not accept any ICMP redirect messages, and therefore, won't allow outsiders to update the system's routing tables.

#### **Rationale:**

Attackers could use bogus ICMP redirect messages to maliciously alter the system routing tables and get them to send packets to incorrect networks and allow your system packets to be captured.

## Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.conf.all.accept_redirects
net.ipv4.conf.all.accept_redirects = 0

# sysctl net.ipv4.conf.default.accept_redirects
net.ipv4.conf.default.accept_redirects = 0

# grep "net\.ipv4\.conf\.all\.accept_redirects" /etc/sysctl.conf
/etc/sysctl.d/*
net.ipv4.conf.all.accept_redirects= 0

# grep "net\.ipv4\.conf\.default\.accept_redirects" /etc/sysctl.conf
/etc/sysctl.d/*

net.ipv4.conf.default.accept_redirects= 0

# sysctl net.ipv6.conf.all.accept_redirects
net.ipv6.conf.all.accept_redirects = 0

# sysctl net.ipv6.conf.default.accept_redirects
net.ipv6.conf.default.accept_redirects = 0

# grep "net\.ipv6\.conf\.all\.accept_redirects" /etc/sysctl.conf
/etc/sysctl.d/*
net.ipv6.conf.all.accept_redirects= 0

# grep "net\.ipv6\.conf\.default\.accept_redirects" /etc/sysctl.conf
/etc/sysctl.d/*

net.ipv6.conf.default.accept_redirects= 0
```

## Remediation:







Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.conf.all.accept_redirects = 0
net.ipv4.conf.default.accept_redirects = 0
net.ipv6.conf.all.accept_redirects = 0
net.ipv6.conf.default.accept_redirects = 0
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.conf.all.accept_redirects=0
# sysctl -w net.ipv4.conf.default.accept_redirects=0
# sysctl -w net.ipv6.conf.all.accept_redirects=0
# sysctl -w net.ipv6.conf.default.accept_redirects=0
# sysctl -w net.ipv4.route.flush=1
# sysctl -w net.ipv6.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>3 Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b><u>11 Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			

### 3.2.3 Ensure secure ICMP redirects are not accepted (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Secure ICMP redirects are the same as ICMP redirects, except they come from gateways listed on the default gateway list. It is assumed that these gateways are known to your system, and that they are likely to be secure.

#### Rationale:

It is still possible for even known gateways to be compromised. Setting `net.ipv4.conf.all.secure_redirects` to 0 protects the system from routing table updates by possibly compromised known gateways.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.conf.all.secure_redirects
net.ipv4.conf.all.secure_redirects = 0

# sysctl net.ipv4.conf.default.secure_redirects
net.ipv4.conf.default.secure_redirects = 0

# grep "net\.ipv4\.conf\.all\.secure_redirects" /etc/sysctl.conf
/etc/sysctl.d/*
net.ipv4.conf.all.secure_redirects= 0

# grep "net\.ipv4\.conf\.default\.secure_redirects" /etc/sysctl.conf
/etc/sysctl.d/*
net.ipv4.conf.default.secure_redirects= 0
```

## Remediation:







Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.conf.all.secure_redirects = 0
net.ipv4.conf.default.secure_redirects = 0
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.conf.all.secure_redirects=0
# sysctl -w net.ipv4.conf.default.secure_redirects=0
# sysctl -w net.ipv4.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>3 <u>Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b>11 <u>Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			



### 3.2.4 Ensure suspicious packets are logged (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

When enabled, this feature logs packets with un-routable source addresses to the kernel log.

#### Rationale:

Enabling this feature and logging these packets allows an administrator to investigate the possibility that an attacker is sending spoofed packets to their system.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.conf.all.log_martians
net.ipv4.conf.all.log_martians = 1

# sysctl net.ipv4.conf.default.log_martians
net.ipv4.conf.default.log_martians = 1

# grep "net\.ipv4\.conf\.all\.log_martians" /etc/sysctl.conf /etc/sysctl.d/*
net.ipv4.conf.all.log_martians = 1

# grep "net\.ipv4\.conf\.default\.log_martians" /etc/sysctl.conf
/etc/sysctl.d/*
net.ipv4.conf.default.log_martians = 1
```

#### Remediation:











Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.conf.all.log_martians = 1
net.ipv4.conf.default.log_martians = 1
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.conf.all.log_martians=1
# sysctl -w net.ipv4.conf.default.log_martians=1
# sysctl -w net.ipv4.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.2 <u>Collect Audit Logs</u></b> Collect audit logs. Ensure that logging, per the enterprise's audit log management process, has been enabled across enterprise assets.			
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>6.2 <u>Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b>6.3 <u>Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b>6 <u>Maintenance, Monitoring, and Analysis of Audit Logs</u></b> Maintenance, Monitoring, and Analysis of Audit Logs			

### 3.2.5 Ensure broadcast ICMP requests are ignored (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Setting `net.ipv4.icmp_echo_ignore_broadcasts` to 1 will cause the system to ignore all ICMP echo and timestamp requests to broadcast and multicast addresses.

#### Rationale:

Accepting ICMP echo and timestamp requests with broadcast or multicast destinations for your network could be used to trick your host into starting (or participating) in a Smurf attack. A Smurf attack relies on an attacker sending large amounts of ICMP broadcast messages with a spoofed source address. All hosts receiving this message and responding would send echo-reply messages back to the spoofed address, which is probably not routable. If many hosts respond to the packets, the amount of traffic on the network could be significantly multiplied.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.icmp_echo_ignore_broadcasts
net.ipv4.icmp_echo_ignore_broadcasts = 1

# grep "net\.ipv4\.icmp_echo_ignore_broadcasts" /etc/sysctl.conf
/etc/sysctl.d/*
net.ipv4.icmp_echo_ignore_broadcasts = 1
```

#### Remediation:







Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.icmp_echo_ignore_broadcasts = 1
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.icmp_echo_ignore_broadcasts=1
# sysctl -w net.ipv4.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>3 Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b><u>11 Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			

### 3.2.6 Ensure bogus ICMP responses are ignored (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Setting `icmp_ignore_bogus_error_responses` to 1 prevents the kernel from logging bogus responses (RFC-1122 non-compliant) from broadcast reframes, keeping file systems from filling up with useless log messages.

#### Rationale:

Some routers (and some attackers) will send responses that violate RFC-1122 and attempt to fill up a log file system with many useless error messages.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.icmp_ignore_bogus_error_responses
net.ipv4.icmp_ignore_bogus_error_responses = 1

# grep "net.ipv4.icmp_ignore_bogus_error_responses" /etc/sysctl.conf
/etc/sysctl.d/*

net.ipv4.icmp_ignore_bogus_error_responses = 1
```

#### Remediation:







Set the following parameter in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.icmp_ignore_bogus_error_responses = 1
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.icmp_ignore_bogus_error_responses=1
# sysctl -w net.ipv4.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>3 Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b><u>11 Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			

### 3.2.7 Ensure Reverse Path Filtering is enabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Setting `net.ipv4.conf.all.rp_filter` and `net.ipv4.conf.default.rp_filter` to 1 forces the Linux kernel to utilize reverse path filtering on a received packet to determine if the packet was valid. Essentially, with reverse path filtering, if the return packet does not go out the same interface that the corresponding source packet came from, the packet is dropped (and logged if `log_martians` is set).

#### Rationale:

Setting these flags is a good way to deter attackers from sending your system bogus packets that cannot be responded to. One instance where this feature breaks down is if asymmetrical routing is employed. This would occur when using dynamic routing protocols (bgp, ospf, etc) on your system. If you are using asymmetrical routing on your system, you will not be able to enable this feature without breaking the routing.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.conf.all.rp_filter
net.ipv4.conf.all.rp_filter = 1

# sysctl net.ipv4.conf.default.rp_filter
net.ipv4.conf.default.rp_filter = 1

# grep "net\.ipv4\.conf\.all\.rp_filter" /etc/sysctl.conf /etc/sysctl.d/*
net.ipv4.conf.all.rp_filter = 1

# grep "net\.ipv4\.conf\.default\.rp_filter" /etc/sysctl.conf /etc/sysctl.d/*
net.ipv4.conf.default.rp_filter = 1
```

## Remediation:







Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.conf.all.rp_filter = 1
net.ipv4.conf.default.rp_filter = 1
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.conf.all.rp_filter=1
# sysctl -w net.ipv4.conf.default.rp_filter=1
# sysctl -w net.ipv4.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>3 <u>Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b>11 <u>Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			



### 3.2.8 Ensure TCP SYN Cookies is enabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

When `tcp_syncookies` is set, the kernel will handle TCP SYN packets normally until the half-open connection queue is full, at which time, the SYN cookie functionality kicks in. SYN cookies work by not using the SYN queue at all. Instead, the kernel simply replies to the SYN with a SYN|ACK, but will include a specially crafted TCP sequence number that encodes the source and destination IP address and port number and the time the packet was sent. A legitimate connection would send the ACK packet of the three way handshake with the specially crafted sequence number. This allows the system to verify that it has received a valid response to a SYN cookie and allow the connection, even though there is no corresponding SYN in the queue.

#### Rationale:

Attackers use SYN flood attacks to perform a denial of service attacked on a system by sending many SYN packets without completing the three way handshake. This will quickly use up slots in the kernel's half-open connection queue and prevent legitimate connections from succeeding. SYN cookies allow the system to keep accepting valid connections, even if under a denial of service attack.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv4.tcp_syncookies
net.ipv4.tcp_syncookies = 1

# grep "net\.ipv4\.tcp_syncookies" /etc/sysctl.conf /etc/sysctl.d/*
net.ipv4.tcp_syncookies = 1
```

## Remediation:







Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv4.tcp_syncookies = 1
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv4.tcp_syncookies=1
# sysctl -w net.ipv4.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>3 <u>Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b>11 <u>Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			

### 3.2.9 Ensure IPv6 router advertisements are not accepted (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

This setting disables the system's ability to accept IPv6 router advertisements.

#### Rationale:

It is recommended that systems not accept router advertisements as they could be tricked into routing traffic to compromised machines. Setting hard routes within the system (usually a single default route to a trusted router) protects the system from bad routes.

#### Audit:

Run the following commands and verify output matches:

```
# sysctl net.ipv6.conf.all.accept_ra
net.ipv6.conf.all.accept_ra = 0

# sysctl net.ipv6.conf.default.accept_ra
net.ipv6.conf.default.accept_ra = 0

# grep "net\.ipv6\.conf\.all\.accept_ra" /etc/sysctl.conf /etc/sysctl.d/*
net.ipv6.conf.all.accept_ra = 0

# grep "net\.ipv6\.conf\.default\.accept_ra" /etc/sysctl.conf /etc/sysctl.d/*
net.ipv6.conf.default.accept_ra = 0
```

#### Remediation:







Set the following parameters in `/etc/sysctl.conf` or a `/etc/sysctl.d/*` file:

```
net.ipv6.conf.all.accept_ra = 0
net.ipv6.conf.default.accept_ra = 0
```

Run the following commands to set the active kernel parameters:

```
# sysctl -w net.ipv6.conf.all.accept_ra=0
# sysctl -w net.ipv6.conf.default.accept_ra=0
# sysctl -w net.ipv6.route.flush=1
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>3 Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b><u>11 Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b> Secure Configurations for Network Devices such as Firewalls, Routers and switches			

### ***3.3 TCP Wrappers***

### 3.3.1 Ensure TCP Wrappers is installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

TCP Wrappers provides a simple access list and standardized logging method for services capable of supporting it. In the past, services that were called from `inetd` and `xinetd` supported the use of tcp wrappers. As `inetd` and `xinetd` have been falling in disuse, any service that can support tcp wrappers will have the `libwrap.so` library attached to it.

#### Rationale:

TCP Wrappers provide a good simple access list mechanism to services that may not have that support built in. It is recommended that all services that can support TCP Wrappers, use it.

#### Audit:

Run the following command and verify TCP Wrappers is installed:

```
dpkg -s tcpd
```

#### Remediation:

Run the following command to install TCP Wrappers:

```
apt-get install tcpd
```










#### Additional Information:

To verify if a service supports TCP Wrappers, run the following command:

```
# ldd <path-to-daemon> | grep libwrap.so
```

If there is any output, then the service supports TCP Wrappers.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v8	<b>4.5 <u>Implement and Manage a Firewall on End-User Devices</u></b> Implement and manage a host-based firewall or port-filtering tool on end-user devices, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.2 <u>Leverage Host-based Firewalls</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			

### 3.3.2 Ensure `/etc/hosts.allow` is configured (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/hosts.allow` file specifies which IP addresses are permitted to connect to the host. It is intended to be used in conjunction with the `/etc/hosts.deny` file.

#### Rationale:

The `/etc/hosts.allow` file supports access control by IP and helps ensure that only authorized systems can connect to the system.

#### Audit:

Run the following command and verify the contents of the `/etc/hosts.allow` file:

```
# cat /etc/hosts.allow
```

#### Remediation:

Run the following command to create `/etc/hosts.allow`:

```
# echo "ALL: <net>/<mask>, <net>/<mask>, ..." >/etc/hosts.allow
```










where each `<net>/<mask>` combination (for example, "192.168.1.0/255.255.255.0") represents one network block in use by your organization that requires access to this system.

#### Additional Information:

Contents of the `/etc/hosts.allow` file will vary depending on your network configuration.



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v8	<b>4.5 <u>Implement and Manage a Firewall on End-User Devices</u></b> Implement and manage a host-based firewall or port-filtering tool on end-user devices, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.2 <u>Leverage Host-based Firewalls</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			

### 3.3.3 Ensure /etc/hosts.deny is configured (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/hosts.deny` file specifies which IP addresses are **not** permitted to connect to the host. It is intended to be used in conjunction with the `/etc/hosts.allow` file.

#### Rationale:

The `/etc/hosts.deny` file serves as a failsafe so that any host not specified in `/etc/hosts.allow` is denied access to the system.

#### Audit:

Run the following command and verify the contents of the `/etc/hosts.deny` file:

```
# cat /etc/hosts.deny
ALL: ALL
```

#### Remediation:










Run the following command to create `/etc/hosts.deny`:

```
# echo "ALL: ALL" >> /etc/hosts.deny
```

#### Additional Information:

Contents of the `/etc/hosts.deny` file may include additional options depending on your network configuration.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v8	<b>4.5 <u>Implement and Manage a Firewall on End-User Devices</u></b> Implement and manage a host-based firewall or port-filtering tool on end-user devices, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.2 <u>Leverage Host-based Firewalls</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			

### 3.3.4 Ensure permissions on /etc/hosts.allow are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/hosts.allow` file contains networking information that is used by many applications and therefore must be readable for these applications to operate.

#### Rationale:

It is critical to ensure that the `/etc/hosts.allow` file is protected from unauthorized write access. Although it is protected by default, the file permissions could be changed either inadvertently or through malicious actions.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` is `644`:







```
# stat /etc/hosts.allow
Access: (0644/-rw-r--r--)  Uid: (   0/   root)   Gid: (   0/   root)
```

#### Remediation:

Run the following commands to set permissions on `/etc/hosts.allow`:

```
# chown root:root /etc/hosts.allow
# chmod 644 /etc/hosts.allow
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### 3.3.5 Ensure permissions on /etc/hosts.deny are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/hosts.deny` file contains network information that is used by many system applications and therefore must be readable for these applications to operate.

#### Rationale:

It is critical to ensure that the `/etc/hosts.deny` file is protected from unauthorized write access. Although it is protected by default, the file permissions could be changed either inadvertently or through malicious actions.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and Access is `644` :







```
# stat /etc/hosts.deny
Access: (0644/-rw-r--r--)  Uid: (   0/   root)   Gid: (   0/   root)
```

#### Remediation:

Run the following commands to set permissions on `/etc/hosts.deny` :

```
# chown root:root /etc/hosts.deny
# chmod 644 /etc/hosts.deny
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b></p> <p>Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.</p>			
v7	<p><b><u>5.1 Establish Secure Configurations</u></b></p> <p>Maintain documented, standard security configuration standards for all authorized operating systems and software.</p>			
v6	<p><b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b></p> <p>Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.</p>			

### ***3.4 Uncommon Network Protocols***

The Linux kernel modules support several network protocols that are not commonly used. If these protocols are not needed, it is recommended that they be disabled in the kernel.

**Note:** This should not be considered a comprehensive list of uncommon network protocols, you may wish to consider additions to those listed here for your environment.



### 3.4.1 Ensure DCCP is disabled (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The Datagram Congestion Control Protocol (DCCP) is a transport layer protocol that supports streaming media and telephony. DCCP provides a way to gain access to congestion control, without having to do it at the application layer, but does not provide in-sequence delivery.

#### Rationale:

If the protocol is not required, it is recommended that the drivers not be installed to reduce the potential attack surface.

#### Audit:

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v dccp
install /bin/true

# lsmod | grep dccp
<No output>
```

#### Remediation:






Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/dccp.conf`

and add the following line:

```
install dccp /bin/true
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.2 <u>Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.4.2 Ensure SCTP is disabled (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The Stream Control Transmission Protocol (SCTP) is a transport layer protocol used to support message oriented communication, with several streams of messages in one connection. It serves a similar function as TCP and UDP, incorporating features of both. It is message-oriented like UDP, and ensures reliable in-sequence transport of messages with congestion control like TCP.

#### Rationale:

If the protocol is not being used, it is recommended that kernel module not be loaded, disabling the service to reduce the potential attack surface.

#### Audit:

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v sctp  
  
install /bin/true  
# lsmod | grep sctp  
<No output>
```

#### Remediation:






Edit or create a file in the /etc/modprobe.d/ directory ending in .conf

Example: vim /etc/modprobe.d/sctp.conf

and add the following line:

```
install sctp /bin/true
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.2 <u>Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.4.3 Ensure RDS is disabled (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The Reliable Datagram Sockets (RDS) protocol is a transport layer protocol designed to provide low-latency, high-bandwidth communications between cluster nodes. It was developed by the Oracle Corporation.

#### Rationale:

If the protocol is not being used, it is recommended that kernel module not be loaded, disabling the service to reduce the potential attack surface.

#### Audit:

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v rds
install /bin/true

# lsmod | grep rds
<No output>
```

#### Remediation:






Edit or create a file in the `/etc/modprobe.d/` directory ending in `.conf`

Example: `vim /etc/modprobe.d/rds.conf`

and add the following line:

```
install rds /bin/true
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.2 <u>Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.4.4 Ensure TIPC is disabled (Manual)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

The Transparent Inter-Process Communication (TIPC) protocol is designed to provide communication between cluster nodes.

**Rationale:**

If the protocol is not being used, it is recommended that kernel module not be loaded, disabling the service to reduce the potential attack surface.

**Audit:**

Run the following commands and verify the output is as indicated:

```
# modprobe -n -v tpic
install /bin/true

# lsmod | grep tpic
<No output>
```

**Remediation:**






Edit or create a file in the /etc/modprobe.d/ directory ending in .conf

Example: vim /etc/modprobe.d/tpic.conf

and add the following line:

```
install tpic /bin/true
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.2 <u>Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			



## ***3.5 Firewall Configuration***

IPtables is an application that allows a system administrator to configure the IPv4 tables, IPv6 tables, chains and rules provided by the Linux kernel firewall. While several methods of configuration exist this section is intended only to ensure the resulting IPtables and rules are in place, not how they are configured. If IPv6 is in use in your environment, similar settings should be applied to the IP6tables as well.

### 3.5.1 Configure IPv4 iptables

Iptables is used to set up, maintain, and inspect the tables of IP packet filter rules in the Linux kernel. Several different tables may be defined. Each table contains a number of built-in chains and may also contain user-defined chains.

Each chain is a list of rules which can match a set of packets. Each rule specifies what to do with a packet that matches. This is called a 'target', which may be a jump to a user-defined chain in the same table.

Note: This section broadly assumes starting with an empty IPtables firewall ruleset (established by flushing the rules with `iptables -F`). Remediation steps included only affect the live system, you will also need to configure your default firewall configuration to apply on boot. Configuration of a live systems firewall directly over a remote connection will often result in being locked out. It is advised to have a known good firewall configuration set to run on boot and to configure an entire firewall structure in a script that is then run and tested before saving to boot. The following script will implement the firewall rules of this section and open port 22(ssh) from anywhere:

```
#!/bin/bash

# Flush IPtables rules
iptables -F

# Ensure default deny firewall policy
iptables -P INPUT DROP
iptables -P OUTPUT DROP
iptables -P FORWARD DROP

# Ensure loopback traffic is configured
iptables -A INPUT -i lo -j ACCEPT
iptables -A OUTPUT -o lo -j ACCEPT
iptables -A INPUT -s 127.0.0.0/8 -j DROP

# Ensure outbound and established connections are configured
iptables -A OUTPUT -p tcp -m state --state NEW,ESTABLISHED -j ACCEPT
iptables -A OUTPUT -p udp -m state --state NEW,ESTABLISHED -j ACCEPT
iptables -A OUTPUT -p icmp -m state --state NEW,ESTABLISHED -j ACCEPT
iptables -A INPUT -p tcp -m state --state ESTABLISHED -j ACCEPT
iptables -A INPUT -p udp -m state --state ESTABLISHED -j ACCEPT
iptables -A INPUT -p icmp -m state --state ESTABLISHED -j ACCEPT

# Open inbound ssh(tcp port 22) connections
iptables -A INPUT -p tcp --dport 22 -m state --state NEW -j ACCEPT
```

### 3.5.1.1 Ensure default deny firewall policy (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

A default deny all policy on connections ensures that any unconfigured network usage will be rejected.

#### Rationale:

With a default accept policy the firewall will accept any packet that is not configured to be denied. It is easier to white list acceptable usage than to black list unacceptable usage.

#### Audit:

Run the following command and verify that the policy for the `INPUT` , `OUTPUT` , and `FORWARD` chains is `DROP` or `REJECT` :

```
# iptables -L
Chain INPUT (policy DROP)
Chain FORWARD (policy DROP)
Chain OUTPUT (policy DROP)
```

#### Remediation:

Run the following commands to implement a default DROP policy:







```
# iptables -P INPUT DROP
# iptables -P OUTPUT DROP
# iptables -P FORWARD DROP
```

#### Additional Information:

Changing firewall settings while connected over network can result in being locked out of the system.

Remediation will only affect the active system firewall, be sure to configure the default policy in your firewall management to apply on boot as well.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.5.1.2 Ensure loopback traffic is configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Configure the loopback interface to accept traffic. Configure all other interfaces to deny traffic to the loopback network (127.0.0.0/8).

#### Rationale:

Loopback traffic is generated between processes on machine and is typically critical to operation of the system. The loopback interface is the only place that loopback network (127.0.0.0/8) traffic should be seen, all other interfaces should ignore traffic on this network as an anti-spoofing measure.

#### Audit:

Run the following commands and verify output includes the listed rules in order (packet and byte counts may differ):

```
# iptables -L INPUT -v -n
Chain INPUT (policy DROP 0 packets, 0 bytes)
  pkts bytes target     prot opt in     out     source
destination
    0    0 ACCEPT     all  --  lo      *       0.0.0.0/0           0.0.0.0/0
    0    0 DROP       all  --  *       *       127.0.0.0/8         0.0.0.0/0

# iptables -L OUTPUT -v -n
Chain OUTPUT (policy DROP 0 packets, 0 bytes)
  pkts bytes target     prot opt in     out     source
destination
    0    0 ACCEPT     all  --  *       lo      0.0.0.0/0           0.0.0.0/0
```

#### Remediation:

Run the following commands to implement the loopback rules:







```
# iptables -A INPUT -i lo -j ACCEPT
# iptables -A OUTPUT -o lo -j ACCEPT
# iptables -A INPUT -s 127.0.0.0/8 -j DROP
```

### Additional Information:

Changing firewall settings while connected over network can result in being locked out of the system.

Remediation will only affect the active system firewall, be sure to configure the default policy in your firewall management to apply on boot as well.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.5.1.3 Ensure outbound and established connections are configured (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Configure the firewall rules for new outbound, and established connections.

#### Rationale:

If rules are not in place for new outbound, and established connections all packets will be dropped by the default policy preventing network usage.

#### Audit:

Run the following command and verify all rules for new outbound, and established connections match site policy:

```
# iptables -L -v -n
```

#### Remediation:

Configure iptables in accordance with site policy. The following commands will implement a policy to allow all outbound connections and all established connections:







```
# iptables -A OUTPUT -p tcp -m state --state NEW,ESTABLISHED -j ACCEPT
# iptables -A OUTPUT -p udp -m state --state NEW,ESTABLISHED -j ACCEPT
# iptables -A OUTPUT -p icmp -m state --state NEW,ESTABLISHED -j ACCEPT
# iptables -A INPUT -p tcp -m state --state ESTABLISHED -j ACCEPT
# iptables -A INPUT -p udp -m state --state ESTABLISHED -j ACCEPT
# iptables -A INPUT -p icmp -m state --state ESTABLISHED -j ACCEPT
```

#### Additional Information:

Changing firewall settings while connected over network can result in being locked out of the system.

Remediation will only affect the active system firewall, be sure to configure the default policy in your firewall management to apply on boot as well.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			



### 3.5.1.4 Ensure firewall rules exist for all open ports (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Any ports that have been opened on non-loopback addresses need firewall rules to govern traffic.

#### Rationale:

Without a firewall rule configured for open ports default firewall policy will drop all packets to these ports.

#### Audit:

Run the following command to determine open ports:

```
# netstat -ln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
```

Run the following command to determine firewall rules:

```
# iptables -L INPUT -v -n
Chain INPUT (policy DROP 0 packets, 0 bytes)
pkts bytes target      prot opt in      out     source
destination
    0     0 ACCEPT      all  --  lo      *       0.0.0.0/0           0.0.0.0/0
    0     0 DROP        all  --  *       *       127.0.0.0/8          0.0.0.0/0
    0     0 ACCEPT      tcp  --  *       *       0.0.0.0/0            0.0.0.0/0
tcp dpt:22 state NEW
```

Verify all open ports listening on non-localhost addresses have at least one firewall rule. The last line identified by the "tcp dpt:22 state NEW" identifies it as a firewall rule for new connections on tcp port 22.

## Remediation:

For each port identified in the audit which does not have a firewall rule establish a proper rule for accepting inbound connections:

```
# iptables -A INPUT -p <protocol> --dport <port> -m state --state NEW -j ACCEPT
```









## Additional Information:

Changing firewall settings while connected over network can result in being locked out of the system.

Remediation will only affect the active system firewall, be sure to configure the default policy in your firewall management to apply on boot as well.

The remediation command opens up the port to traffic from all sources. Consult iptables documentation and set any restrictions in compliance with site policy.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.2 <u>Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

## 3.5.2 Configure IPv6 ip6tables

Ip6tables is used to set up, maintain, and inspect the tables of IPv6 packet filter rules in the Linux kernel. Several different tables may be defined. Each table contains a number of built-in chains and may also contain user-defined chains. Each chain is a list of rules which can match a set of packets. Each rule specifies what to do with a packet that matches. This is called a 'target', which may be a jump to a user-defined chain in the same table.

If IPv6 is enabled on the system, the ip6tables should be configured.

Note: This section broadly assumes starting with an empty ip6tables firewall ruleset (established by flushing the rules with ip6tables -F). Remediation steps included only affect the live system, you will also need to configure your default firewall configuration to apply on boot. Configuration of a live systems firewall directly over a remote connection will often result in being locked out. It is advised to have a known good firewall configuration set to run on boot and to configure an entire firewall structure in a script that is then run and tested before saving to boot. The following script will implement the firewall rules of this section and open port 22(ssh) from anywhere:

```
#!/bin/bash

# Flush ip6tables rules
ip6tables -F

# Ensure default deny firewall policy
ip6tables -P INPUT DROP
ip6tables -P OUTPUT DROP
ip6tables -P FORWARD DROP

# Ensure loopback traffic is configured
ip6tables -A INPUT -i lo -j ACCEPT
ip6tables -A OUTPUT -o lo -j ACCEPT
ip6tables -A INPUT -s ::1 -j DROP

# Ensure outbound and established connections are configured
ip6tables -A OUTPUT -p tcp -m state --state NEW,ESTABLISHED -j ACCEPT
ip6tables -A OUTPUT -p udp -m state --state NEW,ESTABLISHED -j ACCEPT
ip6tables -A OUTPUT -p icmp -m state --state NEW,ESTABLISHED -j ACCEPT
ip6tables -A INPUT -p tcp -m state --state ESTABLISHED -j ACCEPT
ip6tables -A INPUT -p udp -m state --state ESTABLISHED -j ACCEPT
ip6tables -A INPUT -p icmp -m state --state ESTABLISHED -j ACCEPT

# Open inbound ssh(tcp port 22) connections
ip6tables -A INPUT -p tcp --dport 22 -m state --state NEW -j ACCEPT
```

### 3.5.2.1 Ensure IPv6 default deny firewall policy (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

A default deny all policy on connections ensures that any unconfigured network usage will be rejected.

#### Rationale:

With a default accept policy the firewall will accept any packet that is not configured to be denied. It is easier to white list acceptable usage than to black list unacceptable usage.

#### Audit:

Run the following command and verify that the policy for the INPUT, OUTPUT, and FORWARD chains is DROP or REJECT:

```
# iptables -L
Chain INPUT (policy DROP)
Chain FORWARD (policy DROP)
Chain OUTPUT (policy DROP)
```

OR

Run the following command and verify that all linux lines have the ipv6.disable=1 parameter set:

```
# grep "^s*linux" /boot/grub/grub.cfg
```

#### Remediation:

Run the following commands to implement a default DROP policy:







```
# iptables -P INPUT DROP
# iptables -P OUTPUT DROP
# iptables -P FORWARD DROP
```

### Additional Information:

Changing firewall settings while connected over network can result in being locked out of the system.

Remediation will only affect the active system firewall, be sure to configure the default policy in your firewall management to apply on boot as well.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.5.2.2 Ensure IPv6 loopback traffic is configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Configure the loopback interface to accept traffic. Configure all other interfaces to deny traffic to the loopback network (::1).

#### Rationale:

Loopback traffic is generated between processes on machine and is typically critical to operation of the system. The loopback interface is the only place that loopback network (::1) traffic should be seen, all other interfaces should ignore traffic on this network as an anti-spoofing measure.

#### Audit:

Run the following commands and verify output includes the listed rules in order (packet and byte counts may differ):

```
# ip6tables -L INPUT -v -n
Chain INPUT (policy DROP 0 packets, 0 bytes)
pkts bytes target      prot opt in      out     source
destination
    0     0 ACCEPT      all  lo      *       ::/0
    0     0 DROP        all  *       *       ::1

# ip6tables -L OUTPUT -v -n
Chain OUTPUT (policy DROP 0 packets, 0 bytes)
pkts bytes target      prot opt in      out     source
destination
    0     0 ACCEPT      all  *       lo      ::/0
```

OR

Run the following command and verify that all linux lines have the ipv6.disable=1 parameter set:

```
# grep "^s*linux" /boot/grub/grub.cfg
```

## Remediation:

Run the following commands to implement the loopback rules:







```
# ip6tables -A INPUT -i lo -j ACCEPT
# ip6tables -A OUTPUT -o lo -j ACCEPT
# ip6tables -A INPUT -s ::1 -j DROP
```

## Additional Information:

Changing firewall settings while connected over network can result in being locked out of the system.

Remediation will only affect the active system firewall, be sure to configure the default policy in your firewall management to apply on boot as well.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.5.2.3 Ensure IPv6 outbound and established connections are configured (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Configure the firewall rules for new outbound, and established IPv6 connections.

#### Rationale:

If rules are not in place for new outbound, and established connections all packets will be dropped by the default policy preventing network usage.

#### Audit:

Run the following command and verify all rules for new outbound, and established connections match site policy:

```
# ip6tables -L -v -n
```

OR

Run the following command and verify that all linux lines have the ipv6.disable=1 parameter set:

```
# grep "^s*linux" /boot/grub/grub.cfg
```

#### Remediation:

Configure iptables in accordance with site policy. The following commands will implement a policy to allow all outbound connections and all established connections:

```
# ip6tables -A OUTPUT -p tcp -m state --state NEW,ESTABLISHED -j ACCEPT
# ip6tables -A OUTPUT -p udp -m state --state NEW,ESTABLISHED -j ACCEPT
# ip6tables -A OUTPUT -p icmp -m state --state NEW,ESTABLISHED -j ACCEPT
# ip6tables -A INPUT -p tcp -m state --state ESTABLISHED -j ACCEPT
# ip6tables -A INPUT -p udp -m state --state ESTABLISHED -j ACCEPT
# ip6tables -A INPUT -p icmp -m state --state ESTABLISHED -j ACCEPT
```









### Additional Information:

Changing firewall settings while connected over network can result in being locked out of the system.

Remediation will only affect the active system firewall, be sure to configure the default policy in your firewall management to apply on boot as well.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.5.2.4 Ensure IPv6 firewall rules exist for all open ports (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Any ports that have been opened on non-loopback addresses need firewall rules to govern traffic.

#### Rationale:

Without a firewall rule configured for open ports default firewall policy will drop all packets to these ports.

#### Audit:

Run the following command to determine open ports:

```
# netstat -ln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp6      0      0 :::22                  :::*                    LISTEN
```

Run the following command to determine firewall rules:

```
# iptables -L INPUT -v -n
Chain INPUT (policy DROP 0 packets, 0 bytes)
Chain INPUT (policy DROP 0 packets, 0 bytes)
  pkts bytes target     prot opt in     out     source destination
  0      0 ACCEPT    all  --  all    all    ::/0   ::/0
  0      0 DROP      all  --  *      *      ::1    ::/0
  0      0 ACCEPT    tcp  --  *      *      ::/0   ::/0
tcp dpt:22 state NEW
```

Verify all open ports listening on non-localhost addresses have at least one firewall rule. The last line identified by the "tcp dpt:22 state NEW" identifies it as a firewall rule for new connections on tcp port 22.

OR

Run the following command and verify that all linux lines have the ipv6.disable=1 parameter set:

```
# grep "^s*linux" /boot/grub/grub.cfg
```

## Remediation:

For each port identified in the audit which does not have a firewall rule establish a proper rule for accepting inbound connections:

```
# iptables -A INPUT -p <protocol> --dport <port> -m state --state NEW -j ACCEPT
```







## Additional Information:

Changing firewall settings while connected over network can result in being locked out of the system.

Remediation will only affect the active system firewall, be sure to configure the default policy in your firewall management to apply on boot as well.

The remediation command opens up the port to traffic from all sources. Consult iptables documentation and set any restrictions in compliance with site policy.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.1 <u>Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 3.5.3 Ensure iptables is installed (Automated)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

`iptables` allows configuration of the IPv4 tables in the linux kernel and the rules stored within them. Most firewall configuration utilities operate as a front end to `iptables`.

**Rationale:**

`iptables` is required for firewall management and configuration.

**Audit:**

Run the following command and verify `iptables` is installed:







```
# dpkg -s iptables
```

**Remediation:**

Run the following command to install `iptables`:

```
# apt-get install iptables
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.4 <u>Implement and Manage a Firewall on Servers</u></b> Implement and manage a firewall on servers, where supported. Example implementations include a virtual firewall, operating system firewall, or a third-party firewall agent.			
v7	<b>9.4 <u>Apply Host-based Firewalls or Port Filtering</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			
v6	<b>9.2 <u>Leverage Host-based Firewalls</u></b> Apply host-based firewalls or port filtering tools on end systems, with a default-deny rule that drops all traffic except those services and ports that are explicitly allowed.			

### *3.6 Ensure wireless interfaces are disabled (Manual)*

**Profile Applicability:**

- Level 1 - Server
- Level 2 - Workstation

**Description:**

Wireless networking is used when wired networks are unavailable. Debian contains a wireless tool kit to allow system administrators to configure and use wireless networks.

**Rationale:**

If wireless is not to be used, wireless devices can be disabled to reduce the potential attack surface.

**Impact:**

Many if not all laptop workstations and some desktop workstations will connect via wireless requiring these interfaces be enabled.

**Audit:**

Run the following command to determine wireless interfaces on the system:

```
# iwconfig
```

Run the following command and verify wireless interfaces are active:

```
# ip link show up
```





**Remediation:**

Run the following command to disable any wireless interfaces:

```
# ip link set <interface> down
```

Disable any wireless interfaces in your network configuration.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b></p> <p>Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.</p>			
v7	<p><b><u>15.4 Disable Wireless Access on Devices if Not Required</u></b></p> <p>Disable wireless access on devices that do not have a business purpose for wireless access.</p>			
v7	<p><b><u>15.5 Limit Wireless Access on Client Devices</u></b></p> <p>Configure wireless access on client machines that do have an essential wireless business purpose, to allow access only to authorized wireless networks and to restrict access to other wireless networks.</p>			
v6	<p><b><u>15.4 Configure Only Authorized Wireless Access On Client Machines</u></b></p> <p>Where a specific business need for wireless access has been identified, configure wireless access on client machines to allow access only to authorized wireless networks. For devices that do not have an essential wireless business purpose, disable wireless access in the hardware configuration (basic input/output system or extensible firmware interface).</p>			

### 3.7 Disable IPv6 (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Although IPv6 has many advantages over IPv4, not all organizations have IPv6 or dual stack configurations implemented.

#### Rationale:

If IPv6 or dual stack is not to be used, it is recommended that IPv6 be disabled to reduce the attack surface of the system.

#### Audit:

Run the following command and verify that all linux lines have the `ipv6.disable=1` parameter set:

```
# grep "^s*linux" /boot/grub/grub.cfg
```

#### Remediation:

Edit `/etc/default/grub` and remove add `ipv6.disable=1` to the `GRUB_CMDLINE_LINUX` parameters:






```
GRUB_CMDLINE_LINUX="ipv6.disable=1"
```

Run the following command to update the `grub2` configuration:

```
# update-grub
```



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b></p> <p>Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.</p>			
v7	<p><b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b></p> <p>Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.</p>			
v6	<p><b><u>3 Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b></p> <p>Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</p>			
v6	<p><b><u>11 Secure Configurations for Network Devices such as Firewalls, Routers and switches</u></b></p> <p>Secure Configurations for Network Devices such as Firewalls, Routers and switches</p>			

## 4 Logging and Auditing

The items in this section describe how to configure logging, log monitoring, and auditing, using tools included in most distributions.

It is recommended that `rsyslog` be used for logging (with `logwatch` providing summarization) and `auditd` be used for auditing (with `aureport` providing summarization) to automatically monitor logs for intrusion attempts and other suspicious system behavior.

In addition to the local log files created by the steps in this section, it is also recommended that sites collect copies of their system logs on a secure, centralized log server via an encrypted connection. Not only does centralized logging help sites correlate events that may be occurring on multiple systems, but having a second copy of the system log information may be critical after a system compromise where the attacker has modified the local log files on the affected system(s). If a log correlation system is deployed, configure it to process the logs described in this section.

Because it is often necessary to correlate log information from many different systems (particularly after a security incident) it is recommended that the time be synchronized 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. See the `ntpd(8)` manual page for more information on configuring NTP.

It is important that all logs described in this section be monitored on a regular basis and correlated to determine trends. A seemingly innocuous entry in one log could be more significant when compared to an entry in another log.

**Note on log file permissions:** There really isn't a "one size fits all" solution to the permissions on log files. Many sites utilize group permissions so that administrators who are in a defined security group do not have to elevate privileges to root in order to read log files. Also, if a third party log aggregation tool is used, it may need to have group permissions to read the log files, which is preferable to having it run `setuid` to root.

## 4.1 Configure System Accounting (auditd)

System auditing, through `auditd`, allows system administrators to monitor their systems such that they can detect unauthorized access or modification of data. By default, `auditd` will audit SELinux AVC denials, system logins, account modifications, and authentication events. Events will be logged to `/var/log/audit/audit.log`. The recording of these events will use a modest amount of disk space on a system. If significantly more events are captured, additional on system or off system storage may need to be allocated.

The recommendations in this section implement an audit policy that produces large quantities of logged data. In some environments it can be challenging to store or process these logs and as such they are marked as Level 2 for both Servers and Workstations. **Note:** For 64 bit systems that have `arch` as a rule parameter, you will need two rules: one for 64 bit and one for 32 bit systems. For 32 bit systems, only one rule is needed.

**Note:** Once all configuration changes have been made to `/etc/audit/audit.rules`, the `auditd` configuration must be reloaded:

```
# systemctl reload auditd
```

### ***4.1.1 Configure Data Retention***

When auditing, it is important to carefully configure the storage requirements for audit logs. By default, auditd will max out the log files at 5MB and retain only 4 copies of them. Older versions will be deleted. It is possible on a system that the 20 MBs of audit logs may fill up the system causing loss of audit data. While the recommendations here provide guidance, check your site policy for audit storage requirements.

#### *4.1.1.1 Ensure audit log storage size is configured (Automated)*

##### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

##### **Description:**

Configure the maximum size of the audit log file. Once the log reaches the maximum size, it will be rotated and a new log file will be started.

##### **Rationale:**

It is important that an appropriate size is determined for log files so that they do not impact the system and audit data is not lost.

##### **Audit:**

Run the following command and ensure output is in compliance with site policy:

```
# grep max_log_file /etc/audit/auditd.conf  
max_log_file = <MB>
```

##### **Remediation:**





Set the following parameter in `/etc/audit/auditd.conf` in accordance with site policy:

```
max_log_file = <MB>
```

##### **Additional Information:**

The `max_log_file` parameter is measured in megabytes.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.3 <u>Ensure Adequate Audit Log Storage</u></b> Ensure that logging destinations maintain adequate storage to comply with the enterprise's audit log management process.			
v7	<b>6.4 <u>Ensure adequate storage for logs</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated.			
v6	<b>6.3 <u>Ensure Audit Logging Systems Are Not Subject To Loss (i.e. rotation/archive)</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated on a regular basis, so that log files will not fill up between log rotation intervals. The logs must be archived and digitally signed on a periodic basis.			

#### 4.1.1.2 Ensure system is disabled when audit logs are full (Automated)

##### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

##### Description:

The `auditd` daemon can be configured to halt the system when the audit logs are full.

##### Rationale:

In high security contexts, the risk of detecting unauthorized access or nonrepudiation exceeds the benefit of the system's availability.

##### Audit:

Run the following commands and verify output matches:





```
# grep space_left_action /etc/audit/auditd.conf
space_left_action = email
# grep action_mail_acct /etc/audit/auditd.conf
action_mail_acct = root
# grep admin_space_left_action /etc/audit/auditd.conf
admin_space_left_action = halt
```

##### Remediation:

Set the following parameters in `/etc/audit/auditd.conf`:

```
space_left_action = email
action_mail_acct = root
admin_space_left_action = halt
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.3 <u>Ensure Adequate Audit Log Storage</u></b> Ensure that logging destinations maintain adequate storage to comply with the enterprise's audit log management process.			
v7	<b>6.4 <u>Ensure adequate storage for logs</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated.			
v6	<b>6.3 <u>Ensure Audit Logging Systems Are Not Subject To Loss (i.e. rotation/archive)</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated on a regular basis, so that log files will not fill up between log rotation intervals. The logs must be archived and digitally signed on a periodic basis.			



### 4.1.1.3 Ensure audit logs are not automatically deleted (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

The `max_log_file_action` setting determines how to handle the audit log file reaching the max file size. A value of `keep_logs` will rotate the logs but never delete old logs.

#### Rationale:

In high security contexts, the benefits of maintaining a long audit history exceed the cost of storing the audit history.

#### Audit:

Run the following command and verify output matches:





```
# grep max_log_file_action /etc/audit/auditd.conf  
max_log_file_action = keep_logs
```

#### Remediation:

Set the following parameter in `/etc/audit/auditd.conf`:

```
max_log_file_action = keep_logs
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.3 <u>Ensure Adequate Audit Log Storage</u></b> Ensure that logging destinations maintain adequate storage to comply with the enterprise's audit log management process.			
v7	<b>6.4 <u>Ensure adequate storage for logs</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated.			
v6	<b>6.3 <u>Ensure Audit Logging Systems Are Not Subject To Loss (i.e. rotation/archive)</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated on a regular basis, so that log files will not fill up between log rotation intervals. The logs must be archived and digitally signed on a periodic basis.			

### 4.1.2 Ensure auditd service is enabled (Automated)

**Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

**Description:**

Turn on the `auditd` daemon to record system events.

**Rationale:**

The capturing of system events provides system administrators with information to allow them to determine if unauthorized access to their system is occurring.

**Audit:**

Run the following command to verify `auditd` is enabled:

```
# systemctl is-enabled auditd
enabled
```









Verify result is "enabled".

**Remediation:**

Run the following command to enable `auditd`:

```
# systemctl enable auditd
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.1 Establish and Maintain an Audit Log Management Process</u></b> Establish and maintain an audit log management process that defines the enterprise's logging requirements. At a minimum, address the collection, review, and retention of audit logs for enterprise assets. Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>6.2 Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b><u>6.3 Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b><u>6.2 Ensure Audit Log Settings Support Appropriate Log Entry Formatting</u></b> Validate audit log settings for each hardware device and the software installed on it, ensuring that logs include a date, timestamp, source addresses, destination addresses, and various other useful elements of each packet and/or transaction. Systems should record logs in a standardized format such as syslog entries or those outlined by the Common Event Expression initiative. If systems cannot generate logs in a standardized format, log normalization tools can be deployed to convert logs into such a format.			

### 4.1.3 Ensure auditing for processes that start prior to auditd is enabled (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

Configure `grub` so that processes that are capable of being audited can be audited even if they start up prior to `auditd` startup.

#### Rationale:

Audit events need to be captured on processes that start up prior to `auditd`, so that potential malicious activity cannot go undetected.

#### Audit:

Run the following command and verify that each linux line has the `audit=1` parameter set:

```
# grep "^s*linux" /boot/grub/grub.cfg
```

#### Remediation:

Edit `/etc/default/grub` and add `audit=1` to `GRUB_CMDLINE_LINUX`:

```
GRUB_CMDLINE_LINUX="audit=1"
```









Run the following command to update the `grub2` configuration:

```
# update-grub
```

#### Additional Information:

This recommendation is designed around the `grub` bootloader, if `LILO` or another bootloader is in use in your environment enact equivalent settings.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.1 Establish and Maintain an Audit Log Management Process</u></b> Establish and maintain an audit log management process that defines the enterprise's logging requirements. At a minimum, address the collection, review, and retention of audit logs for enterprise assets. Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>6.2 Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b><u>6.3 Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b><u>6.2 Ensure Audit Log Settings Support Appropriate Log Entry Formatting</u></b> Validate audit log settings for each hardware device and the software installed on it, ensuring that logs include a date, timestamp, source addresses, destination addresses, and various other useful elements of each packet and/or transaction. Systems should record logs in a standardized format such as syslog entries or those outlined by the Common Event Expression initiative. If systems cannot generate logs in a standardized format, log normalization tools can be deployed to convert logs into such a format.			

#### 4.1.4 Ensure events that modify date and time information are collected (Automated)

##### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

##### Description:

Capture events where the system date and/or time has been modified. The parameters in this section are set to determine if the `adjtimex` (tune kernel clock), `settimeofday` (Set time, using `timeval` and `timezone` structures) `stime` (using seconds since 1/1/1970) or `clock_settime` (allows for the setting of several internal clocks and timers) system calls have been executed and always write an audit record to the `/var/log/audit.log` file upon exit, tagging the records with the identifier "time-change"

##### Rationale:

Unexpected changes in system date and/or time could be a sign of malicious activity on the system.

##### Audit:

On a 32 bit system run the following commands:

```
# grep time-change /etc/audit/audit.rules
# auditctl -l | grep time-change
```

Verify output of both matches:

```
-a always,exit -F arch=b32 -S adjtimex -S settimeofday -S stime -k time-change
-a always,exit -F arch=b32 -S clock_settime -k time-change
-w /etc/localtime -p wa -k time-change
```

On a 64 bit system run the following commands:

```
# grep time-change /etc/audit/audit.rules
# auditctl -l | grep time-change
```

Verify output of both matches:

```
-a always,exit -F arch=b64 -S adjtimex -S settimeofday -k time-change
-a always,exit -F arch=b32 -S adjtimex -S settimeofday -S stime -k time-change
-a always,exit -F arch=b64 -S clock_settime -k time-change
-a always,exit -F arch=b32 -S clock_settime -k time-change
-w /etc/localtime -p wa -k time-change
```

## Remediation:

For 32 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b32 -S adjtimex -S settimeofday -S stime -k time-change
-a always,exit -F arch=b32 -S clock_settime -k time-change
-w /etc/localtime -p wa -k time-change
```





For 64 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b64 -S adjtimex -S settimeofday -k time-change
-a always,exit -F arch=b32 -S adjtimex -S settimeofday -S stime -k time-change
-a always,exit -F arch=b64 -S clock_settime -k time-change
-a always,exit -F arch=b32 -S clock_settime -k time-change
-w /etc/localtime -p wa -k time-change
```

## Additional Information:

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>5.5 <u>Implement Automated Configuration Monitoring Systems</u></b> Utilize a Security Content Automation Protocol (SCAP) compliant configuration monitoring system to verify all security configuration elements, catalog approved exceptions, and alert when unauthorized changes occur.			
v6	<b>3.6 <u>Implement Automated Configuration Monitoring System (i.e. Configuration Assessment Tools)</u></b> Implement and test an automated configuration monitoring system that verifies all remotely testable secure configuration elements, and alerts when unauthorized changes occur. This includes detecting new listening ports, new administrative users, changes to group and local policy objects (where applicable), and new services running on a system. Whenever possible use tools compliant with the Security Content Automation Protocol (SCAP) in order to streamline reporting and integration.			



### 4.1.5 Ensure events that modify user/group information are collected (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

Record events affecting the `group`, `passwd` (user IDs), `shadow` and `gshadow` (passwords) or `/etc/security/opasswd` (old passwords, based on remember parameter in the PAM configuration) files. The parameters in this section will watch the files to see if they have been opened for write or have had attribute changes (e.g. permissions) and tag them with the identifier "identity" in the audit log file.

#### Rationale:

Unexpected changes to these files could be an indication that the system has been compromised and that an unauthorized user is attempting to hide their activities or compromise additional accounts.

#### Audit:

Run the following commands:

```
# grep identity /etc/audit/audit.rules
# auditctl -l | grep identity
```

Verify output of both matches:

```
-w /etc/group -p wa -k identity
-w /etc/passwd -p wa -k identity
-w /etc/gshadow -p wa -k identity
-w /etc/shadow -p wa -k identity
-w /etc/security/opasswd -p wa -k identity
```

## Remediation:





Add the following lines to the `/etc/audit/audit.rules` file:

```
-w /etc/group -p wa -k identity
-w /etc/passwd -p wa -k identity
-w /etc/gshadow -p wa -k identity
-w /etc/shadow -p wa -k identity
-w /etc/security/opasswd -p wa -k identity
```

## Additional Information:

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>4.8 <u>Log and Alert on Changes to Administrative Group Membership</u></b> Configure systems to issue a log entry and alert when an account is added to or removed from any group assigned administrative privileges.			
v6	<b>5.4 <u>Log Administrative User Addition And Removal</u></b> Configure systems to issue a log entry and alert when an account is added to or removed from a domain administrators' group, or when a new local administrator account is added on a system.			

#### *4.1.6 Ensure events that modify the system's network environment are collected (Automated)*

##### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

##### **Description:**

Record changes to network environment files or system calls. The below parameters monitor the `sethostname` (set the systems host name) or `setdomainname` (set the systems domainname) system calls, and write an audit event on system call exit. The other parameters monitor the `/etc/issue` and `/etc/issue.net` files (messages displayed pre-login), `/etc/hosts` (file containing host names and associated IP addresses) and `/etc/network` (directory containing network interface scripts and configurations) files.

##### **Rationale:**

Monitoring `sethostname` and `setdomainname` will identify potential unauthorized changes to host and domainname of a system. The changing of these names could potentially break security parameters that are set based on those names. The `/etc/hosts` file is monitored for changes in the file that can indicate an unauthorized intruder is trying to change machine associations with IP addresses and trick users and processes into connecting to unintended machines. Monitoring `/etc/issue` and `/etc/issue.net` is important, as intruders could put disinformation into those files and trick users into providing information to the intruder. Monitoring `/etc/network` is important as it can show if network interfaces or scripts are being modified in a way that can lead to the machine becoming unavailable or compromised. All audit records will be tagged with the identifier "system-locale."

## Audit:

On a 32 bit system run the following commands:

```
# grep system-locale /etc/audit/audit.rules
# auditctl -l | grep system-locale
```

Verify output of both matches:

```
-a always,exit -F arch=b32 -S sethostname -S setdomainname -k system-locale
-w /etc/issue -p wa -k system-locale
-w /etc/issue.net -p wa -k system-locale
-w /etc/hosts -p wa -k system-locale
-w /etc/network/ -p wa -k system-locale
```

On a 64 bit system run the following commands:

```
# grep system-locale /etc/audit/audit.rules
# auditctl -l | grep system-locale
```

Verify output of both matches:

```
-a always,exit -F arch=b64 -S sethostname -S setdomainname -k system-locale
-a always,exit -F arch=b32 -S sethostname -S setdomainname -k system-locale
-w /etc/issue -p wa -k system-locale
-w /etc/issue.net -p wa -k system-locale
-w /etc/hosts -p wa -k system-locale
-w /etc/network/ -p wa -k system-locale
```

## Remediation:

For 32 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b32 -S sethostname -S setdomainname -k system-locale
-w /etc/issue -p wa -k system-locale
-w /etc/issue.net -p wa -k system-locale
-w /etc/hosts -p wa -k system-locale
-w /etc/network/ -p wa -k system-locale
```

For 64 bit systems add the following lines to the `/etc/audit/audit.rules` file:





```
-a always,exit -F arch=b64 -S sethostname -S setdomainname -k system-locale
-a always,exit -F arch=b32 -S sethostname -S setdomainname -k system-locale
-w /etc/issue -p wa -k system-locale
-w /etc/issue.net -p wa -k system-locale
-w /etc/hosts -p wa -k system-locale
-w /etc/network/ -p wa -k system-locale
```

## Additional Information:

`/etc/network` is common to Debian based distributions. You should expand or replace this coverage to any network configuration files on your system.

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.5 Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b><u>5.5 Implement Automated Configuration Monitoring Systems</u></b> Utilize a Security Content Automation Protocol (SCAP) compliant configuration monitoring system to verify all security configuration elements, catalog approved exceptions, and alert when unauthorized changes occur.			
v6	<b><u>3.6 Implement Automated Configuration Monitoring System (i.e. Configuration Assessment Tools)</u></b> Implement and test an automated configuration monitoring system that verifies all remotely testable secure configuration elements, and alerts when unauthorized changes occur. This includes detecting new listening ports, new administrative users, changes to group and local policy objects (where applicable), and new services running on a system. Whenever possible use tools compliant with the Security Content Automation Protocol (SCAP) in order to streamline reporting and integration.			

### 4.1.7 Ensure events that modify the system's Mandatory Access Controls are collected (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

Monitor SELinux/AppArmor mandatory access controls. The parameters below monitor any write access (potential additional, deletion or modification of files in the directory) or attribute changes to the /etc/selinux or /etc/apparmor and /etc/apparmor.d directories.

#### Rationale:

Changes to files in these directories could indicate that an unauthorized user is attempting to modify access controls and change security contexts, leading to a compromise of the system.

#### Audit:

On systems using SELinux run the following commands:

```
# grep MAC-policy /etc/audit/audit.rules
# auditctl -l | grep MAC-policy
```

Verify output of both matches:

```
-w /etc/selinux/ -p wa -k MAC-policy
-w /usr/share/selinux/ -p wa -k MAC-policy
```

On systems using AppArmor run the following commands:

```
# grep MAC-policy /etc/audit/audit.rules
# auditctl -l | grep MAC-policy
```

Verify output of both matches:

```
-w /etc/apparmor/ -p wa -k MAC-policy
-w /etc/apparmor.d/ -p wa -k MAC-policy
```

## Remediation:

On systems using SELinux add the following line to the `/etc/audit/audit.rules` file:

```
-w /etc/selinux/ -p wa -k MAC-policy  
-w /usr/share/selinux/ -p wa -k MAC-policy
```





On systems using AppArmor add the following line to the `/etc/audit/audit.rules` file:

```
-w /etc/apparmor/ -p wa -k MAC-policy  
-w /etc/apparmor.d/ -p wa -k MAC-policy
```

## Additional Information:

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>5.5 <u>Implement Automated Configuration Monitoring Systems</u></b> Utilize a Security Content Automation Protocol (SCAP) compliant configuration monitoring system to verify all security configuration elements, catalog approved exceptions, and alert when unauthorized changes occur.			
v6	<b>3.6 <u>Implement Automated Configuration Monitoring System (i.e. Configuration Assessment Tools)</u></b> Implement and test an automated configuration monitoring system that verifies all remotely testable secure configuration elements, and alerts when unauthorized changes occur. This includes detecting new listening ports, new administrative users, changes to group and local policy objects (where applicable), and new services running on a system. Whenever possible use tools compliant with the Security Content Automation Protocol (SCAP) in order to streamline reporting and integration.			

### 4.1.8 Ensure login and logout events are collected (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

Monitor login and logout events. The parameters below track changes to files associated with login/logout events. The file `/var/log/faillog` tracks failed events from login. The file `/var/log/lastlog` maintain records of the last time a user successfully logged in. The file `/var/log/tallylog` maintains records of failures via the `pam_tally2` module

#### Rationale:

Monitoring login/logout events could provide a system administrator with information associated with brute force attacks against user logins.

#### Audit:

Run the following commands:

```
# grep logins /etc/audit/audit.rules
# auditctl -l | grep logins
```

Verify output of both includes:

```
-w /var/log/faillog -p wa -k logins
-w /var/log/lastlog -p wa -k logins
-w /var/log/tallylog -p wa -k logins
```

#### Remediation:

Add the following lines to the `/etc/audit/audit.rules` file:









```
-w /var/log/faillog -p wa -k logins
-w /var/log/lastlog -p wa -k logins
-w /var/log/tallylog -p wa -k logins
```

#### Additional Information:

Reloading the auditd config to set active settings may require a system reboot.



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>4.9 <u>Log and Alert on Unsuccessful Administrative Account Login</u></b> Configure systems to issue a log entry and alert on unsuccessful logins to an administrative account.			
v7	<b>16.11 <u>Lock Workstation Sessions After Inactivity</u></b> Automatically lock workstation sessions after a standard period of inactivity.			
v7	<b>16.13 <u>Alert on Account Login Behavior Deviation</u></b> Alert when users deviate from normal login behavior, such as time-of-day, workstation location and duration.			
v6	<b>5.5 <u>Log Failed Administrative Login Attempts</u></b> Configure systems to issue a log entry and alert on any unsuccessful login to an administrative account.			
v6	<b>16.4 <u>Automatically Log Off Users After Standard Period Of Inactivity</u></b> Regularly monitor the use of all accounts, automatically logging off users after a standard period of inactivity.			
v6	<b>16.10 <u>Profile User Account Usage And Monitor For Anomalies</u></b> Profile each user's typical account usage by determining normal time-of-day access and access duration. Reports should be generated that indicate users who have logged in during unusual hours or have exceeded their normal login duration. This includes flagging the use of the user's credentials from a computer other than computers on which the user generally works.			

### 4.1.9 Ensure session initiation information is collected (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

Monitor session initiation events. The parameters in this section track changes to the files associated with session events. The file `/var/run/utmp` file tracks all currently logged in users. All audit records will be tagged with the identifier "session." The `/var/log/wtmp` file tracks logins, logouts, shutdown, and reboot events. The file `/var/log/btmp` keeps track of failed login attempts and can be read by entering the command `/usr/bin/last -f /var/log/btmp`. All audit records will be tagged with the identifier "logins."

#### Rationale:

Monitoring these files for changes could alert a system administrator to logins occurring at unusual hours, which could indicate intruder activity (i.e. a user logging in at a time when they do not normally log in).

#### Audit:

Run the following commands:

```
# grep session /etc/audit/audit.rules
# auditctl -l | grep session
```

Verify output of both matches:

```
-w /var/run/utmp -p wa -k session
```

Run the following commands:

```
# grep logins /etc/audit/audit.rules
# auditctl -l | grep logins
```

Verify output of both matches:

```
-w /var/log/wtmp -p wa -k logins
-w /var/log/btmp -p wa -k logins
```

## Remediation:

Add the following lines to the `/etc/audit/audit.rules` file:

```
-w /var/run/utmp -p wa -k session  
-w /var/log/wtmp -p wa -k logins  
-w /var/log/btmp -p wa -k logins
```

## Additional Information:

The `last` command can be used to read `/var/log/wtmp` (`last` with no parameters) and `/var/run/utmp` (`last -f /var/run/utmp`)

Reloading the `auditd` config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.		●	●
v7	<b>4.9 <u>Log and Alert on Unsuccessful Administrative Account Login</u></b> Configure systems to issue a log entry and alert on unsuccessful logins to an administrative account.		●	●
v7	<b>16.11 <u>Lock Workstation Sessions After Inactivity</u></b> Automatically lock workstation sessions after a standard period of inactivity.	●	●	●
v7	<b>16.13 <u>Alert on Account Login Behavior Deviation</u></b> Alert when users deviate from normal login behavior, such as time-of-day, workstation location and duration.			●
v6	<b>5.5 <u>Log Failed Administrative Login Attempts</u></b> Configure systems to issue a log entry and alert on any unsuccessful login to an administrative account.			
v6	<b>16.4 <u>Automatically Log Off Users After Standard Period Of Inactivity</u></b> Regularly monitor the use of all accounts, automatically logging off users after a standard period of inactivity.			
v6	<b>16.10 <u>Profile User Account Usage And Monitor For Anomalies</u></b> Profile each user's typical account usage by determining normal time-of-day access and access duration. Reports should be generated that indicate users who have logged in during unusual hours or have exceeded their normal login duration. This includes flagging the use of the user's credentials from a computer other than computers on which the user generally works.			

#### *4.1.10 Ensure discretionary access control permission modification events are collected (Automated)*

##### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

##### **Description:**

Monitor changes to file permissions, attributes, ownership and group. The parameters in this section track changes for system calls that affect file permissions and attributes. The `chmod`, `fchmod` and `fchmodat` system calls affect the permissions associated with a file. The `chown`, `fchown`, `fchownat` and `lchown` system calls affect owner and group attributes on a file. The `setxattr`, `lsetxattr`, `fsetxattr` (set extended file attributes) and `removexattr`, `lremovexattr`, `fremovexattr` (remove extended file attributes) control extended file attributes. In all cases, an audit record will only be written for non-system user ids (`auid >= 1000`) and will ignore Daemon events (`auid = 4294967295`). All audit records will be tagged with the identifier "perm\_mod."

##### **Rationale:**

Monitoring for changes in file attributes could alert a system administrator to activity that could indicate intruder activity or policy violation.

##### **Audit:**

On a 32 bit system run the following commands:

```
# grep perm_mod /etc/audit/audit.rules
# auditctl -l | grep perm_mod
```

Verify output of both matches:

```
-a always,exit -F arch=b32 -S chmod -S fchmod -S fchmodat -F auid>=1000 -F
auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S chown -S fchown -S fchownat -S lchown -F
auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S setxattr -S lsetxattr -S fsetxattr -S
removexattr -S lremovexattr -S fremovexattr -F auid>=1000 -F auid!=4294967295
-k perm_mod
```

On a 64 bit system run the following commands:

```
# grep perm_mod /etc/audit/audit.rules
# auditctl -l | grep perm_mod
```

Verify output of both matches:

```
-a always,exit -F arch=b64 -S chmod -S fchmod -S fchmodat -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S chmod -S fchmod -S fchmodat -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b64 -S chown -S fchown -S fchownat -S lchown -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S chown -S fchown -S fchownat -S lchown -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b64 -S setxattr -S lsetxattr -S fsetxattr -S removexattr -S lremovexattr -S fremovexattr -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S setxattr -S lsetxattr -S fsetxattr -S removexattr -S lremovexattr -S fremovexattr -F auid>=1000 -F auid!=4294967295 -k perm_mod
```

## Remediation:

For 32 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b32 -S chmod -S fchmod -S fchmodat -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S chown -S fchown -S fchownat -S lchown -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S setxattr -S lsetxattr -S fsetxattr -S removexattr -S lremovexattr -S fremovexattr -F auid>=1000 -F auid!=4294967295 -k perm_mod
```





For 64 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b64 -S chmod -S fchmod -S fchmodat -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S chmod -S fchmod -S fchmodat -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b64 -S chown -S fchown -S fchownat -S lchown -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S chown -S fchown -S fchownat -S lchown -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b64 -S setxattr -S lsetxattr -S fsetxattr -S removexattr -S lremovexattr -S fremovexattr -F auid>=1000 -F auid!=4294967295 -k perm_mod
-a always,exit -F arch=b32 -S setxattr -S lsetxattr -S fsetxattr -S removexattr -S lremovexattr -S fremovexattr -F auid>=1000 -F auid!=4294967295 -k perm_mod
```

## Additional Information:

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.5 Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b><u>5.5 Implement Automated Configuration Monitoring Systems</u></b> Utilize a Security Content Automation Protocol (SCAP) compliant configuration monitoring system to verify all security configuration elements, catalog approved exceptions, and alert when unauthorized changes occur.			
v6	<b><u>3.6 Implement Automated Configuration Monitoring System (i.e. Configuration Assessment Tools)</u></b> Implement and test an automated configuration monitoring system that verifies all remotely testable secure configuration elements, and alerts when unauthorized changes occur. This includes detecting new listening ports, new administrative users, changes to group and local policy objects (where applicable), and new services running on a system. Whenever possible use tools compliant with the Security Content Automation Protocol (SCAP) in order to streamline reporting and integration.			

#### 4.1.11 Ensure unsuccessful unauthorized file access attempts are collected (Automated)

##### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

##### Description:

Monitor for unsuccessful attempts to access files. The parameters below are associated with system calls that control creation ( `creat` ), opening ( `open` , `openat` ) and truncation ( `truncate` , `ftruncate` ) of files. An audit log record will only be written if the user is a non-privileged user (`audit >= 1000`), is not a Daemon event (`audit=4294967295`) and if the system call returned `EACCES` (permission denied to the file) or `EPERM` (some other permanent error associated with the specific system call). All audit records will be tagged with the identifier "access."

##### Rationale:

Failed attempts to open, create or truncate files could be an indication that an individual or process is trying to gain unauthorized access to the system.

##### Audit:

On a 32 bit system run the following commands:

```
# grep access /etc/audit/audit.rules
# auditctl -l | grep access
```

Verify output of both matches:

```
-a always,exit -F arch=b32 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EACCES -F audit>=1000 -F audit!=4294967295 -k access
-a always,exit -F arch=b32 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EPERM -F audit>=1000 -F audit!=4294967295 -k access
```

On a 64 bit system run the following commands:

```
# grep access /etc/audit/audit.rules
# auditctl -l | grep access
```

Verify output of both matches:



```
-a always,exit -F arch=b64 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EACCES -F auid>=1000 -F auid!=4294967295 -k access
-a always,exit -F arch=b32 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EACCES -F auid>=1000 -F auid!=4294967295 -k access
-a always,exit -F arch=b64 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EPERM -F auid>=1000 -F auid!=4294967295 -k access
-a always,exit -F arch=b32 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EPERM -F auid>=1000 -F auid!=4294967295 -k access
```

## Remediation:

For 32 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b32 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EACCES -F auid>=1000 -F auid!=4294967295 -k access
-a always,exit -F arch=b32 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EPERM -F auid>=1000 -F auid!=4294967295 -k access
```

For 64 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b64 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EACCES -F auid>=1000 -F auid!=4294967295 -k access
-a always,exit -F arch=b32 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EACCES -F auid>=1000 -F auid!=4294967295 -k access
-a always,exit -F arch=b64 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EPERM -F auid>=1000 -F auid!=4294967295 -k access
-a always,exit -F arch=b32 -S creat -S open -S openat -S truncate -S
ftruncate -F exit=-EPERM -F auid>=1000 -F auid!=4294967295 -k access
```

## Additional Information:

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.		●	●
v7	<b>14.9 <u>Enforce Detail Logging for Access or Changes to Sensitive Data</u></b> Enforce detailed audit logging for access to sensitive data or changes to sensitive data (utilizing tools such as File Integrity Monitoring or Security Information and Event Monitoring).			●
v6	<b>14.6 <u>Enforce Detailed Audit Logging For Sensitive Information</u></b> Enforce detailed audit logging for access to nonpublic data and special authentication for sensitive data.			

#### 4.1.12 Ensure use of privileged commands is collected (Automated)

##### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

##### Description:

Monitor privileged programs (those that have the setuid and/or setgid bit set on execution) to determine if unprivileged users are running these commands.

##### Rationale:

Execution of privileged commands by non-privileged users could be an indication of someone trying to gain unauthorized access to the system.

##### Audit:

Run the following command replacing `<partition>` with a list of partitions where programs can be executed from on your system:

```
# find <partition> -xdev \( -perm -4000 -o -perm -2000 \) -type f | awk
'{print \
"-a always,exit -F path=" $1 " -F perm=x -F auid>=1000 -F auid!=4294967295 \
-k privileged" }'
```

Verify all resulting lines are in the `/etc/audit/audit.rules` file and the output of `auditctl -l`.

## Remediation:

To remediate this issue, the system administrator will have to execute a find command to locate all the privileged programs and then add an audit line for each one of them. The audit parameters associated with this are as follows:

-F path=" \$1 " - will populate each file name found through the find command and processed by awk. -F perm=x - will write an audit record if the file is executed. -F auid>=1000 - will write a record if the user executing the command is not a privileged user. -F auid!= 4294967295 - will ignore Daemon events

All audit records should be tagged with the identifier "privileged".

Run the following command replacing with a list of partitions where programs can be executed from on your system:






```
# find <partition> -xdev \( -perm -4000 -o -perm -2000 \) -type f | awk  
'{print \  
"-a always,exit -F path=" $1 " -F perm=x -F auid>=1000 -F auid!=4294967295 \  
-k privileged" }'
```

Add all resulting lines to the /etc/audit/audit.rules file.

## Additional Information:

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>5.1 <u>Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

#### *4.1.13 Ensure successful file system mounts are collected (Automated)*

##### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

##### **Description:**

Monitor the use of the `mount` system call. The `mount` (and `umount` ) system call controls the mounting and unmounting of file systems. The parameters below configure the system to create an audit record when the mount system call is used by a non-privileged user

##### **Rationale:**

It is highly unusual for a non privileged user to `mount` file systems to the system. While tracking `mount` commands gives the system administrator evidence that external media may have been mounted (based on a review of the source of the mount and confirming it's an external media type), it does not conclusively indicate that data was exported to the media. System administrators who wish to determine if data were exported, would also have to track successful `open` , `creat` and `truncate` system calls requiring write access to a file under the mount point of the external media file system. This could give a fair indication that a write occurred. The only way to truly prove it, would be to track successful writes to the external media. Tracking write system calls could quickly fill up the audit log and is not recommended. Recommendations on configuration options to track data export to media is beyond the scope of this document.

## Audit:

On a 32 bit system run the following commands:

```
# grep mounts /etc/audit/audit.rules
# auditctl -l | grep mounts
```

Verify output of both matches:

```
-a always,exit -F arch=b32 -S mount -F auid>=1000 -F auid!=4294967295 -k
mounts
```

On a 64 bit system run the following commands:

```
# grep mounts /etc/audit/audit.rules
# auditctl -l | grep mounts
```

Verify output of both matches:

```
-a always,exit -F arch=b64 -S mount -F auid>=1000 -F auid!=4294967295 -k
mounts
-a always,exit -F arch=b32 -S mount -F auid>=1000 -F auid!=4294967295 -k
mounts
```

## Remediation:

For 32 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b32 -S mount -F auid>=1000 -F auid!=4294967295 -k
mounts
```

For 64 bit systems add the following lines to the `/etc/audit/audit.rules` file:






```
-a always,exit -F arch=b64 -S mount -F auid>=1000 -F auid!=4294967295 -k
mounts
-a always,exit -F arch=b32 -S mount -F auid>=1000 -F auid!=4294967295 -k
mounts
```

## Additional Information:

This tracks successful and unsuccessful mount commands. File system mounts do not have to come from external media and this action still does not verify write (e.g. CD ROMS).

Reloading the auditd config to set active settings may require a system reboot.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>13 <u>Data Protection</u></b> Data Protection			

#### 4.1.14 Ensure file deletion events by users are collected (Automated)

##### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

##### Description:

Monitor the use of system calls associated with the deletion or renaming of files and file attributes. This configuration statement sets up monitoring for the `unlink` (remove a file), `unlinkat` (remove a file attribute), `rename` (rename a file) and `renameat` (rename a file attribute) system calls and tags them with the identifier "delete".

##### Rationale:

Monitoring these calls from non-privileged users could provide a system administrator with evidence that inappropriate removal of files and file attributes associated with protected files is occurring. While this audit option will look at all events, system administrators will want to look for specific privileged files that are being deleted or altered.

##### Audit:

On a 32 bit system run the following commands:

```
# grep delete /etc/audit/audit.rules
# auditctl -l | grep delete
```

Verify output of both matches:

```
-a always,exit -F arch=b32 -S unlink -S unlinkat -S rename -S renameat -F
auid>=1000 -F auid!=4294967295 -k delete
```

On a 64 bit system run the following commands:

```
# grep delete /etc/audit/audit.rules
# auditctl -l | grep delete
```

Verify output of both matches:

```
-a always,exit -F arch=b64 -S unlink -S unlinkat -S rename -S renameat -F
auid>=1000 -F auid!=4294967295 -k delete
-a always,exit -F arch=b32 -S unlink -S unlinkat -S rename -S renameat -F
auid>=1000 -F auid!=4294967295 -k delete
```



## Remediation:

For 32 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-a always,exit -F arch=b32 -S unlink -S unlinkat -S rename -S renameat -F  
auid>=1000 -F auid!=4294967295 -k delete
```

For 64 bit systems add the following lines to the `/etc/audit/audit.rules` file:



```
-a always,exit -F arch=b64 -S unlink -S unlinkat -S rename -S renameat -F  
auid>=1000 -F auid!=4294967295 -k delete  
-a always,exit -F arch=b32 -S unlink -S unlinkat -S rename -S renameat -F  
auid>=1000 -F auid!=4294967295 -k delete
```

## Additional Information:

At a minimum, configure the audit system to collect file deletion events for all users and root.

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>13 <u>Data Protection</u></b> Data Protection			
v6	<b>13 <u>Data Protection</u></b> Data Protection			

#### *4.1.15 Ensure changes to system administration scope (sudoers) is collected (Automated)*

##### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

##### **Description:**

Monitor scope changes for system administrations. If the system has been properly configured to force system administrators to log in as themselves first and then use the `sudo` command to execute privileged commands, it is possible to monitor changes in scope. The file `/etc/sudoers` will be written to when the file or its attributes have changed. The audit records will be tagged with the identifier "scope."

##### **Rationale:**

Changes in the `/etc/sudoers` file can indicate that an unauthorized change has been made to scope of system administrator activity.

##### **Audit:**

Run the following commands:

```
# grep scope /etc/audit/audit.rules
# auditctl -l | grep scope
```

Verify output of both matches:

```
-w /etc/sudoers -p wa -k scope
-w /etc/sudoers.d/ -p wa -k scope
```

##### **Remediation:**

Add the following line to the `/etc/audit/audit.rules` file:

```
-w /etc/sudoers -p wa -k scope
-w /etc/sudoers.d/ -p wa -k scope
```

##### **Additional Information:**

Reloading the `auditd` config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.		●	●
v7	<b>4.8 <u>Log and Alert on Changes to Administrative Group Membership</u></b> Configure systems to issue a log entry and alert when an account is added to or removed from any group assigned administrative privileges.		●	●
v6	<b>5.4 <u>Log Administrative User Addition And Removal</u></b> Configure systems to issue a log entry and alert when an account is added to or removed from a domain administrators' group, or when a new local administrator account is added on a system.			

### 4.1.16 Ensure system administrator actions (sudolog) are collected (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

Monitor the `sudo` log file. If the system has been properly configured to disable the use of the `su` command and force all administrators to have to log in first and then use `sudo` to execute privileged commands, then all administrator commands will be logged to `/var/log/sudo.log`. Any time a command is executed, an audit event will be triggered as the `/var/log/sudo.log` file will be opened for write and the executed administration command will be written to the log.

#### Rationale:

Changes in `/var/log/sudo.log` indicate that an administrator has executed a command or the log file itself has been tampered with. Administrators will want to correlate the events written to the audit trail with the records written to `/var/log/sudo.log` to verify if unauthorized commands have been executed.

#### Audit:

Run the following commands:

```
# grep actions /etc/audit/audit.rules
# auditctl -l | grep actions
```

Verify output of both matches:

```
-w /var/log/sudo.log -p wa -k actions
```

#### Remediation:

Add the following lines to the `/etc/audit/audit.rules` file:





```
-w /var/log/sudo.log -p wa -k actions
```

### Additional Information:

The system must be configured with `su` disabled (See Item 5.6 Ensure access to the `su` command is restricted) to force all command execution through `sudo`. This will not be effective on the console, as administrators can log in as root.

Reloading the `auditd` config to set active settings may require a system reboot.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>4.9 <u>Log and Alert on Unsuccessful Administrative Account Login</u></b> Configure systems to issue a log entry and alert on unsuccessful logins to an administrative account.			
v6	<b>5.1 <u>Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			
v6	<b>5.5 <u>Log Failed Administrative Login Attempts</u></b> Configure systems to issue a log entry and alert on any unsuccessful login to an administrative account.			

#### *4.1.17 Ensure kernel module loading and unloading is collected (Automated)*

##### **Profile Applicability:**

- Level 2 - Server
- Level 2 - Workstation

##### **Description:**

Monitor the loading and unloading of kernel modules. The programs `insmod` (install a kernel module), `rmmod` (remove a kernel module), and `modprobe` (a more sophisticated program to load and unload modules, as well as some other features) control loading and unloading of modules. The `init_module` (load a module) and `delete_module` (delete a module) system calls control loading and unloading of modules. Any execution of the loading and unloading module programs and system calls will trigger an audit record with an identifier of "modules".

##### **Rationale:**

Monitoring the use of `insmod`, `rmmod` and `modprobe` could provide system administrators with evidence that an unauthorized user loaded or unloaded a kernel module, possibly compromising the security of the system. Monitoring of the `init_module` and `delete_module` system calls would reflect an unauthorized user attempting to use a different program to load and unload modules.

## Audit:

On a 32 bit system run the following commands:

```
# grep modules /etc/audit/audit.rules
# auditctl -l | grep modules
```

Verify output of both matches:

```
-w /sbin/insmod -p x -k modules
-w /sbin/rmmod -p x -k modules
-w /sbin/modprobe -p x -k modules
-a always,exit -F arch=b32 -S init_module -S delete_module -k modules
```

On a 64 bit system run the following commands:

```
# grep modules /etc/audit/audit.rules
# auditctl -l | grep modules
```

Verify output of both matches:

```
-w /sbin/insmod -p x -k modules
-w /sbin/rmmod -p x -k modules
-w /sbin/modprobe -p x -k modules
-a always,exit -F arch=b64 -S init_module -S delete_module -k modules
```

## Remediation:

For 32 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-w /sbin/insmod -p x -k modules
-w /sbin/rmmod -p x -k modules
-w /sbin/modprobe -p x -k modules
-a always,exit -F arch=b32 -S init_module -S delete_module -k modules
```

For 64 bit systems add the following lines to the `/etc/audit/audit.rules` file:

```
-w /sbin/insmod -p x -k modules
-w /sbin/rmmod -p x -k modules
-w /sbin/modprobe -p x -k modules
-a always,exit -F arch=b64 -S init_module -S delete_module -k modules
```

## Additional Information:

Reloading the auditd config to set active settings may require a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.		●	●
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.	●	●	●
v6	<b>3 <u>Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			



#### 4.1.18 Ensure the audit configuration is immutable (Automated)

##### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

##### Description:

Set system audit so that audit rules cannot be modified with `auditctl`. Setting the flag "-e 2" forces audit to be put in immutable mode. Audit changes can only be made on system reboot.

##### Rationale:

In immutable mode, unauthorized users cannot execute changes to the audit system to potentially hide malicious activity and then put the audit rules back. Users would most likely notice a system reboot and that could alert administrators of an attempt to make unauthorized audit changes.

##### Audit:

Run the following command and verify output matches:

```
# grep "^s*[^#]" /etc/audit/audit.rules | tail -1  
-e 2
```

##### Remediation:









Add the following line to the end of the `/etc/audit/audit.rules` file.

```
-e 2
```

##### Additional Information:

This setting will ensure reloading the auditd config to set active settings requires a system reboot.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.1 Establish and Maintain an Audit Log Management Process</u></b> Establish and maintain an audit log management process that defines the enterprise's logging requirements. At a minimum, address the collection, review, and retention of audit logs for enterprise assets. Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>6.2 Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b><u>6.3 Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b><u>3 Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers</u></b> Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers			
v6	<b><u>6 Maintenance, Monitoring, and Analysis of Audit Logs</u></b> Maintenance, Monitoring, and Analysis of Audit Logs			

## ***4.2 Configure Logging***

Logging services should be configured to prevent information leaks and to aggregate logs on a remote server so that they can be reviewed in the event of a system compromise and ease log analysis.

### 4.2.1 Configure *rsyslog*

The `rsyslog` software is recommended as a replacement for the `syslogd` daemon and provides improvements over `syslogd`, such as connection-oriented (i.e. TCP) transmission of logs, the option to log to database formats, and the encryption of log data en route to a central logging server. **Note:** This section only applies if `rsyslog` is installed on the system.

#### 4.2.1.1 Ensure rsyslog Service is enabled (Automated)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

Once the `rsyslog` package is installed it needs to be activated.

**Rationale:**

If the `rsyslog` service is not activated the system may default to the `syslogd` service or lack logging instead.

**Audit:**

Run the following command to verify `rsyslog` is enabled:

```
# systemctl is-enabled rsyslog
enabled
```











Verify result is "enabled".

**Remediation:**

Run the following command to enable `rsyslog`:

```
# systemctl enable rsyslog
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.1 Establish and Maintain an Audit Log Management Process</u></b> Establish and maintain an audit log management process that defines the enterprise's logging requirements. At a minimum, address the collection, review, and retention of audit logs for enterprise assets. Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v8	<b><u>8.5 Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b><u>6.2 Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b><u>6.3 Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b><u>6.2 Ensure Audit Log Settings Support Appropriate Log Entry Formatting</u></b> Validate audit log settings for each hardware device and the software installed on it, ensuring that logs include a date, timestamp, source addresses, destination addresses, and various other useful elements of each packet and/or transaction. Systems should record logs in a standardized format such as syslog entries or those outlined by the Common Event Expression initiative. If systems cannot generate logs in a standardized format, log normalization tools can be deployed to convert logs into such a format.			

#### 4.2.1.2 Ensure logging is configured (Manual)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

The `/etc/rsyslog.conf` and `/etc/rsyslog.d/*.conf` files specifies rules for logging and which files are to be used to log certain classes of messages.

**Rationale:**

A great deal of important security-related information is sent via `rsyslog` (e.g., successful and failed su attempts, failed login attempts, root login attempts, etc.).

**Audit:**

Review the contents of the `/etc/rsyslog.conf` and `/etc/rsyslog.d/*.conf` files to ensure appropriate logging is set. In addition, run the following command and verify that the log files are logging information:

```
# ls -l /var/log/
```

## Remediation:

Edit the following lines in the `/etc/rsyslog.conf` and `/etc/rsyslog.d/*.conf` files as appropriate for your environment:

```
*.emerg                                :omusrmsg:*
mail.*                                -/var/log/mail
mail.info                             -/var/log/mail.info
mail.warning                          -/var/log/mail.warn
mail.err                              /var/log/mail.err
news.crit                             -/var/log/news/news.crit
news.err                             -/var/log/news/news.err
news.notice                          -/var/log/news/news.notice
*.=warning;*.=err                    -/var/log/warn
*.crit                               /var/log/warn
*.*;mail.none;news.none              -/var/log/messages
local0,local1.*                      -/var/log/localmessages
local2,local3.*                      -/var/log/localmessages
local4,local5.*                      -/var/log/localmessages
local6,local7.*                      -/var/log/localmessages
```

Run the following command to reload the `rsyslogd` configuration:









```
# pkill -HUP rsyslogd
```

## References:

1. See the `rsyslog.conf(5)` man page for more information.



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.2 <u>Collect Audit Logs</u></b> Collect audit logs. Ensure that logging, per the enterprise's audit log management process, has been enabled across enterprise assets.			
v7	<b>6.2 <u>Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b>6.3 <u>Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b>6.2 <u>Ensure Audit Log Settings Support Appropriate Log Entry Formatting</u></b> Validate audit log settings for each hardware device and the software installed on it, ensuring that logs include a date, timestamp, source addresses, destination addresses, and various other useful elements of each packet and/or transaction. Systems should record logs in a standardized format such as syslog entries or those outlined by the Common Event Expression initiative. If systems cannot generate logs in a standardized format, log normalization tools can be deployed to convert logs into such a format.			

### 4.2.1.3 Ensure rsyslog default file permissions configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

rsyslog will create logfiles that do not already exist on the system. This setting controls what permissions will be applied to these newly created files.

#### Rationale:

It is important to ensure that log files have the correct permissions to ensure that sensitive data is archived and protected.

#### Audit:

Run the following command and verify that `$FileCreateMode` is 0640 or more restrictive:

```
# grep ^\($FileCreateMode /etc/rsyslog.conf /etc/rsyslog.d/*.conf
```

#### Remediation:

Edit the `/etc/rsyslog.conf` and `/etc/rsyslog.d/*.conf` files and set `$FileCreateMode` to 0640 or more restrictive:

```
$FileCreateMode 0640
```







#### References:

1. See the `rsyslog.conf(5)` man page for more information.

#### Additional Information:

You should also ensure this is not overridden with less restrictive settings in any `/etc/rsyslog.d/*` conf file.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

#### 4.2.1.4 Ensure rsyslog is configured to send logs to a remote log host (Automated)

##### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

##### Description:

The `rsyslog` utility supports the ability to send logs it gathers to a remote log host running `syslogd(8)` or to receive messages from remote hosts, reducing administrative overhead.

##### Rationale:

Storing log data on a remote host protects log integrity from local attacks. If an attacker gains root access on the local system, they could tamper with or remove log data that is stored on the local system

##### Audit:

Review the `/etc/rsyslog.conf` and `/etc/rsyslog.d/*.conf` files and verify that logs are sent to a central host (where `loghost.example.com` is the name of your central log host):

```
# grep "^*.*[^\I][^\I]*@" /etc/rsyslog.conf /etc/rsyslog.d/*.conf
*.* @@loghost.example.com
```

##### Remediation:

Edit the `/etc/rsyslog.conf` and `/etc/rsyslog.d/*.conf` files and add the following line (where `loghost.example.com` is the name of your central log host).

```
*.* @@loghost.example.com
```

Run the following command to reload the `rsyslogd` configuration:

```
# pkill -HUP rsyslogd
```

##### References:

1. See the `rsyslog.conf(5)` man page for more information.

### Additional Information:

The double "at" sign (@@) directs `rsyslog` to use TCP to send log messages to the server, which is a more reliable transport mechanism than the default UDP protocol.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.9 Centralize Audit Logs</b> Centralize, to the extent possible, audit log collection and retention across enterprise assets.		●	●
v7	<b>6.6 Deploy SIEM or Log Analytic tool</b> Deploy Security Information and Event Management (SIEM) or log analytic tool for log correlation and analysis.		●	●
v7	<b>6.8 Regularly Tune SIEM</b> On a regular basis, tune your SIEM system to better identify actionable events and decrease event noise.			●
v6	<b>6.6 Deploy A SIEM OR Log Analysis Tools For Aggregation And Correlation/Analysis</b> Deploy a SIEM (Security Information and Event Management) or log analytic tools for log aggregation and consolidation from multiple machines and for log correlation and analysis. Using the SIEM tool, system administrators and security personnel should devise profiles of common events from given systems so that they can tune detection to focus on unusual activity, avoid false positives, more rapidly identify anomalies, and prevent overwhelming analysts with insignificant alerts.			

#### 4.2.1.5 Ensure remote rsyslog messages are only accepted on designated log hosts. (Manual)

##### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

##### Description:

By default, `rsyslog` does not listen for log messages coming in from remote systems. The `ModLoad` tells `rsyslog` to load the `imtcp.so` module so it can listen over a network via TCP. The `InputTCPServerRun` option instructs `rsyslogd` to listen on the specified TCP port.

##### Rationale:

The guidance in the section ensures that remote log hosts are configured to only accept `rsyslog` data from hosts within the specified domain and that those systems that are not designed to be log hosts do not accept any remote `rsyslog` messages. This provides protection from spoofed log data and ensures that system administrators are reviewing reasonably complete syslog data in a central location.

##### Audit:

Run the following commands and verify the resulting lines are uncommented on designated log hosts and commented or removed on all others:

```
# grep '$ModLoad imtcp' /etc/rsyslog.conf /etc/rsyslog.d/*.conf
$ModLoad imtcp
# grep '$InputTCPServerRun' /etc/rsyslog.conf /etc/rsyslog.d/*.conf
$InputTCPServerRun 514
```

## Remediation:

For hosts that are designated as log hosts, edit the `/etc/rsyslog.conf` file and uncomment or add the following lines:

```
$ModLoad imtcp
$InputTCPServerRun 514
```

For hosts that are not designated as log hosts, edit the `/etc/rsyslog.conf` file and comment or remove the following lines:

```
# $ModLoad imtcp
# $InputTCPServerRun 514
```

Run the following command to reload the `rsyslogd` configuration:

```
# pkill -HUP rsyslogd
```








## References:

1. See the `rsyslog(8)` man page for more information.

## Additional Information:

The `$ModLoad imtcp` line can have the `.so` extension added to the end of the module, or use the full path to the module.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.1 Establish and Maintain an Audit Log Management Process</u></b> Establish and maintain an audit log management process that defines the enterprise's logging requirements. At a minimum, address the collection, review, and retention of audit logs for enterprise assets. Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v8	<b><u>8.9 Centralize Audit Logs</u></b> Centralize, to the extent possible, audit log collection and retention across enterprise assets.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>9.1 Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			



### 4.2.2 Configure *syslog-ng*

The `syslog-ng` software is recommended as a replacement for the `syslogd` daemon and provides improvements over `syslogd`, such as connection-oriented (i.e. TCP) transmission of logs, the option to log to database formats, and the encryption of log data en route to a central logging server. **Note:** This section only applies if `syslog-ng` is installed on the system.

#### 4.2.2.1 Ensure syslog-ng service is enabled (Automated)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

Once the `syslog-ng` package is installed it needs to be activated.

**Rationale:**

If the `syslog-ng` service is not activated the system may default to the `syslogd` service or lack logging instead.

**Audit:**

Run the following command to verify `syslog-ng` is enabled:

```
# systemctl is-enabled syslog-ng
enabled
```









Verify result is "enabled".

**Remediation:**

Run the following command to enable `syslog-ng`:

```
# update-rc.d syslog-ng enable
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.1 Establish and Maintain an Audit Log Management Process</u></b> Establish and maintain an audit log management process that defines the enterprise's logging requirements. At a minimum, address the collection, review, and retention of audit logs for enterprise assets. Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>6.2 Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b><u>6.3 Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b><u>6.2 Ensure Audit Log Settings Support Appropriate Log Entry Formatting</u></b> Validate audit log settings for each hardware device and the software installed on it, ensuring that logs include a date, timestamp, source addresses, destination addresses, and various other useful elements of each packet and/or transaction. Systems should record logs in a standardized format such as syslog entries or those outlined by the Common Event Expression initiative. If systems cannot generate logs in a standardized format, log normalization tools can be deployed to convert logs into such a format.			

#### 4.2.2.2 Ensure logging is configured (Manual)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

The `/etc/syslog-ng/syslog-ng.conf` file specifies rules for logging and which files are to be used to log certain classes of messages.

**Rationale:**

A great deal of important security-related information is sent via `syslog-ng` (e.g., successful and failed su attempts, failed login attempts, root login attempts, etc.).

**Audit:**

Review the contents of the `/etc/syslog-ng/syslog-ng.conf` file to ensure appropriate logging is set. In addition, run the following command and ensure that the log files are logging information:

```
# ls -l /var/log/
```

## Remediation:

Edit the log lines in the `/etc/syslog-ng/syslog-ng.conf` file as appropriate for your environment:

```
log { source(src); source(chroots); filter(f_console); destination(console);  
};  
log { source(src); source(chroots); filter(f_console); destination(xconsole);  
};  
log { source(src); source(chroots); filter(f_newscrit);  
destination(newscrit); };  
log { source(src); source(chroots); filter(f_newsserr); destination(newsserr);  
};  
log { source(src); source(chroots); filter(f_newsnotice);  
destination(newsnotice); };  
log { source(src); source(chroots); filter(f_mailinfo);  
destination(mailinfo); };  
log { source(src); source(chroots); filter(f_mailwarn);  
destination(mailwarn); };  
log { source(src); source(chroots); filter(f_mailerr); destination(mailerr);  
};  
log { source(src); source(chroots); filter(f_mail); destination(mail); };  
log { source(src); source(chroots); filter(f_acpid); destination(acpid);  
flags(final); };  
log { source(src); source(chroots); filter(f_acpid_full);  
destination(devnull); flags(final); };  
log { source(src); source(chroots); filter(f_acpid_old); destination(acpid);  
flags(final); };  
log { source(src); source(chroots); filter(f_netmgm); destination(netmgm);  
flags(final); };  
log { source(src); source(chroots); filter(f_local);  
destination(localmessages); };  
log { source(src); source(chroots); filter(f_messages);  
destination(messages); };  
log { source(src); source(chroots); filter(f_iptables);  
destination(firewall); };  
log { source(src); source(chroots); filter(f_warn); destination(warn); };
```







Run the following command to reload the `syslog-ng` configuration:

```
# pkill -HUP syslog-ng
```

## References:

1. See the `syslog-ng` man page for more information.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.2 <u>Collect Audit Logs</u></b> Collect audit logs. Ensure that logging, per the enterprise's audit log management process, has been enabled across enterprise assets.			
v7	<b>6.2 <u>Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v6	<b>6.2 <u>Ensure Audit Log Settings Support Appropriate Log Entry Formatting</u></b> Validate audit log settings for each hardware device and the software installed on it, ensuring that logs include a date, timestamp, source addresses, destination addresses, and various other useful elements of each packet and/or transaction. Systems should record logs in a standardized format such as syslog entries or those outlined by the Common Event Expression initiative. If systems cannot generate logs in a standardized format, log normalization tools can be deployed to convert logs into such a format.			

### 4.2.2.3 Ensure syslog-ng default file permissions configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

syslog-ng will create logfiles that do not already exist on the system. This setting controls what permissions will be applied to these newly created files.

#### Rationale:

It is important to ensure that log files exist and have the correct permissions to ensure that sensitive `syslog-ng` data is archived and protected.

#### Audit:

Run the following command and verify the `perm` option is `0640` or more restrictive:

```
# grep ^options /etc/syslog-ng/syslog-ng.conf
options { chain_hostnames(off); flush_lines(0); perm(0640); stats_freq(3600);
threaded(yes); };
```

#### Remediation:







Edit the `/etc/syslog-ng/syslog-ng.conf` and set `perm` option to `0640` or more restrictive:

```
options { chain_hostnames(off); flush_lines(0); perm(0640); stats_freq(3600);
threaded(yes); };
```

#### References:

1. See the `syslog-ng` man pages for more information.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>5.1 <u>Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			



#### 4.2.2.4 Ensure syslog-ng is configured to send logs to a remote log host (Manual)

##### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

##### Description:

The `syslog-ng` utility supports the ability to send logs it gathers to a remote log host or to receive messages from remote hosts, reducing administrative overhead.

##### Rationale:

Storing log data on a remote host protects log integrity from local attacks. If an attacker gains root access on the local system, they could tamper with or remove log data that is stored on the local system

##### Audit:

Review the `/etc/syslog-ng/syslog-ng.conf` file and verify that logs are sent to a central host (where `logfile.example.com` is the name of your central log host):

```
destination logserver { tcp("logfile.example.com" port(514)); };  
log { source(src); destination(logserver); };
```

##### Remediation:

Edit the `/etc/syslog-ng/syslog-ng.conf` file and add the following lines (where `logfile.example.com` is the name of your central log host).

```
destination logserver { tcp("logfile.example.com" port(514)); };  
log { source(src); destination(logserver); };
```

Run the following command to reload the `syslog-ng` configuration:

```
# pkill -HUP syslog-ng
```

##### References:

1. See the `syslog-ng.conf(5)` man page for more information.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.9 Centralize Audit Logs</u></b> Centralize, to the extent possible, audit log collection and retention across enterprise assets.		●	●
v7	<b><u>6.6 Deploy SIEM or Log Analytic tool</u></b> Deploy Security Information and Event Management (SIEM) or log analytic tool for log correlation and analysis.		●	●
v7	<b><u>6.8 Regularly Tune SIEM</u></b> On a regular basis, tune your SIEM system to better identify actionable events and decrease event noise.			●
v6	<b><u>6.6 Deploy A SIEM OR Log Analysis Tools For Aggregation And Correlation/Analysis</u></b> Deploy a SIEM (Security Information and Event Management) or log analytic tools for log aggregation and consolidation from multiple machines and for log correlation and analysis. Using the SIEM tool, system administrators and security personnel should devise profiles of common events from given systems so that they can tune detection to focus on unusual activity, avoid false positives, more rapidly identify anomalies, and prevent overwhelming analysts with insignificant alerts.			

#### 4.2.2.5 Ensure remote syslog-ng messages are only accepted on designated log hosts (Manual)

##### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

##### Description:

By default, `syslog-ng` does not listen for log messages coming in from remote systems.

##### Rationale:

The guidance in the section ensures that remote log hosts are configured to only accept `syslog-ng` data from hosts within the specified domain and that those systems that are not designed to be log hosts do not accept any remote `syslog-ng` messages. This provides protection from spoofed log data and ensures that system administrators are reviewing reasonably complete syslog data in a central location.

##### Audit:

Review the `/etc/syslog-ng/syslog-ng.conf` file and verify the following lines are configured appropriately on designated log hosts:

```
source net{ tcp(); };
destination remote { file("/var/log/remote/${FULLHOST}-log"); };
log { source(net); destination(remote); };
```

##### Remediation:

On designated log hosts edit the `/etc/syslog-ng/syslog-ng.conf` file and configure the following lines are appropriately:

```
source net{ tcp(); };
destination remote { file("/var/log/remote/${FULLHOST}-log"); };
log { source(net); destination(remote); };
```

On non designated log hosts edit the `/etc/syslog-ng/syslog-ng.conf` file and remove or edit any sources that accept network sourced log messages.








Run the following command to reload the `syslog-ng` configuration:

```
# pkill -HUP syslog-ng
```

## References:

1. See the syslog-ng(8) man page for more information.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>8.1 Establish and Maintain an Audit Log Management Process</u></b> Establish and maintain an audit log management process that defines the enterprise's logging requirements. At a minimum, address the collection, review, and retention of audit logs for enterprise assets. Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v8	<b><u>8.9 Centralize Audit Logs</u></b> Centralize, to the extent possible, audit log collection and retention across enterprise assets.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>9.1 Limit Open Ports, Protocols, and Services</u></b> Ensure that only ports, protocols, and services with validated business needs are running on each system.			

### 4.2.3 Ensure rsyslog or syslog-ng is installed (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `rsyslog` and `syslog-ng` software are recommended replacements to the original `syslogd` daemon which provide improvements over `syslogd`, such as connection-oriented (i.e. TCP) transmission of logs, the option to log to database formats, and the encryption of log data en route to a central logging server.

#### Rationale:

The security enhancements of `rsyslog` and `syslog-ng` such as connection-oriented (i.e. TCP) transmission of logs, the option to log to database formats, and the encryption of log data en route to a central logging server) justify installing and configuring the package.

#### Audit:

Verify either `rsyslog` or `syslog-ng` is installed. Depending on the package management in use one of the following command groups may provide the needed information:









```
# dpkg -s rsyslog
# dpkg -s syslog-ng
```

#### Remediation:

Install `rsyslog` or `syslog-ng` using one of the following commands:

```
# apt-get install rsyslog
# apt-get install syslog-ng
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.2 <u>Collect Audit Logs</u></b> Collect audit logs. Ensure that logging, per the enterprise's audit log management process, has been enabled across enterprise assets.			
v7	<b>6.2 <u>Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b>6.3 <u>Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b>6.2 <u>Ensure Audit Log Settings Support Appropriate Log Entry Formatting</u></b> Validate audit log settings for each hardware device and the software installed on it, ensuring that logs include a date, timestamp, source addresses, destination addresses, and various other useful elements of each packet and/or transaction. Systems should record logs in a standardized format such as syslog entries or those outlined by the Common Event Expression initiative. If systems cannot generate logs in a standardized format, log normalization tools can be deployed to convert logs into such a format.			

## 4.2.4 Ensure permissions on all logfiles are configured (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Log files stored in /var/log/ contain logged information from many services on the system, or on log hosts others as well.

### Rationale:

It is important to ensure that log files have the correct permissions to ensure that sensitive data is archived and protected.

### Audit:

Run the following command and verify that other has no permissions on any files and group does not have write or execute permissions on any files:

```
# find /var/log -type f -ls
```

### Remediation:

Run the following command to set permissions on all existing log files:







```
# chmod -R g-wx,o-rwx /var/log/*
```

### Additional Information:

You may also need to change the configuration for your logging software or services for any logs that had incorrect permissions.

Some software or environments may re-set the permissions on these files. Site policy should dictate the appropriate setting for your implementation.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>5.1 <u>Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			



### *4.3 Ensure logrotate is configured (Manual)*

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

The system includes the capability of rotating log files regularly to avoid filling up the system with logs or making the logs unmanageable large.

**Rationale:**

By keeping the log files smaller and more manageable, a system administrator can easily archive these files to another system and spend less time looking through inordinately large log files.

**Audit:**

Review `/etc/logrotate.conf` and `/etc/logrotate.d/*` and verify logs are rotated according to site policy.





**Remediation:**

Edit `/etc/logrotate.conf` and `/etc/logrotate.d/*` to ensure logs are rotated according to site policy.

**Additional Information:**

If no `maxage` setting is set for logrotate a situation can occur where logrotate is interrupted and fails to delete rotated logfiles. It is recommended to set this to a value greater than the longest any log file should exist on your system to ensure that any such logfile is removed but standard rotation settings are not overridden.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.3 <u>Ensure Adequate Audit Log Storage</u></b> Ensure that logging destinations maintain adequate storage to comply with the enterprise's audit log management process.			
v7	<b>6.4 <u>Ensure adequate storage for logs</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated.			
v6	<b>6.3 <u>Ensure Audit Logging Systems Are Not Subject To Loss (i.e. rotation/archive)</u></b> Ensure that all systems that store logs have adequate storage space for the logs generated on a regular basis, so that log files will not fill up between log rotation intervals. The logs must be archived and digitally signed on a periodic basis.			

## ***5 Access, Authentication and Authorization***

## ***5.1 Configure cron***

### 5.1.1 Ensure cron daemon is enabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `cron` daemon is used to execute batch jobs on the system.

#### Rationale:

While there may not be user jobs that need to be run on the system, the system does have maintenance jobs that may include security monitoring that have to run, and `cron` is used to execute them.

#### Audit:

Run the following command to verify `cron` is enabled:

```
# systemctl is-enabled cron
enabled
```







Verify result is "enabled".

#### Remediation:

Run the following command to enable `cron`:

```
# systemctl enable cron
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>6 Maintenance, Monitoring, and Analysis of Audit Logs</u></b> Maintenance, Monitoring, and Analysis of Audit Logs			

### 5.1.2 Ensure permissions on /etc/crontab are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/crontab` file is used by `cron` to control its own jobs. The commands in this item make sure that root is the user and group owner of the file and that only the owner can access the file.

#### Rationale:

This file contains information on what system jobs are run by cron. Write access to these files could provide unprivileged users with the ability to elevate their privileges. Read access to these files could provide users with the ability to gain insight on system jobs that run on the system and could provide them a way to gain unauthorized privileged access.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other`:







```
# stat /etc/crontab
Access: (0600/-rw-----)  Uid: (    0/   root)   Gid: (    0/   root)
```

#### Remediation:

Run the following commands to set ownership and permissions on `/etc/crontab`:

```
# chown root:root /etc/crontab
# chmod og-rwx /etc/crontab
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			



### 5.1.3 Ensure permissions on /etc/cron.hourly are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

This directory contains system `cron` jobs that need to run on an hourly basis. The files in this directory cannot be manipulated by the `crontab` command, but are instead edited by system administrators using a text editor. The commands below restrict read/write and search access to user and group `root`, preventing regular users from accessing this directory.

#### Rationale:

Granting write access to this directory for non-privileged users could provide them the means for gaining unauthorized elevated privileges. Granting read access to this directory could give an unprivileged user insight in how to gain elevated privileges or circumvent auditing controls.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other` :







```
# stat /etc/cron.hourly
Access: (0700/drwx-----)  Uid: (    0/    root)  Gid: (    0/    root)
```

#### Remediation:

Run the following commands to set ownership and permissions on `/etc/cron.hourly` :

```
# chown root:root /etc/cron.hourly
# chmod og-rwx /etc/cron.hourly
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### 5.1.4 Ensure permissions on /etc/cron.daily are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/cron.daily` directory contains system cron jobs that need to run on a daily basis. The files in this directory cannot be manipulated by the `crontab` command, but are instead edited by system administrators using a text editor. The commands below restrict read/write and search access to user and group root, preventing regular users from accessing this directory.

#### Rationale:

Granting write access to this directory for non-privileged users could provide them the means for gaining unauthorized elevated privileges. Granting read access to this directory could give an unprivileged user insight in how to gain elevated privileges or circumvent auditing controls.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other` :







```
# stat /etc/cron.daily
Access: (0700/drwx-----)  Uid: (    0/    root)   Gid: (    0/    root)
```

#### Remediation:

Run the following commands to set ownership and permissions on `/etc/cron.daily` :

```
# chown root:root /etc/cron.daily
# chmod og-rwx /etc/cron.daily
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### 5.1.5 Ensure permissions on /etc/cron.weekly are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/cron.weekly` directory contains system cron jobs that need to run on a weekly basis. The files in this directory cannot be manipulated by the `crontab` command, but are instead edited by system administrators using a text editor. The commands below restrict read/write and search access to user and group root, preventing regular users from accessing this directory.

#### Rationale:

Granting write access to this directory for non-privileged users could provide them the means for gaining unauthorized elevated privileges. Granting read access to this directory could give an unprivileged user insight in how to gain elevated privileges or circumvent auditing controls.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other` :







```
# stat /etc/cron.weekly
Access: (0700/drwx-----)  Uid: (    0/    root)  Gid: (    0/    root)
```

#### Remediation:

Run the following commands to set ownership and permissions on `/etc/cron.weekly` :

```
# chown root:root /etc/cron.weekly
# chmod og-rwx /etc/cron.weekly
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### 5.1.6 Ensure permissions on /etc/cron.monthly are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/cron.monthly` directory contains system cron jobs that need to run on a monthly basis. The files in this directory cannot be manipulated by the `crontab` command, but are instead edited by system administrators using a text editor. The commands below restrict read/write and search access to user and group root, preventing regular users from accessing this directory.

#### Rationale:

Granting write access to this directory for non-privileged users could provide them the means for gaining unauthorized elevated privileges. Granting read access to this directory could give an unprivileged user insight in how to gain elevated privileges or circumvent auditing controls.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other` :







```
# stat /etc/cron.monthly
Access: (0700/drwx-----)  Uid: (    0/    root)  Gid: (    0/    root)
```

#### Remediation:

Run the following commands to set ownership and permissions on `/etc/cron.monthly` :

```
# chown root:root /etc/cron.monthly
# chmod og-rwx /etc/cron.monthly
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b>5.1 <u>Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			



### 5.1.7 Ensure permissions on /etc/cron.d are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/cron.d` directory contains system `cron` jobs that need to run in a similar manner to the hourly, daily weekly and monthly jobs from `/etc/crontab`, but require more granular control as to when they run. The files in this directory cannot be manipulated by the `crontab` command, but are instead edited by system administrators using a text editor. The commands below restrict read/write and search access to user and group root, preventing regular users from accessing this directory.

#### Rationale:

Granting write access to this directory for non-privileged users could provide them the means for gaining unauthorized elevated privileges. Granting read access to this directory could give an unprivileged user insight in how to gain elevated privileges or circumvent auditing controls.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other` :







```
# stat /etc/cron.d
Access: (0700/drwx-----)  Uid: (    0/    root)   Gid: (    0/    root)
```

#### Remediation:

Run the following commands to set ownership and permissions on `/etc/cron.d`:

```
# chown root:root /etc/cron.d
# chmod og-rwx /etc/cron.d
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### 5.1.8 Ensure at/cron is restricted to authorized users (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Configure `/etc/cron.allow` and `/etc/at.allow` to allow specific users to use these services. If `/etc/cron.allow` or `/etc/at.allow` do not exist, then `/etc/at.deny` and `/etc/cron.deny` are checked. Any user not specifically defined in those files is allowed to use at and cron. By removing the files, only users in `/etc/cron.allow` and `/etc/at.allow` are allowed to use at and cron. Note that even though a given user is not listed in `cron.allow`, cron jobs can still be run as that user. The `cron.allow` file only controls administrative access to the `crontab` command for scheduling and modifying cron jobs.

#### Rationale:

On many systems, only the system administrator is authorized to schedule cron jobs. Using the `cron.allow` file to control who can run cron jobs enforces this policy. It is easier to manage an allow list than a deny list. In a deny list, you could potentially add a user ID to the system and forget to add it to the deny files.

#### Audit:

Run the following commands and ensure `/etc/cron.deny` and `/etc/at.deny` do not exist:

```
# stat /etc/cron.deny
stat: cannot stat `/etc/cron.deny': No such file or directory
# stat /etc/at.deny
stat: cannot stat `/etc/at.deny': No such file or directory
```

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other` for both `/etc/cron.allow` and `/etc/at.allow`:




```
# stat /etc/cron.allow
Access: (0600/-rw-----)  Uid: (   0/   root)  Gid: (   0/   root)
# stat /etc/at.allow
Access: (0600/-rw-----)  Uid: (   0/   root)  Gid: (   0/   root)
```

## Remediation:

Run the following commands to remove `/etc/cron.deny` and `/etc/at.deny` and create and set permissions and ownership for `/etc/cron.allow` and `/etc/at.allow`:

```
# rm /etc/cron.deny
# rm /etc/at.deny
# touch /etc/cron.allow
# touch /etc/at.allow
# chmod og-rwx /etc/cron.allow
# chmod og-rwx /etc/at.allow
# chown root:root /etc/cron.allow
# chown root:root /etc/at.allow
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			

## 5.2 SSH Server Configuration

SSH is a secure, encrypted replacement for common login services such as `telnet`, `ftp`, `rlogin`, `rsh`, and `rcp`. It is strongly recommended that sites abandon older clear-text login protocols and use SSH to prevent session hijacking and sniffing of sensitive data off the network.

**Note:** The recommendations in this section only apply if the SSH daemon is installed on the system, if remote access is not required the SSH daemon can be removed and this section skipped.

**Note:** Once all configuration changes have been made to `/etc/ssh/sshd_config`, the `sshd` configuration must be reloaded:

```
# systemctl reload sshd
```

### 5.2.1 Ensure permissions on /etc/ssh/sshd\_config are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/ssh/sshd_config` file contains configuration specifications for `sshd`. The command below sets the owner and group of the file to `root`.

#### Rationale:

The `/etc/ssh/sshd_config` file needs to be protected from unauthorized changes by non-privileged users.

#### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` does not grant permissions to `group` or `other`:







```
# stat /etc/ssh/sshd_config
Access: (0600/-rw-----)  Uid: (   0/   root)   Gid: (   0/   root)
```

#### Remediation:

Run the following commands to set ownership and permissions on `/etc/ssh/sshd_config`:

```
# chown root:root /etc/ssh/sshd_config
# chmod og-rwx /etc/ssh/sshd_config
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### *5.2.2 Ensure permissions on SSH private host key files are configured (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

An SSH private key is one of two files used in SSH public key authentication. In this authentication method, The possession of the private key is proof of identity. Only a private key that corresponds to a public key will be able to authenticate successfully. The private keys need to be stored and handled carefully, and no copies of the private key should be distributed.

#### **Rationale:**

If an unauthorized user obtains the private SSH host key file, the host could be impersonated



## Audit:

Run the following command and verify Uid is 0/root and and Gid is 0/root. Ensure group and other do not have permissions

```
# find /etc/ssh -xdev -type f -name 'ssh_host_*_key' -exec stat {} \;

  File: '/etc/ssh/ssh_host_rsa_key'
  Size: 1679          Blocks: 8          IO Block: 4096   regular file
Device: ca01h/51713d  Inode: 8628138      Links: 1
Access: (0600/-rw-----)  Uid: (  0/   root)   Gid: (  0/   root)
Access: 2018-10-22 18:24:56.861750616 +0000
Modify: 2018-10-22 18:24:56.861750616 +0000
Change: 2018-10-22 18:24:56.873750616 +0000
Birth: -
  File: '/etc/ssh/ssh_host_ecdsa_key'
  Size: 227          Blocks: 8          IO Block: 4096   regular file
Device: ca01h/51713d  Inode: 8631760      Links: 1
Access: (0600/-rw-----)  Uid: (  0/   root)   Gid: (  0/   root)
Access: 2018-10-22 18:24:56.897750616 +0000
Modify: 2018-10-22 18:24:56.897750616 +0000
Change: 2018-10-22 18:24:56.905750616 +0000
Birth: -
  File: '/etc/ssh/ssh host ed25519 key'
  Size: 387          Blocks: 8          IO Block: 4096   regular file
Device: ca01h/51713d  Inode: 8631762      Links: 1
Access: (0600/-rw-----)  Uid: (  0/   root)   Gid: (  0/   root)
Access: 2018-10-22 18:24:56.945750616 +0000
Modify: 2018-10-22 18:24:56.945750616 +0000
Change: 2018-10-22 18:24:56.957750616 +0000
Birth: -
```







## Remediation:

Run the following commands to set ownership and permissions on the private SSH host key files

```
# find /etc/ssh -xdev -type f -name 'ssh_host_*_key' -exec chown root:root {} \;

# find /etc/ssh -xdev -type f -name 'ssh_host_*_key' -exec chmod 0600 {} \;
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			

### *5.2.3 Ensure permissions on SSH public host key files are configured (Automated)*

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

An SSH public key is one of two files used in SSH public key authentication. In this authentication method, a public key is a key that can be used for verifying digital signatures generated using a corresponding private key. Only a public key that corresponds to a private key will be able to authenticate successfully.

**Rationale:**

If a public host key file is modified by an unauthorized user, the SSH service may be compromised.

## Audit:

Run the following command and verify Access does not grant write or execute permissions to group or other for all returned files

```
# find /etc/ssh -xdev -type f -name 'ssh_host_*_key.pub' -exec stat {} \;

  File: '/etc/ssh/ssh_host_rsa_key.pub'
  Size: 382          Blocks: 8          IO Block: 4096   regular file
Device: ca01h/51713d  Inode: 8631758      Links: 1
Access: (0644/-rw-r--r--)  Uid: (  0/   root)   Gid: (  0/   root)
Access: 2018-10-22 18:24:56.861750616 +0000
Modify: 2018-10-22 18:24:56.861750616 +0000
Change: 2018-10-22 18:24:56.881750616 +0000
Birth: -
  File: '/etc/ssh/ssh_host_ecdsa_key.pub'
  Size: 162          Blocks: 8          IO Block: 4096   regular file
Device: ca01h/51713d  Inode: 8631761      Links: 1
Access: (0644/-rw-r--r--)  Uid: (  0/   root)   Gid: (  0/   root)
Access: 2018-10-22 18:24:56.897750616 +0000
Modify: 2018-10-22 18:24:56.897750616 +0000
Change: 2018-10-22 18:24:56.917750616 +0000
Birth: -
  File: '/etc/ssh/ssh_host_ed25519_key.pub'
  Size: 82           Blocks: 8          IO Block: 4096   regular file
Device: ca01h/51713d  Inode: 8631763      Links: 1
Access: (0644/-rw-r--r--)  Uid: (  0/   root)   Gid: (  0/   root)
Access: 2018-10-22 18:24:56.945750616 +0000
Modify: 2018-10-22 18:24:56.945750616 +0000
Change: 2018-10-22 18:24:56.961750616 +0000
Birth: -
```







## Remediation:

Run the following commands to set permissions and ownership on the SSH host public key files

```
# find /etc/ssh -xdev -type f -name 'ssh_host_*_key.pub' -exec chmod 0644 {} \;

#find /etc/ssh -xdev -type f -name 'ssh_host_*_key.pub' -exec chown root:root {} \;
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## 5.2.4 Ensure SSH Protocol is set to 2 (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

SSH supports two different and incompatible protocols: SSH1 and SSH2. SSH1 was the original protocol and was subject to security issues. SSH2 is more advanced and secure.

### Rationale:

SSH v1 suffers from insecurities that do not affect SSH v2.

### Audit:

Run the following command and verify that output matches:

```
# sshd -T | grep protocol  
Protocol 2
```

### Remediation:







Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
Protocol 2
```

### Default Value:

Protocol 2

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>3.4 Use Only Secure Channels For Remote System Administration</u></b> Perform all remote administration of servers, workstation, network devices, and similar equipment over secure channels. Protocols such as telnet, VNC, RDP, or others that do not actively support strong encryption should only be used if they are performed over a secondary encryption channel, such as SSL, TLS or IPSEC.			

### 5.2.5 Ensure SSH LogLevel is appropriate (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

`INFO` level is the basic level that only records login activity of SSH users. In many situations, such as Incident Response, it is important to determine when a particular user was active on a system. The logout record can eliminate those users who disconnected, which helps narrow the field.

`VERBOSE` level specifies that login and logout activity as well as the key fingerprint for any SSH key used for login will be logged. This information is important for SSH key management, especially in legacy environments.

#### Rationale:

SSH provides several logging levels with varying amounts of verbosity. `DEBUG` is specifically **not** recommended other than strictly for debugging SSH communications since it provides so much data that it is difficult to identify important security information.

#### Audit:

Run the following command and verify that output matches:

```
# sshd -T | grep loglevel  
LogLevel VERBOSE  
  
OR  
  
loglevel INFO
```

#### Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
LogLevel VERBOSE
```

OR

```
LogLevel INFO
```













**Default Value:**

LogLevel INFO

**References:**

1. [https://www.ssh.com/ssh/sshd\\_config/](https://www.ssh.com/ssh/sshd_config/)

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>8.2 <u>Collect Audit Logs</u></b> Collect audit logs. Ensure that logging, per the enterprise's audit log management process, has been enabled across enterprise assets.			
v8	<b>8.5 <u>Collect Detailed Audit Logs</u></b> Configure detailed audit logging for enterprise assets containing sensitive data. Include event source, date, username, timestamp, source addresses, destination addresses, and other useful elements that could assist in a forensic investigation.			
v7	<b>6.2 <u>Activate audit logging</u></b> Ensure that local logging has been enabled on all systems and networking devices.			
v7	<b>6.3 <u>Enable Detailed Logging</u></b> Enable system logging to include detailed information such as an event source, date, user, timestamp, source addresses, destination addresses, and other useful elements.			
v6	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			

## 5.2.6 Ensure SSH X11 forwarding is disabled (Automated)

### Profile Applicability:

- Level 1 - Workstation
- Level 2 - Server

### Description:

The X11Forwarding parameter provides the ability to tunnel X11 traffic through the connection to enable remote graphic connections.

### Rationale:

Disable X11 forwarding unless there is an operational requirement to use X11 applications directly. There is a small risk that the remote X11 servers of users who are logged in via SSH with X11 forwarding could be compromised by other users on the X11 server. Note that even if X11 forwarding is disabled, users can always install their own forwarders.

### Audit:

Run the following command and verify that output matches:

```
# sshd -T | grep x11forwarding
X11Forwarding no
```

### Remediation:





Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
X11Forwarding no
```

### Default Value:

X11Forwarding yes

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.8 Uninstall or Disable Unnecessary Services on Enterprise Assets and Software</u></b> Uninstall or disable unnecessary services on enterprise assets and software, such as an unused file sharing service, web application module, or service function.			
v7	<b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b> Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

### 5.2.7 Ensure SSH MaxAuthTries is set to 4 or less (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `MaxAuthTries` parameter specifies the maximum number of authentication attempts permitted per connection. When the login failure count reaches half the number, error messages will be written to the `syslog` file detailing the login failure.

#### Rationale:

Setting the `MaxAuthTries` parameter to a low number will minimize the risk of successful brute force attacks to the SSH server. While the recommended setting is 4, set the number based on site policy.

#### Audit:

Run the following command and verify that output `MaxAuthTries` is 4 or less:

```
# sshd -T | grep maxauthtries  
MaxAuthTries 4
```

#### Remediation:





Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
MaxAuthTries 4
```

#### Default Value:

`MaxAuthTries 6`

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16.13 Alert on Account Login Behavior Deviation</u></b> Alert when users deviate from normal login behavior, such as time-of-day, workstation location and duration.			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

### 5.2.8 Ensure SSH IgnoreRhosts is enabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `IgnoreRhosts` parameter specifies that `.rhosts` and `.shosts` files will not be used in `RhostsRSAAuthentication` or `HostbasedAuthentication`.

#### Rationale:

Setting this parameter forces users to enter a password when authenticating with ssh.

#### Audit:

Run the following command and verify that output matches:

```
# sshd -T | grep ignorerhosts  
IgnoreRhosts yes
```

#### Remediation:






Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
IgnoreRhosts yes
```

#### Default Value:

`IgnoreRhosts yes`

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b></p> <p>Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.</p>			
v7	<p><b><u>9.2 Ensure Only Approved Ports, Protocols and Services Are Running</u></b></p> <p>Ensure that only network ports, protocols, and services listening on a system with validated business needs, are running on each system.</p>			
v6	<p><b><u>9 Limitation and Control of Network Ports, Protocols, and Services</u></b></p> <p>Limitation and Control of Network Ports, Protocols, and Services</p>			

### 5.2.9 Ensure SSH HostbasedAuthentication is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `HostbasedAuthentication` parameter specifies if authentication is allowed through trusted hosts via the user of `.rhosts`, or `/etc/hosts.equiv`, along with successful public key client host authentication. This option only applies to SSH Protocol Version 2.

#### Rationale:

Even though the `.rhosts` files are ineffective if support is disabled in `/etc/pam.conf`, disabling the ability to use `.rhosts` files in SSH provides an additional layer of protection .

#### Audit:

Run the following command and verify that output matches:

```
# sshd -T | grep hostbasedauthentication
HostbasedAuthentication no
```

#### Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:






```
HostbasedAuthentication no
```

#### Default Value:

HostbasedAuthentication no



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16.3 Require Multi-factor Authentication</u></b> Require multi-factor authentication for all user accounts, on all systems, whether managed onsite or by a third-party provider.			
v6	<b><u>9 Limitation and Control of Network Ports, Protocols, and Services</u></b> Limitation and Control of Network Ports, Protocols, and Services			

### 5.2.10 Ensure SSH root login is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `PermitRootLogin` parameter specifies if the root user can log in using `ssh(1)`. The default is `no`.

#### Rationale:

Disallowing root logins over SSH requires system admins to authenticate using their own individual account, then escalating to root via `sudo` or `su`. This in turn limits opportunity for non-repudiation and provides a clear audit trail in the event of a security incident

#### Audit:

Run the following command and verify that output matches:

```
# sshd -T | grep permitrootlogin  
PermitRootLogin no
```

#### Remediation:







Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
PermitRootLogin no
```

#### Default Value:

`PermitRootLogin without-password`

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>4.3 Ensure the Use of Dedicated Administrative Accounts</u></b> Ensure that all users with administrative account access use a dedicated or secondary account for elevated activities. This account should only be used for administrative activities and not internet browsing, email, or similar activities.			
v6	<b><u>5.8 Administrators Should Not Directly Log In To A System (i.e. use RunAs/sudo)</u></b> Administrators should be required to access a system using a fully logged and non-administrative account. Then, once logged on to the machine without administrative privileges, the administrator should transition to administrative privileges using tools such as Sudo on Linux/UNIX, RunAs on Windows, and other similar facilities for other types of systems.			

### 5.2.11 Ensure SSH PermitEmptyPasswords is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `PermitEmptyPasswords` parameter specifies if the SSH server allows login to accounts with empty password strings.

#### Rationale:

Disallowing remote shell access to accounts that have an empty password reduces the probability of unauthorized access to the system

#### Audit:

Run the following command and verify that output matches:

```
# sshd -T | grep permitemptypasswords
PermitEmptyPasswords no
```

#### Remediation:






Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
PermitEmptyPasswords no
```

#### Default Value:

`PermitEmptyPasswords no`

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16.3 Require Multi-factor Authentication</u></b> Require multi-factor authentication for all user accounts, on all systems, whether managed onsite or by a third-party provider.			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

### 5.2.12 Ensure SSH PermitUserEnvironment is disabled (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `PermitUserEnvironment` option allows users to present environment options to the `ssh` daemon.

#### Rationale:

Permitting users the ability to set environment variables through the SSH daemon could potentially allow users to bypass security controls (e.g. setting an execution path that has `ssh` executing trojan'd programs)

#### Audit:

Run the following command and verify that output matches:

```
# sshd -T | grep permituserenvironment
PermitUserEnvironment no
```

#### Remediation:







Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
PermitUserEnvironment no
```

#### Default Value:

`PermitUserEnvironment no`

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

### *5.2.13 Ensure only strong ciphers are used (Automated)*

#### **Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

#### **Description:**

This variable limits the ciphers that SSH can use during communication.

#### **Rationale:**

Weak ciphers that are used for authentication to the cryptographic module cannot be relied upon to provide confidentiality or integrity, and system data may be compromised

The DES, Triple DES, and Blowfish ciphers, as used in SSH, have a birthday bound of approximately four billion blocks, which makes it easier for remote attackers to obtain cleartext data via a birthday attack against a long-duration encrypted session, aka a "Sweet32" attack

The RC4 algorithm, as used in the TLS protocol and SSL protocol, does not properly combine state data with key data during the initialization phase, which makes it easier for remote attackers to conduct plaintext-recovery attacks against the initial bytes of a stream by sniffing network traffic that occasionally relies on keys affected by the Invariance Weakness, and then using a brute-force approach involving LSB values, aka the "Bar Mitzvah" issue

The passwords used during an SSH session encrypted with RC4 can be recovered by an attacker who is able to capture and replay the session

Error handling in the SSH protocol; Client and Server, when using a block cipher algorithm in Cipher Block Chaining (CBC) mode, makes it easier for remote attackers to recover certain plaintext data from an arbitrary block of ciphertext in an SSH session via unknown vectors

The mm\_newkeys\_from\_blob function in monitor\_wrap.c, when an AES-GCM cipher is used, does not properly initialize memory for a MAC context data structure, which allows remote authenticated users to bypass intended ForceCommand and login-shell restrictions via packet data that provides a crafted callback address



## Audit:

Run the following command and verify that output does not contain any of the listed weak ciphers

```
# sshd -T | grep ciphers
```

## Weak Ciphers:

```
3des-cbc  
aes128-cbc  
aes192-cbc  
aes256-cbc  
arcfour  
arcfour128  
arcfour256  
blowfish-cbc  
cast128-cbc  
rijndael-cbc@lysator.liu.se
```

## Remediation:

Edit the `/etc/ssh/sshd_config` file add/modify the `Ciphers` line to contain a comma separated list of the site approved ciphers

Example:

```
Ciphers chacha20-poly1305@openssh.com,aes256-gcm@openssh.com,aes128-gcm@openssh.com,aes256-ctr,aes192-ctr,aes128-ctr
```

## Default Value:

```
Ciphers chacha20-poly1305@openssh.com,aes128-ctr,aes192-ctr,aes256-ctr,aes128-gcm@openssh.com,aes256-gcm@openssh.com,aes128-cbc,aes192-cbc,aes256-cbc,blowfish-cbc,cast128-cbc,3des-cbc
```

## References:

1. <https://nvd.nist.gov/vuln/detail/CVE-2016-2183>
2. <https://nvd.nist.gov/vuln/detail/CVE-2015-2808>
3. <https://nvd.nist.gov/vuln/detail/CVE-2008-5161>
4. <https://nvd.nist.gov/vuln/detail/CVE-2013-4548>
5. <https://www.kb.cert.org/vuls/id/565052>
6. <https://www.openssh.com/txt/cbc.adv>
7. SSHD\_CONFIG(5)

### Additional Information:

Some organizations may have stricter requirements for approved ciphers. Ensure that ciphers used are in compliance with site policy.





The only ciphers currently FIPS 140-2 compliant are: aes256-ctr,aes192-ctr,aes128-ctr

CVE-2013-4548 referenced above applies to OpenSSH versions 6.2 and 6.3. If running these versions of Open SSH, Please upgrade to version 6.4 or later to fix the vulnerability, or disable AES-GCM in the server configuration.

The Following are the supported ciphers in openSSH 7:

```
3des-cbc
aes128-cbc
aes192-cbc
aes256-cbc
aes128-ctr
aes192-ctr
aes256-ctr
aes128-gcm@openssh.com
aes256-gcm@openssh.com
arcfour
arcfour128
arcfour256
blowfish-cbc
cast128-cbc
rijndael-cbc@lysator.liu.se
chacha20-poly1305@openssh.com
```

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.10 <u>Encrypt Sensitive Data in Transit</u></b> Encrypt sensitive data in transit. Example implementations can include: Transport Layer Security (TLS) and Open Secure Shell (OpenSSH).			
v7	<b>14.4 <u>Encrypt All Sensitive Information in Transit</u></b> Encrypt all sensitive information in transit.			
v6	<b>3.4 <u>Use Only Secure Channels For Remote System Administration</u></b> Perform all remote administration of servers, workstation, network devices, and similar equipment over secure channels. Protocols such as telnet, VNC, RDP, or others that do not actively support strong encryption should only be used if they are performed over a secondary encryption channel, such as SSL, TLS or IPSEC.			

### 5.2.14 Ensure only strong MAC algorithms are used (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

This variable limits the types of MAC algorithms that SSH can use during communication.

#### Rationale:

MD5 and 96-bit MAC algorithms are considered weak and have been shown to increase exploitability in SSH downgrade attacks. Weak algorithms continue to have a great deal of attention as a weak spot that can be exploited with expanded computing power. An attacker that breaks the algorithm could take advantage of a MiTM position to decrypt the SSH tunnel and capture credentials and information

#### Audit:

Run the following command and verify that output does not contain any of the listed weak MAC algorithms:

```
# sshd -T | grep -i "MACs"
```

Weak MAC algorithms:

```
hmac-md5
hmac-md5-96
hmac-ripemd160
hmac-sha1
hmac-sha1-96
umac-64@openssh.com
umac-128@openssh.com
hmac-md5-etm@openssh.com
hmac-md5-96-etm@openssh.com
hmac-ripemd160-etm@openssh.com
hmac-sha1-etm@openssh.com
hmac-sha1-96-etm@openssh.com
umac-64-etm@openssh.com
umac-128-etm@openssh.com
```

## Remediation:

Edit the `/etc/ssh/sshd_config` file and add/modify the MACs line to contain a comma separated list of the site approved MACs

Example:

```
MACs hmac-sha2-512-etm@openssh.com,hmac-sha2-256-etm@openssh.com,hmac-sha2-512,hmac-sha2-256
```

## Default Value:

```
macs hmac-sha1,hmac-sha1-96,hmac-sha2-256,hmac-sha2-512,hmac-md5,hmac-md5-96,hmac-ripemd160,hmac-ripemd160@openssh.com,umac-64@openssh.com,umac-128@openssh.com,hmac-sha1-etm@openssh.com,hmac-sha1-96-etm@openssh.com,hmac-sha2-256-etm@openssh.com,hmac-sha2-512-etm@openssh.com,hmac-md5-etm@openssh.com,hmac-md5-96-etm@openssh.com,hmac-ripemd160-etm@openssh.com,umac-64-etm@openssh.com,umac-128-etm@openssh.com
```

## References:

1. More information on SSH downgrade attacks can be found here:  
<http://www.mitls.org/pages/attacks/SLOTH>

### **Additional Information:**







Some organizations may have stricter requirements for approved MACs. Ensure that MACs used are in compliance with site policy.

The only MACs currently FIPS 140-2 approved are hmac-sha2-256 and hmac-sha2-512

The Supported MACs are:

```
hmac-md5
hmac-md5-96
hmac-ripemd160
hmac-sha1
hmac-sha1-96
hmac-sha2-256
hmac-sha2-512
umac-64@openssh.com
umac-128@openssh.com
hmac-md5-etm@openssh.com
hmac-md5-96-etm@openssh.com
hmac-ripemd160-etm@openssh.com
hmac-sha1-etm@openssh.com
hmac-sha1-96-etm@openssh.com
hmac-sha2-256-etm@openssh.com
hmac-sha2-512-etm@openssh.com
umac-64-etm@openssh.com
umac-128-etm@openssh.com
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.10 <u>Encrypt Sensitive Data in Transit</u></b> Encrypt sensitive data in transit. Example implementations can include: Transport Layer Security (TLS) and Open Secure Shell (OpenSSH).			
v7	<b>14.4 <u>Encrypt All Sensitive Information in Transit</u></b> Encrypt all sensitive information in transit.			
v7	<b>16.5 <u>Encrypt Transmittal of Username and Authentication Credentials</u></b> Ensure that all account usernames and authentication credentials are transmitted across networks using encrypted channels.			
v6	<b>3.4 <u>Use Only Secure Channels For Remote System Administration</u></b> Perform all remote administration of servers, workstation, network devices, and similar equipment over secure channels. Protocols such as telnet, VNC, RDP, or others that do not actively support strong encryption should only be used if they are performed over a secondary encryption channel, such as SSL, TLS or IPSEC.			

### 5.2.15 Ensure only strong Key Exchange algorithms are used (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Key exchange is any method in cryptography by which cryptographic keys are exchanged between two parties, allowing use of a cryptographic algorithm. If the sender and receiver wish to exchange encrypted messages, each must be equipped to encrypt messages to be sent and decrypt messages received

#### Rationale:

Key exchange methods that are considered weak should be removed. A key exchange method may be weak because too few bits are used, or the hashing algorithm is considered too weak. Using weak algorithms could expose connections to man-in-the-middle attacks

#### Audit:

Run the following command and verify that output does not contain any of the listed weak Key Exchange algorithms

```
# sshd -T | grep kexalgorithms
```

Weak Key Exchange Algorithms:

```
diffie-hellman-group1-sha1  
diffie-hellman-group14-sha1  
diffie-hellman-group-exchange-sha1
```

#### Remediation:

Edit the /etc/ssh/sshd\_config file add/modify the KexAlgorithms line to contain a comma separated list of the site approved key exchange algorithms

Example:

```
KexAlgorithms curve25519-sha256@libssh.org,ecdh-sha2-nistp521,ecdh-sha2-nistp384,ecdh-sha2-nistp256,diffie-hellman-group-exchange-sha256
```

### Default Value:

KexAlgorithms curve25519-sha256@libssh.org,ecdh-sha2-nistp256,ecdh-sha2-nistp384,ecdh-sha2-nistp521,diffie-hellman-group-exchange-sha256,diffie-hellman-group14-sha1

### Additional Information:

Kex algorithms have a higher preference the earlier they appear in the list





Some organizations may have stricter requirements for approved Key exchange algorithms. Ensure that Key exchange algorithms used are in compliance with site policy.

The only Key Exchange Algorithms currently FIPS 140-2 approved are: ecdh-sha2-nistp256,ecdh-sha2-nistp384,ecdh-sha2-nistp521,diffie-hellman-group-exchange-sha256,diffie-hellman-group16-sha512,diffie-hellman-group18-sha512,diffie-hellman-group14-sha256

The Key Exchange algorithms supported by OpenSSH 6.7 are:

```
curve25519-sha256@libssh.org
diffie-hellman-group1-sha1
diffie-hellman-group14-sha1
diffie-hellman-group-exchange-sha1
diffie-hellman-group-exchange-sha256
ecdh-sha2-nistp256
ecdh-sha2-nistp384
ecdh-sha2-nistp521
```

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.10 <u>Encrypt Sensitive Data in Transit</u></b> Encrypt sensitive data in transit. Example implementations can include: Transport Layer Security (TLS) and Open Secure Shell (OpenSSH).			
v7	<b>14.4 <u>Encrypt All Sensitive Information in Transit</u></b> Encrypt all sensitive information in transit.			
v6	<b>3.4 <u>Use Only Secure Channels For Remote System Administration</u></b> Perform all remote administration of servers, workstation, network devices, and similar equipment over secure channels. Protocols such as telnet, VNC, RDP, or others that do not actively support strong encryption should only be used if they are performed over a secondary encryption channel, such as SSL, TLS or IPSEC.			





## 5.2.16 Ensure SSH Idle Timeout Interval is configured (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The two options `ClientAliveInterval` and `ClientAliveCountMax` control the timeout of ssh sessions. When the `ClientAliveInterval` variable is set, ssh sessions that have no activity for the specified length of time are terminated. When the `ClientAliveCountMax` variable is set, `sshd` will send client alive messages at every `ClientAliveInterval` interval. When the number of consecutive client alive messages are sent with no response from the client, the ssh session is terminated. For example, if the `ClientAliveInterval` is set to 15 seconds and the `ClientAliveCountMax` is set to 3, the client ssh session will be terminated after 45 seconds of idle time.

### Rationale:

Having no timeout value associated with a connection could allow an unauthorized user access to another user's ssh session (e.g. user walks away from their computer and doesn't lock the screen). Setting a timeout value at least reduces the risk of this happening..

While the recommended setting is 300 seconds (5 minutes), set this timeout value based on site policy. The recommended setting for `ClientAliveCountMax` is 0. In this case, the client session will be terminated after 5 minutes of idle time and no keepalive messages will be sent.

### Audit:

Run the following commands and verify `ClientAliveInterval` is between 1 and 300 and `ClientAliveCountMax` is 3 or less:

```
# sshd -T | grep clientaliveinterval
ClientAliveInterval 300

# sshd -T | grep clientalivecountmax
ClientAliveCountMax 0
```

## Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameters according to site policy:







```
ClientAliveInterval 300  
ClientAliveCountMax 0
```

## Default Value:

ClientAliveInterval 0

ClientAliveCountMax 3

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.3 <u>Configure Automatic Session Locking on Enterprise Assets</u></b> Configure automatic session locking on enterprise assets after a defined period of inactivity. For general purpose operating systems, the period must not exceed 15 minutes. For mobile end-user devices, the period must not exceed 2 minutes.			
v7	<b>16.11 <u>Lock Workstation Sessions After Inactivity</u></b> Automatically lock workstation sessions after a standard period of inactivity.			
v6	<b>16.4 <u>Automatically Log Off Users After Standard Period Of Inactivity</u></b> Regularly monitor the use of all accounts, automatically logging off users after a standard period of inactivity.			

### 5.2.17 Ensure SSH LoginGraceTime is set to one minute or less (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `LoginGraceTime` parameter specifies the time allowed for successful authentication to the SSH server. The longer the Grace period is the more open unauthenticated connections can exist. Like other session controls in this session the Grace Period should be limited to appropriate organizational limits to ensure the service is available for needed access.

#### Rationale:

Setting the `LoginGraceTime` parameter to a low number will minimize the risk of successful brute force attacks to the SSH server. It will also limit the number of concurrent unauthenticated connections. While the recommended setting is 60 seconds (1 Minute), set the number based on site policy.

#### Audit:

Run the following command and verify that output `LoginGraceTime` is between 1 and 60:

```
# sshd -T | grep logingracetime  
LoginGraceTime 60
```

#### Remediation:







Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
LoginGraceTime 60
```

#### Default Value:

`LoginGraceTime 120`

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

## 5.2.18 Ensure SSH access is limited (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

There are several options available to limit which users and group can access the system via SSH. It is recommended that at least one of the following options be leveraged:

#### AllowUsers

The `AllowUsers` variable gives the system administrator the option of allowing specific users to `ssh` into the system. The list consists of space separated user names. Numeric user IDs are not recognized with this variable. If a system administrator wants to restrict user access further by only allowing the allowed users to log in from a particular host, the entry can be specified in the form of `user@host`.

#### AllowGroups

The `AllowGroups` variable gives the system administrator the option of allowing specific groups of users to `ssh` into the system. The list consists of space separated group names. Numeric group IDs are not recognized with this variable.

#### DenyUsers

The `DenyUsers` variable gives the system administrator the option of denying specific users to `ssh` into the system. The list consists of space separated user names. Numeric user IDs are not recognized with this variable. If a system administrator wants to restrict user access further by specifically denying a user's access from a particular host, the entry can be specified in the form of `user@host`.

#### DenyGroups

The `DenyGroups` variable gives the system administrator the option of denying specific groups of users to `ssh` into the system. The list consists of space separated group names. Numeric group IDs are not recognized with this variable.

### Rationale:

Restricting which users can remotely access the system via SSH will help ensure that only authorized users access the system.

**Audit:**

Run the following commands and verify that output matches for at least one:

```
# sshd -T | grep allowusers
AllowUsers <userlist>

# sshd -T | grep allowgroups
AllowGroups <grouplist>

# sshd -T | grep denyusers
DenyUsers <userlist>







# sshd -T | grep denygroups
DenyGroups <grouplist>
```

**Remediation:**

Edit the `/etc/ssh/sshd_config` file to set one or more of the parameter as follows:

```
AllowUsers <userlist>
AllowGroups <grouplist>
DenyUsers <userlist>
DenyGroups <grouplist>
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>5.4 Restrict Administrator Privileges to Dedicated Administrator Accounts</u></b></p> <p>Restrict administrator privileges to dedicated administrator accounts on enterprise assets. Conduct general computing activities, such as internet browsing, email, and productivity suite use, from the user's primary, non-privileged account.</p>			
v7	<p><b><u>4.3 Ensure the Use of Dedicated Administrative Accounts</u></b></p> <p>Ensure that all users with administrative account access use a dedicated or secondary account for elevated activities. This account should only be used for administrative activities and not internet browsing, email, or similar activities.</p>			
v6	<p><b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b></p> <p>Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.</p>			
v6	<p><b><u>5.8 Administrators Should Not Directly Log In To A System (i.e. use RunAs/sudo)</u></b></p> <p>Administrators should be required to access a system using a fully logged and non-administrative account. Then, once logged on to the machine without administrative privileges, the administrator should transition to administrative privileges using tools such as Sudo on Linux/UNIX, RunAs on Windows, and other similar facilities for other types of systems.</p>			



### 5.2.19 Ensure SSH warning banner is configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `Banner` parameter specifies a file whose contents must be sent to the remote user before authentication is permitted. By default, no banner is displayed.

#### Rationale:

Banners are used to warn connecting users of the particular site's policy regarding connection. Presenting a warning message prior to the normal user login may assist the prosecution of trespassers on the computer system.

#### Audit:

Run the following command and verify that output matches:







```
# sshd -T | grep banner  
Banner /etc/issue.net
```

#### Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
Banner /etc/issue.net
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## ***5.3 Configure PAM***

PAM (Pluggable Authentication Modules) is a service that implements modular authentication modules on UNIX systems. PAM is implemented as a set of shared objects that are loaded and executed when a program needs to authenticate a user. Files for PAM are typically located in the `/etc/pam.d` directory. PAM must be carefully configured to secure system authentication. While this section covers some of PAM, please consult other PAM resources to fully understand the configuration capabilities.

### 5.3.1 Ensure password creation requirements are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `pam_pwquality.so` module checks the strength of passwords. It performs checks such as making sure a password is not a dictionary word, it is a certain length, contains a mix of characters (e.g. alphabet, numeric, other) and more. The following are definitions of the `pam_pwquality.so` options.

- `retry=3` - Allow 3 tries before sending back a failure.

The following options are set in the `/etc/security/pwquality.conf` file:

- `minlen = 14` - password must be 14 characters or more
- `dcredit = -1` - provide at least one digit
- `ucredit = -1` - provide at least one uppercase character
- `ocredit = -1` - provide at least one special character
- `lcredit = -1` - provide at least one lowercase character

The settings shown above are one possible policy. Alter these values to conform to your own organization's password policies.

#### Rationale:

Strong passwords protect systems from being hacked through brute force methods.

## Audit:

Run the following commands and verify all password requirements conform to organization policy and minlen is 14 or more:

```
# grep pam_pwquality.so /etc/pam.d/common-password
password requisite pam_pwquality.so retry=3
# grep ^minlen /etc/security/pwquality.conf
minlen = 14
# grep ^dcredit /etc/security/pwquality.conf
dcredit = -1
# grep ^lcredit /etc/security/pwquality.conf
lcredit = -1
# grep ^ocredit /etc/security/pwquality.conf
ocredit = -1
# grep ^ucredit /etc/security/pwquality.conf
ucredit = -1
```

## Remediation:

Run the following command to install the pam\_pwquality module:

```
apt-get install libpam-pwquality
```

Edit the `/etc/pam.d/common-password` file to include the appropriate options for `pam_pwquality.so` and to conform to site policy:

```
password requisite pam_pwquality.so retry=3
```

Edit `/etc/security/pwquality.conf` to add or update the following settings to conform to site policy:






```
minlen = 14
dcredit = -1
ucredit = -1
ocredit = -1
lcredit = -1
```

## Additional Information:

Additional module options may be set, recommendation requirements only cover including `try_first_pass` and `minlen` set to 14 or more.

Settings in `/etc/security/pwquality.conf` must use spaces around the `=` symbol.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<p><b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b></p> <p>Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.</p>			
v7	<p><b><u>4.4 Use Unique Passwords</u></b></p> <p>Where multi-factor authentication is not supported (such as local administrator, root, or service accounts), accounts will use passwords that are unique to that system.</p>			
v6	<p><b><u>5.7 User Accounts Shall Use Long Passwords</u></b></p> <p>Where multi-factor authentication is not supported, user accounts shall be required to use long passwords on the system (longer than 14 characters).</p>			
v6	<p><b><u>16.12 Use Long Passwords For All User Accounts</u></b></p> <p>Where multi-factor authentication is not supported, user accounts shall be required to use long passwords on the system (longer than 14 characters).</p>			

### 5.3.2 Ensure logout for failed password attempts is configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Lock out users after  $n$  unsuccessful consecutive login attempts. The first sets of changes are made to the PAM configuration files. The second set of changes are applied to the program specific PAM configuration file. The second set of changes must be applied to each program that will lock out users. Check the documentation for each secondary program for instructions on how to configure them to work with PAM.

Set the logout number to the policy in effect at your site.

#### Rationale:

Locking out user IDs after  $n$  unsuccessful consecutive login attempts mitigates brute force password attacks against your systems.

#### Audit:

Perform the following to determine the current settings for user logout.

```
# grep "pam_tally2" /etc/pam.d/common-auth
auth required pam_tally2.so onerr=fail audit silent deny=5 unlock_time=900
```

#### Remediation:

Edit the `/etc/pam.d/common-auth` file and add the auth line below:






```
auth required pam_tally2.so onerr=fail audit silent deny=5 unlock_time=900
```

**Note:** If a user has been locked out because they have reached the maximum consecutive failure count defined by `deny=` in the `pam_tally2.so` module, the user can be unlocked by issuing the command `/sbin/pam_tally2 -u <username> --reset`. This command sets the failed count to 0, effectively unlocking the user.

### Additional Information:

Use of the "audit" keyword may log credentials in the case of user error during authentication. This risk should be evaluated in the context of the site policies of your organization.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>16.7 <u>Establish Process for Revoking Access</u></b> Establish and follow an automated process for revoking system access by disabling accounts immediately upon termination or change of responsibilities of an employee or contractor . Disabling these accounts, instead of deleting accounts, allows preservation of audit trails.			
v6	<b>16.7 <u>Configure Account Lockouts</u></b> Use and configure account lockouts such that after a set number of failed login attempts the account is locked for a standard period of time.			



### 5.3.3 Ensure password reuse is limited (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/security/opasswd` file stores the users' old passwords and can be checked to ensure that users are not recycling recent passwords.

#### Rationale:

Forcing users not to reuse their past 5 passwords make it less likely that an attacker will be able to guess the password.

Note that these change only apply to accounts configured on the local system.

#### Audit:

Run the following commands and ensure the `remember` option is '5' or more and included in all results:

```
# egrep '^password\s+required\s+pam_pwhistory.so' /etc/pam.d/common-password  
password required pam_pwhistory.so remember=5
```

#### Remediation:




Edit the `/etc/pam.d/common-password` file to include the `remember` option and conform to site policy as shown:

```
password required pam_pwhistory.so remember=5
```

#### Additional Information:

Additional module options may be set, recommendation only covers those listed here.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

### 5.3.4 Ensure password hashing algorithm is SHA-512 (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The commands below change password encryption from `md5` to `sha512` (a much stronger hashing algorithm). All existing accounts will need to perform a password change to upgrade the stored hashes to the new algorithm.

#### Rationale:

The SHA-512 algorithm provides much stronger hashing than MD5, thus providing additional protection to the system by increasing the level of effort for an attacker to successfully determine passwords.

Note that these change only apply to accounts configured on the local system.

#### Audit:

Run the following commands and ensure the `sha512` option is included in all results:

```
# egrep '^password\s+(\S+\s+)+pam_unix\.so\s+(\S+\s+)*sha512'
/etc/pam.d/common-password
password [success=1 default=ignore] pam_unix.so sha512
```

#### Remediation:

Edit the `/etc/pam.d/common-password` file to include the `sha512` option for `pam_unix.so` as shown:

```
password [success=1 default=ignore] pam_unix.so sha512
```





## Additional Information:

Additional module options may be set, recommendation only covers those listed here.

If it is determined that the password algorithm being used is not SHA-512, once it is changed, it is recommended that all user ID's be immediately expired and forced to change their passwords on next login. To accomplish that, the following commands can be used. Any system accounts that need to be expired should be carefully done separately by the system administrator to prevent any potential problems.

```
# cat /etc/passwd | awk -F: '{ $3 >= 1000 && $1 != "nfsnobody" } { print $1 }' | xargs -n 1 chage -d 0
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.11 <u>Encrypt Sensitive Data at Rest</u></b> Encrypt sensitive data at rest on servers, applications, and databases containing sensitive data. Storage-layer encryption, also known as server-side encryption, meets the minimum requirement of this Safeguard. Additional encryption methods may include application-layer encryption, also known as client-side encryption, where access to the data storage device(s) does not permit access to the plain-text data.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

## ***5.4 User Accounts and Environment***

This section provides guidance on setting up secure defaults for system and user accounts and their environment.

### ***5.4.1 Set Shadow Password Suite Parameters***

While a majority of the password control parameters have been moved to PAM, some parameters are still available through the shadow password suite. Any changes made to `/etc/login.defs` will only be applied if the `usermod` command is used. If user IDs are added a different way, use the `chage` command to effect changes to individual user IDs.

### 5.4.1.1 Ensure password expiration is 365 days or less (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `PASS_MAX_DAYS` parameter in `/etc/login.defs` allows an administrator to force passwords to expire once they reach a defined age. It is recommended that the `PASS_MAX_DAYS` parameter be set to less than or equal to 365 days.

#### Rationale:

The window of opportunity for an attacker to leverage compromised credentials or successfully compromise credentials via an online brute force attack is limited by the age of the password. Therefore, reducing the maximum age of a password also reduces an attacker's window of opportunity.

#### Audit:

Run the following command and verify `PASS_MAX_DAYS` conforms to site policy (no more than 365 days):

```
# grep PASS_MAX_DAYS /etc/login.defs
PASS_MAX_DAYS 90
```

Verify all users with a password maximum days between password change conforms to site policy (no more than 365 days):

```
# egrep ^[^:]+:[^\!]* /etc/shadow | cut -d: -f1
<list of users>
# chage --list <user>
Maximum number of days between password change          : 90
```

#### Remediation:

Set the `PASS_MAX_DAYS` parameter to conform to site policy in `/etc/login.defs`:

```
PASS_MAX_DAYS 90
```

Modify user parameters for all users with a password set to match:






```
# chage --maxdays 90 <user>
```

### Additional Information:

You can also check this setting in `/etc/shadow` directly. The 5th field should be 365 or less for all users with a password.

Note: A value of -1 will disable password expiration. Additionally the password expiration must be greater than the minimum days between password changes or users will be unable to change their password.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>4.4 Use Unique Passwords</u></b> Where multi-factor authentication is not supported (such as local administrator, root, or service accounts), accounts will use passwords that are unique to that system.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			



### 5.4.1.2 Ensure minimum days between password changes is 7 or more (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `PASS_MIN_DAYS` parameter in `/etc/login.defs` allows an administrator to prevent users from changing their password until a minimum number of days have passed since the last time the user changed their password. It is recommended that `PASS_MIN_DAYS` parameter be set to 7 or more days.

#### Rationale:

By restricting the frequency of password changes, an administrator can prevent users from repeatedly changing their password in an attempt to circumvent password reuse controls.

#### Audit:

Run the following command and verify `PASS_MIN_DAYS` is 7 or more:

```
# grep PASS_MIN_DAYS /etc/login.defs
PASS_MIN_DAYS 7
```

Verify all users with a password have their minimum days between password change set to 7 or more:

```
# egrep ^[^:]+:[^\!]* /etc/shadow | cut -d: -f1
<list of users>
# chage --list <user>
Minimum number of days between password change      : 7
```

#### Remediation:

Set the `PASS_MIN_DAYS` parameter to 7 in `/etc/login.defs`:

```
PASS_MIN_DAYS 7
```






Modify user parameters for all users with a password set to match:

```
# chage --mindays 7 <user>
```

### Additional Information:

You can also check this setting in `/etc/shadow` directly. The 4th field should be 7 or more for all users with a password.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>4.4 Use Unique Passwords</u></b> Where multi-factor authentication is not supported (such as local administrator, root, or service accounts), accounts will use passwords that are unique to that system.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

### 5.4.1.3 Ensure password expiration warning days is 7 or more (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `PASS_WARN_AGE` parameter in `/etc/login.defs` allows an administrator to notify users that their password will expire in a defined number of days. It is recommended that the `PASS_WARN_AGE` parameter be set to 7 or more days.

#### Rationale:

Providing an advance warning that a password will be expiring gives users time to think of a secure password. Users caught unaware may choose a simple password or write it down where it may be discovered.

#### Audit:

Run the following command and verify `PASS_WARN_AGE` is 7 or more:

```
# grep PASS_WARN_AGE /etc/login.defs
PASS_WARN_AGE 7
```

Verify all users with a password have their number of days of warning before password expires set to 7 or more:

```
# egrep ^[^:]+:[^!*] /etc/shadow | cut -d: -f1
<list of users>

# chage --list <user>
Number of days of warning before password expires      : 7
``
```

## Remediation:

Set the `PASS_WARN_AGE` parameter to 7 in `/etc/login.defs`:

```
PASS_WARN_AGE 7
```






Modify user parameters for all users with a password set to match:

```
# chage --warndays 7 <user>
```

## Additional Information:

You can also check this setting in `/etc/shadow` directly. The 6th field should be 7 or more for all users with a password.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>4.4 <u>Use Unique Passwords</u></b> Where multi-factor authentication is not supported (such as local administrator, root, or service accounts), accounts will use passwords that are unique to that system.			
v7	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			

#### 5.4.1.4 Ensure inactive password lock is 30 days or less (Automated)

##### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

##### Description:

User accounts that have been inactive for over a given period of time can be automatically disabled. It is recommended that accounts that are inactive for 30 days after password expiration be disabled.

##### Rationale:

Inactive accounts pose a threat to system security since the users are not logging in to notice failed login attempts or other anomalies.

##### Audit:

Run the following command and verify `INACTIVE` is 30 or less:

```
# useradd -D | grep INACTIVE
INACTIVE=30
```

Verify all users with a password have Password inactive no more than 30 days after password expires:

```
# egrep ^[^:]+:[^\!*] /etc/shadow | cut -d: -f1
<list of users>
# chage --list <user>
Password inactive : <date>
```

##### Remediation:

Run the following command to set the default password inactivity period to 30 days:

```
# useradd -D -f 30
```

Modify user parameters for all users with a password set to match:






```
# chage --inactive 30 <user>
```

### Additional Information:

You can also check this setting in `/etc/shadow` directly. The 7th field should be 30 or less for all users with a password.

Note: A value of -1 would disable this setting.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>4.4 Use Unique Passwords</u></b> Where multi-factor authentication is not supported (such as local administrator, root, or service accounts), accounts will use passwords that are unique to that system.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

#### *5.4.1.5 Ensure all users last password change date is in the past (Automated)*

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

All users should have a password change date in the past.

**Rationale:**

If a users recorded password change date is in the future then they could bypass any set password expiration.

**Audit:**






Verify no users with a have Password change date in the future:

```
# cat /etc/shadow | cut -d: -f1  
<list of users>  
# chage --list <user>  
Last Change                               : <date>
```

**Remediation:**

Investigate any users with a password change date in the future and correct them. Locking the account, expiring the password, or resetting the password manually may be appropriate.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>4.4 Use Unique Passwords</u></b> Where multi-factor authentication is not supported (such as local administrator, root, or service accounts), accounts will use passwords that are unique to that system.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			



## 5.4.2 Ensure system accounts are non-login (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

There are a number of accounts provided with Debian that are used to manage applications and are not intended to provide an interactive shell.

### Rationale:

It is important to make sure that accounts that are not being used by regular users are prevented from being used to provide an interactive shell. By default, Debian sets the password field for these accounts to an invalid string, but it is also recommended that the shell field in the password file be set to `/usr/sbin/nologin`. This prevents the account from potentially being used to run any commands. Some built-in accounts may use `/bin/false` which is also acceptable. This prevents the account from potentially being used to run any commands.

### Audit:

Run the following scripts and verify no results are returned:

```
egrep -v "^\+" /etc/passwd | awk -F: '($1!="root" && $1!="sync" && $1!="shutdown" && $1!="halt" && $3<1000 && $7!="/usr/sbin/nologin" && $7!="/bin/false") {print}'

for user in `awk -F: '($1!="root" && $3 < 1000) {print $1 }' /etc/passwd`; do
passwd -S $user | awk -F ' ' '($2!="L") {print $1}'; done
```

## Remediation:

Set the shell for any accounts returned by the audit script to `/usr/sbin/nologin`:

```
# usermod -s /usr/sbin/nologin
```

The following script will automatically set all user shells required to `/usr/sbin/nologin` and lock the `sync`, `shutdown`, and `halt` users:

```
#!/bin/bash

for user in `awk -F: '($3 < 1000) {print $1 }' /etc/passwd`; do
    if [ $user != "root" ]; then
        usermod -L $user
        if [ $user != "sync" ] && [ $user != "shutdown" ] && [ $user != "halt" ];
        then
            usermod -s /usr/sbin/nologin $user
        fi
    fi
done
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>6 <u>Access Control Management</u></b> Use processes and tools to create, assign, manage, and revoke access credentials and privileges for user, administrator, and service accounts for enterprise assets and software.			
v7	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			

### 5.4.3 Ensure default group for the root account is GID 0 (Automated)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

The `usermod` command can be used to specify which group the root user belongs to. This affects permissions of files that are created by the root user.

**Rationale:**

Using GID 0 for the `root` account helps prevent `root`-owned files from accidentally becoming accessible to non-privileged users.

**Audit:**

Run the following command and verify the result is 0:







```
# grep "^root:" /etc/passwd | cut -f4 -d:
0
```

**Remediation:**

Run the following command to set the `root` user default group to GID 0:

```
# usermod -g 0 root
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5 Controlled Use of Administration Privileges</u></b> Controlled Use of Administration Privileges			

#### 5.4.4 Ensure default user umask is 027 or more restrictive (Automated)

##### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

##### Description:

The default `umask` determines the permissions of files created by users. 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` , `.bashrc` , etc.) in their home directories.

##### Rationale:

Setting a very secure default value for `umask` ensures that users make a conscious choice about their file permissions. A default `umask` setting of `077` causes files and directories created by users to not be readable by any other user on the system. 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.

##### Audit:

Run the following commands and verify all `umask` lines returned are `027` or more restrictive.

```
# grep "umask" /etc/bash.bashrc
umask 027
# grep "umask" /etc/profile /etc/profile.d/*.sh
umask 027
```

##### Remediation:

Edit the `/etc/bash.bashrc`, `/etc/profile` and `/etc/profile.d/*.sh` files (and the appropriate files for any other shell supported on your system) and add or edit any `umask` parameters as follows:







```
umask 027
```

### Additional Information:

The audit and remediation in this recommendation apply to bash and shell. If other shells are supported on the system, it is recommended that their configuration files also are checked.

Other methods of setting a default user umask exist however the shell configuration files are the last run and will override other settings if they exist therefor our recommendation is to configure in the shell configuration files. If other methods are in use in your environment they should be audited and the shell configs should be verified to not override.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v7	<b>13 <u>Data Protection</u></b> Data Protection			
v6	<b>13 <u>Data Protection</u></b> Data Protection			

### 5.4.5 Ensure default user shell timeout is 900 seconds or less (Automated)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

The default `TMOUT` determines the shell timeout for users. The `TMOUT` value is measured in seconds.

#### Rationale:

Having no timeout value associated with a shell could allow an unauthorized user access to another user's shell session (e.g. user walks away from their computer and doesn't lock the screen). Setting a timeout value at least reduces the risk of this happening.

#### Audit:

Run the following commands and verify all `TMOUT` lines returned are 900 or less and at least one exists in each file.

```
# grep "^TMOUT" /etc/bashrc
TMOUT=600
# grep "^TMOUT" /etc/profile /etc/profile.d/*.sh
TMOUT=600
```

#### Remediation:







Edit the `/etc/bashrc`, `/etc/profile`, and `/etc/profile.d/*.sh` files (and the appropriate files for any other shell supported on your system) and add or edit any `umask` parameters as follows:

```
TMOUT=600
```

#### Additional Information:

The audit and remediation in this recommendation apply to `bash` and `shell`. If other shells are supported on the system, it is recommended that their configuration files also are checked. Other methods of setting a timeout exist for other shells not covered here.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.3 <u>Configure Automatic Session Locking on Enterprise Assets</u></b> Configure automatic session locking on enterprise assets after a defined period of inactivity. For general purpose operating systems, the period must not exceed 15 minutes. For mobile end-user devices, the period must not exceed 2 minutes.			
v7	<b>16.11 <u>Lock Workstation Sessions After Inactivity</u></b> Automatically lock workstation sessions after a standard period of inactivity.			
v6	<b>16.4 <u>Automatically Log Off Users After Standard Period Of Inactivity</u></b> Regularly monitor the use of all accounts, automatically logging off users after a standard period of inactivity.			



## 5.5 Ensure root login is restricted to system console (Manual)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The file `/etc/securetty` contains a list of valid terminals that may be logged in directly as root.

### Rationale:

Since the system console has special properties to handle emergency situations, it is important to ensure that the console is in a physically secure location and that unauthorized consoles have not been defined.







### Audit:

```
# cat /etc/securetty
```

### Remediation:

Remove entries for any consoles that are not in a physically secure location.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## 5.6 Ensure access to the su command is restricted (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The `su` command allows a user to run a command or shell as another user. The program has been superseded by `sudo`, which allows for more granular control over privileged access. Normally, the `su` command can be executed by any user. By uncommenting the `pam_wheel.so` statement in `/etc/pam.d/su`, the `su` command will only allow users in the `sudo` group to execute `su`.

### Rationale:

Restricting the use of `su`, and using `sudo` in its place, provides system administrators better control of the escalation of user privileges to execute privileged commands. The `sudo` utility also provides a better logging and audit mechanism, as it can log each command executed via `sudo`, whereas `su` can only record that a user executed the `su` program.

### Audit:

Run the following command and verify output includes matching line:

```
# grep pam_wheel.so /etc/pam.d/su
auth required pam_wheel.so
```

Run the following command and verify users in `sudo` group match site policy:

```
# grep sudo /etc/group
sudo:x:10:root,<user list>
```

### Remediation:

Add the following line to the `/etc/pam.d/su` file:

```
auth required pam_wheel.so
```







Create a comma separated list of users in the `sudo` statement in the `/etc/group` file:

```
sudo:x:10:root,<user list>
```

### Additional Information:

The use\_uid option to pam\_wheel.so is a no-op on debian based systems. It is acceptable but not required as these systems use its behavior as default.

### CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## ***6 System Maintenance***

Recommendations in this section are intended as maintenance and are intended to be checked on a frequent basis to ensure system stability. Many recommendations do not have quick remediations and require investigation into the cause and best fix available and may indicate an attempted breach of system security.

## ***6.1 System File Permissions***

This section provides guidance on securing aspects of system files and directories.

### 6.1.1 Audit system file permissions (Manual)

#### Profile Applicability:

- Level 2 - Server
- Level 2 - Workstation

#### Description:

The Debian package manager has a number of useful options. One of these, the `--verify` option, can be used to verify that system packages are correctly installed. The `--verify` option can be used to verify a particular package or to verify all system packages. If no output is returned, the package is installed correctly. The following table describes the meaning of output from the verify option:

Code	Meaning
S	File size differs.
M	File mode differs (includes permissions and file type).
5	The MD5 checksum differs.
D	The major and minor version numbers differ on a device file.
L	A mismatch occurs in a link.
U	The file ownership differs.
G	The file group owner differs.
T	The file time (mtime) differs.

The `dpkg -S` command can be used to determine which package a particular file belongs to. For example the following commands determines which package the `/bin/bash` file belongs to:

```
# dpkg -S /bin/bash
bash: /bin/bash
```

To verify the settings for the package that controls the `/bin/bash` file, run the following:

```
# dpkg --verify bash
??5?????? c /etc/bash.bashrc
```

**Rationale:**

It is important to confirm that packaged system files and directories are maintained with the permissions they were intended to have from the OS vendor.

**Audit:**

Run the following command to review all installed packages. Note that this may be very time consuming and may be best scheduled via the `cron` utility. It is recommended that the output of this command be redirected to a file that can be reviewed later.

```
# dpkg --verify <filename>
```

**Remediation:**

Correct any discrepancies found and rerun the audit until output is clean or risk is mitigated or accepted.







**Additional Information:**

Since packages and important files may change with new updates and releases, it is recommended to verify everything, not just a finite list of files. This can be a time consuming task and results may depend on site policy therefore it is not a scorable benchmark item, but is provided for those interested in additional security measures.

Some of the recommendations of this benchmark alter the state of files audited by this recommendation. The audit command will alert for all changes to a file permissions even if the new state is more secure than the default.



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

## 6.1.2 Ensure permissions on /etc/passwd are configured (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The `/etc/passwd` file contains user account information that is used by many system utilities and therefore must be readable for these utilities to operate.

### Rationale:

It is critical to ensure that the `/etc/passwd` file is protected from unauthorized write access. Although it is protected by default, the file permissions could be changed either inadvertently or through malicious actions.

### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` is `644`:






```
# stat /etc/passwd
Access: (0644/-rw-r--r--)  Uid: (   0/   root)   Gid: (   0/   root)
```

### Remediation:

Run the following command to set permissions on `/etc/passwd`:

```
# chown root:root /etc/passwd
# chmod 644 /etc/passwd
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

### 6.1.3 Ensure permissions on /etc/shadow are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/shadow` file is used to store the information about user accounts that is critical to the security of those accounts, such as the hashed password and other security information.

#### Rationale:

If attackers can gain read access to the `/etc/shadow` file, they can easily run a password cracking program against the hashed password to break it. Other security information that is stored in the `/etc/shadow` file (such as expiration) could also be useful to subvert the user accounts.

#### Audit:

Run the following command and verify `Uid` is `0/root`, `Gid` is `<gid>/shadow`, and `Access` is `640` or more restrictive:






```
# stat /etc/shadow
Access: (0640/-rw-r-----)  Uid: (   0/   root)   Gid: (  42/  shadow)
```

#### Remediation:

Run the one following commands to set permissions on `/etc/shadow`:

```
# chown root:shadow /etc/shadow
# chmod o-rwx,g-wx /etc/shadow
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

## 6.1.4 Ensure permissions on /etc/group are configured (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The `/etc/group` file contains a list of all the valid groups defined in the system. The command below allows read/write access for root and read access for everyone else.

### Rationale:

The `/etc/group` file needs to be protected from unauthorized changes by non-privileged users, but needs to be readable as this information is used with many non-privileged programs.

### Audit:

Run the following command and verify `Uid` and `Gid` are both `0/root` and `Access` is `644`:






```
# stat /etc/group
Access: (0644/-rw-r--r--)  Uid: (   0/   root)   Gid: (   0/   root)
```

### Remediation:

Run the following command to set permissions on `/etc/group`:

```
# chown root:root /etc/group
# chmod 644 /etc/group
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

### 6.1.5 Ensure permissions on /etc/gshadow are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/gshadow` file is used to store the information about groups that is critical to the security of those accounts, such as the hashed password and other security information.

#### Rationale:

If attackers can gain read access to the `/etc/gshadow` file, they can easily run a password cracking program against the hashed password to break it. Other security information that is stored in the `/etc/gshadow` file (such as group administrators) could also be useful to subvert the group.

#### Audit:

Run the following command and verify `Uid` is `0/root`, `Gid` is `<gid>/shadow`, and `Access` is `640` or more restrictive:

```
# stat /etc/gshadow
Access: (0640/-rw-r-----)  Uid: (   0/   root)   Gid: (  42/  shadow)
```






#### Remediation:

Run the following commands to set permissions on `/etc/gshadow`:

```
# chown root:shadow /etc/gshadow
# chmod o-rwx,g-rw /etc/gshadow
```



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

## 6.1.6 Ensure permissions on /etc/passwd- are configured (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The /etc/passwd- file contains backup user account information.

### Rationale:

It is critical to ensure that the /etc/passwd- file is protected from unauthorized access. Although it is protected by default, the file permissions could be changed either inadvertently or through malicious actions.

### Audit:

Run the following command and verify Uid and Gid are both 0/root and Access is 644 or more restrictive:






```
# stat /etc/passwd-  
Access: (0644/-rw-----)  Uid: (    0/    root)   Gid: (    0/    root)
```

### Remediation:

Run the following command to set permissions on /etc/passwd- :

```
# chown root:root /etc/passwd-  
# chmod u-x,go-wx /etc/passwd-
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

### 6.1.7 Ensure permissions on /etc/shadow- are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/shadow-` file is used to store backup information about user accounts that is critical to the security of those accounts, such as the hashed password and other security information.

#### Rationale:

It is critical to ensure that the `/etc/shadow-` file is protected from unauthorized access. Although it is protected by default, the file permissions could be changed either inadvertently or through malicious actions.

#### Audit:

Run the following command and verify `Uid` is `0/root`, `Gid` is `0/root` or `<gid>/shadow`, and `Access` is `640` or more restrictive:






```
# stat /etc/shadow-  
Access: (0640/-rw-r-----)  Uid: (    0/    root)   Gid: (   42/   shadow)
```

#### Remediation:

Run the one of the following `chown` commands as appropriate and the `chmod` to set permissions on `/etc/shadow-` :

```
# chown root:root /etc/shadow-  
# chown root:shadow /etc/shadow-  
# chmod o-rwx,g-rw /etc/shadow-
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

## 6.1.8 Ensure permissions on /etc/group- are configured (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The /etc/group- file contains a backup list of all the valid groups defined in the system.

### Rationale:

It is critical to ensure that the /etc/group- file is protected from unauthorized access. Although it is protected by default, the file permissions could be changed either inadvertently or through malicious actions.

### Audit:

Run the following command and verify Uid and Gid are both 0/root and Access is 644 or more restrictive:






```
# stat /etc/group-  
Access: (0644/-rw-----)  Uid: (   0/   root)   Gid: (   0/   root)
```

### Remediation:

Run the following command to set permissions on /etc/group- :

```
# chown root:root /etc/group-  
# chmod u-x,go-wx /etc/group-
```

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

### 6.1.9 Ensure permissions on /etc/gshadow- are configured (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `/etc/gshadow-` file is used to store backup information about groups that is critical to the security of those accounts, such as the hashed password and other security information.

#### Rationale:

It is critical to ensure that the `/etc/gshadow-` file is protected from unauthorized access. Although it is protected by default, the file permissions could be changed either inadvertently or through malicious actions.

#### Audit:

Run the following command and verify `Uid` is `0/root`, `Gid` is `0/root` or `<gid>/shadow`, and `Access` is `640` or more restrictive:

```
# stat /etc/gshadow-  
Access: (0640/-rw-r-----)  Uid: (    0/    root)   Gid: (   42/   shadow)
```






#### Remediation:

Run the one of the following `chown` commands as appropriate and the `chmod` to set permissions on `/etc/gshadow-` :

```
# chown root:root /etc/gshadow-  
# chown root:shadow /etc/gshadow-  
# chmod o-rwx,g-rw /etc/gshadow-
```



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

### 6.1.10 Ensure no world writable files exist (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Unix-based systems support variable settings to control access to files. World writable files are the least secure. See the `chmod(2)` man page for more information.

#### Rationale:

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.

#### Audit:

Run the following command and verify no files are returned:

```
# df --local -P | awk {'if (NR!=1) print $6'} | xargs -I '{}' find '{}' -xdev -type f -perm -0002
```







The command above only searches local filesystems, there may still be compromised items on network mounted partitions. Additionally the `--local` option to `df` is not universal to all versions, it can be omitted to search all filesystems on a system including network mounted filesystems or the following command can be run manually for each partition:

```
# find <partition> -xdev -type f -perm -0002
```

#### Remediation:

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

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>5.1 <u>Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v7	<b>13 <u>Data Protection</u></b> Data Protection			
v6	<b>14 <u>Controlled Access Based on the Need to Know</u></b> Controlled Access Based on the Need to Know			

### 6.1.11 Ensure no unowned files or directories exist (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Sometimes when administrators delete users from the password file they neglect to remove all files owned by those users from the system.

#### Rationale:

A new user who is assigned the deleted user's user ID or group ID may then end up "owning" these files, and thus have more access on the system than was intended.

#### Audit:

Run the following command and verify no files are returned:

```
# df --local -P | awk {'if (NR!=1) print $6'} | xargs -I '{}' find '{}' -xdev -nouser
```







The command above only searches local filesystems, there may still be compromised items on network mounted partitions. Additionally the `--local` option to `df` is not universal to all versions, it can be omitted to search all filesystems on a system including network mounted filesystems or the following command can be run manually for each partition:

```
# find <partition> -xdev -nouser
```

#### Remediation:

Locate files that are owned by users or groups not listed in the system configuration files, and reset the ownership of these files to some active user on the system as appropriate.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>13.2 Remove Sensitive Data or Systems Not Regularly Accessed by Organization</u></b> Remove sensitive data or systems not regularly accessed by the organization from the network. These systems shall only be used as stand alone systems (disconnected from the network) by the business unit needing to occasionally use the system or completely virtualized and powered off until needed.			
v6	<b><u>14 Controlled Access Based on the Need to Know</u></b> Controlled Access Based on the Need to Know			

### 6.1.12 Ensure no ungrouped files or directories exist (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Sometimes when administrators delete users or groups from the system they neglect to remove all files owned by those users or groups.

#### Rationale:

A new user who is assigned the deleted user's user ID or group ID may then end up "owning" these files, and thus have more access on the system than was intended.

#### Audit:

Run the following command and verify no files are returned:

```
# df --local -P | awk {'if (NR!=1) print $6'} | xargs -I '{}' find '{}' -xdev -nogroup
```







The command above only searches local filesystems, there may still be compromised items on network mounted partitions. Additionally the `--local` option to `df` is not universal to all versions, it can be omitted to search all filesystems on a system including network mounted filesystems or the following command can be run manually for each partition:

```
# find <partition> -xdev -nogroup
```

#### Remediation:

Locate files that are owned by users or groups not listed in the system configuration files, and reset the ownership of these files to some active user on the system as appropriate.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>13.2 Remove Sensitive Data or Systems Not Regularly Accessed by Organization</u></b> Remove sensitive data or systems not regularly accessed by the organization from the network. These systems shall only be used as stand alone systems (disconnected from the network) by the business unit needing to occasionally use the system or completely virtualized and powered off until needed.			
v6	<b><u>14 Controlled Access Based on the Need to Know</u></b> Controlled Access Based on the Need to Know			

### 6.1.13 Audit SUID executables (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The owner of a file can set the file's permissions to run with the owner's or group's permissions, even if the user running the program is not the owner or a member of the group. The most common reason for a SUID program is to enable users to perform functions (such as changing their password) that require root privileges.

#### Rationale:

There are valid reasons for SUID programs, but it is important to identify and review such programs to ensure they are legitimate.

#### Audit:

Run the following command to list SUID files:

```
# df --local -P | awk {'if (NR!=1) print $6'} | xargs -I '{}' find '{}' -xdev -type f -perm -4000
```

The command above only searches local filesystems, there may still be compromised items on network mounted partitions. Additionally the `--local` option to `df` is not universal to all versions, it can be omitted to search all filesystems on a system including network mounted filesystems or the following command can be run manually for each partition:







```
# find <partition> -xdev -type f -perm -4000
```

#### Remediation:

Ensure that no rogue SUID programs have been introduced into the system. Review the files returned by the action in the Audit section and confirm the integrity of these binaries.



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### 6.1.14 Audit SGID executables (Manual)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The owner of a file can set the file's permissions to run with the owner's or group's permissions, even if the user running the program is not the owner or a member of the group. The most common reason for a SGID program is to enable users to perform functions (such as changing their password) that require root privileges.

#### Rationale:

There are valid reasons for SGID programs, but it is important to identify and review such programs to ensure they are legitimate. Review the files returned by the action in the audit section and check to see if system binaries have a different md5 checksum than what from the package. This is an indication that the binary may have been replaced.

#### Audit:

Run the following command to list SGID files:

```
# df --local -P | awk {'if (NR!=1) print $6'} | xargs -I '{}' find '{}' -xdev -type f -perm -2000
```







The command above only searches local filesystems, there may still be compromised items on network mounted partitions. Additionally the `--local` option to `df` is not universal to all versions, it can be omitted to search all filesystems on a system including network mounted filesystems or the following command can be run manually for each partition:

```
# find <partition> -xdev -type f -perm -2000
```

#### Remediation:

Ensure that no rogue SGID programs have been introduced into the system. Review the files returned by the action in the Audit section and confirm the integrity of these binaries.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## ***6.2 User and Group Settings***

This section provides guidance on securing aspects of the users and groups.

**Note:** The recommendations in this section check local users and groups. Any users or groups from other sources such as LDAP will not be audited. In a domain environment similar checks should be performed against domain users and groups.

### 6.2.1 Ensure password fields are not empty (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

An account with an empty password field means that anybody may log in as that user without providing a password.

#### Rationale:

All accounts must have passwords or be locked to prevent the account from being used by an unauthorized user.

#### Audit:

Run the following command and verify that no output is returned:

```
# cat /etc/shadow | awk -F: '($2 == "" ) { print $1 " does not have a password "}'
```






#### Remediation:

If any accounts in the `/etc/shadow` file do not have a password, run the following command to lock the account until it can be determined why it does not have a password:

```
# passwd -l <em><username></em>
```

Also, check to see if the account is logged in and investigate what it is being used for to determine if it needs to be forced off.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>5.2 <u>Use Unique Passwords</u></b> Use unique passwords for all enterprise assets. Best practice implementation includes, at a minimum, an 8-character password for accounts using MFA and a 14-character password for accounts not using MFA.			
v7	<b>4.4 <u>Use Unique Passwords</u></b> Where multi-factor authentication is not supported (such as local administrator, root, or service accounts), accounts will use passwords that are unique to that system.			
v6	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			

## 6.2.2 Ensure no legacy "+" entries exist in /etc/passwd (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The character + 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 are no longer required on most systems, but may exist in files that have been imported from other platforms.

### Rationale:

These entries may provide an avenue for attackers to gain privileged access on the system.

### Audit:






Run the following command and verify that no output is returned:

```
# grep '^\\+: ' /etc/passwd
```

### Remediation:

Remove any legacy '+' entries from /etc/passwd if they exist.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16.2 Configure Centralized Point of Authentication</u></b> Configure access for all accounts through as few centralized points of authentication as possible, including network, security, and cloud systems.			
v6	<b><u>16.9 Configure Account Access Centrally</u></b> Configure access for all accounts through a centralized point of authentication, for example Active Directory or LDAP. Configure network and security devices for centralized authentication as well.			



### 6.2.3 Ensure no legacy "+" entries exist in /etc/shadow (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The character + 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 are no longer required on most systems, but may exist in files that have been imported from other platforms.

#### Rationale:

These entries may provide an avenue for attackers to gain privileged access on the system.

#### Audit:






Run the following command and verify that no output is returned:

```
# grep '^\\+: ' /etc/shadow
```

#### Remediation:

Remove any legacy '+' entries from /etc/shadow if they exist.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16.2 Configure Centralized Point of Authentication</u></b> Configure access for all accounts through as few centralized points of authentication as possible, including network, security, and cloud systems.			
v6	<b><u>16.9 Configure Account Access Centrally</u></b> Configure access for all accounts through a centralized point of authentication, for example Active Directory or LDAP. Configure network and security devices for centralized authentication as well.			

## 6.2.4 Ensure no legacy "+" entries exist in /etc/group (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The character + 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 are no longer required on most systems, but may exist in files that have been imported from other platforms.

### Rationale:

These entries may provide an avenue for attackers to gain privileged access on the system.

### Audit:






Run the following command and verify that no output is returned:

```
# grep '^\\+: ' /etc/group
```

### Remediation:

Remove any legacy '+' entries from /etc/group if they exist.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16.2 Configure Centralized Point of Authentication</u></b> Configure access for all accounts through as few centralized points of authentication as possible, including network, security, and cloud systems.			
v6	<b><u>16.9 Configure Account Access Centrally</u></b> Configure access for all accounts through a centralized point of authentication, for example Active Directory or LDAP. Configure network and security devices for centralized authentication as well.			

### 6.2.5 Ensure root is the only UID 0 account (Automated)

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

Any account with UID 0 has superuser privileges on the system.

**Rationale:**

This access must be limited to only the default `root` account and only from the system console. Administrative access must be through an unprivileged account using an approved mechanism as noted in Item 5.6 Ensure access to the `su` command is restricted.

**Audit:**







Run the following command and verify that only "root" is returned:

```
# cat /etc/passwd | awk -F: '($3 == 0) { print $1 }'  
root
```

**Remediation:**

Remove any users other than `root` with UID 0 or assign them a new UID if appropriate.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

### *6.2.6 Ensure root PATH Integrity (Automated)*

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

The `root` user can execute any command on the system and could be fooled into executing programs unintentionally if the `PATH` is not set correctly.

**Rationale:**

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.

## Audit:

Run the following script and verify no results are returned:

```
#!/bin/bash
if [ "`echo $PATH | grep ::`" != "" ]; then
    echo "Empty Directory in PATH (::)"
fi

if [ "`echo $PATH | grep :$`" != "" ]; then
    echo "Trailing : in PATH"
fi







p=`echo $PATH | sed -e 's/:::/ /' -e 's/:$//' -e 's:/ /g'`
set -- $p
while [ "$1" != "" ]; do
    if [ "$1" = "." ]; then
        echo "PATH contains ."
        shift
        continue
    fi
    if [ -d $1 ]; then
        dirperm=`ls -ldH $1 | cut -f1 -d" "`
        if [ `echo $dirperm | cut -c6` != "-" ]; then
            echo "Group Write permission set on directory $1"
        fi
        if [ `echo $dirperm | cut -c9` != "-" ]; then
            echo "Other Write permission set on directory $1"
        fi
        dirown=`ls -ldH $1 | awk '{print $3}'`
        if [ "$dirown" != "root" ]; then
            echo $1 is not owned by root
        fi
    else
        echo $1 is not a directory
    fi
    shift
done
```

## Remediation:

Correct or justify any items discovered in the Audit step.



## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

## 6.2.7 Ensure all users' home directories exist (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Users can be defined in `/etc/passwd` without a home directory or with a home directory that does not actually exist.

### Rationale:

If the user's home directory does not exist or is unassigned, the user will be placed in `/` and will not be able to write any files or have local environment variables set.

### Audit:

Run the following script and verify no results are returned:

```
#!/bin/bash

cat /etc/passwd | egrep -v '^(root|halt|sync|shutdown)' | awk -F: '($7 !=
"/usr/sbin/nologin" && $7 != "/bin/false") { print $1 " " $6 }' | while read
user dir; do
    if [ ! -d "$dir" ]; then
        echo "The home directory ($dir) of user $user does not exist."
    fi
done
```







### Remediation:

If any users' home directories do not exist, create them and make sure the respective user owns the directory. Users without an assigned home directory should be removed or assigned a home directory as appropriate.

### Additional Information:

The audit script checks all users UID 500 and above except `nfsnobody`. Some distributions split at `UID 1000` instead, consult your documentation and/or the `UID_MIN` setting in `/etc/login.defs` to determine which is appropriate for you.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>13 Data Protection</u></b> Data Protection			

## 6.2.8 Ensure users' home directories permissions are 750 or more restrictive (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

While the system administrator can establish secure permissions for users' home directories, the users can easily override these.

### Rationale:

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.

### Audit:

Run the following script and verify no results are returned:

```
#!/bin/bash

cat /etc/passwd | egrep -v '^(root|halt|sync|shutdown)' | awk -F: '($7 !=
"/usr/sbin/nologin" && $7 != "/bin/false") { print $1 " " $6 }' | while read
user dir; do
    if [ ! -d "$dir" ]; then
        echo "The home directory ($dir) of user $user does not exist."
    else
        dirperm=`ls -ld $dir | cut -f1 -d" "`
        if [ `echo $dirperm | cut -c6` != "-" ]; then
            echo "Group Write permission set on the home directory ($dir) of user
$user"
        fi
        if [ `echo $dirperm | cut -c8` != "-" ]; then
            echo "Other Read permission set on the home directory ($dir) of user
$user"
        fi
        if [ `echo $dirperm | cut -c9` != "-" ]; then
            echo "Other Write permission set on the home directory ($dir) of user
$user"
        fi
        if [ `echo $dirperm | cut -c10` != "-" ]; then
            echo "Other Execute permission set on the home directory ($dir) of user
$user"
        fi
    fi
done
```







## Remediation:

Making global modifications to user home directories without alerting the user community can result in unexpected outages and unhappy users. Therefore, it is recommended that a monitoring policy be established to report user file permissions and determine the action to be taken in accordance with site policy.

## Additional Information:

On some distributions the `/sbin/nologin` should be replaced with `/usr/sbin/nologin`.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>3.3 <u>Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b>14.6 <u>Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b>14.4 <u>Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

## 6.2.9 Ensure users own their home directories (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The user home directory is space defined for the particular user to set local environment variables and to store personal files.

### Rationale:

Since the user is accountable for files stored in the user home directory, the user must be the owner of the directory.

### Audit:

Run the following script and verify no results are returned:







```
#!/bin/bash

cat /etc/passwd | egrep -v '^(root|halt|sync|shutdown)' | awk -F: '($7 !=
"/usr/sbin/nologin" && $7 != "/bin/false") { print $1 " " $6 }' | while read
user dir; do
    if [ ! -d "$dir" ]; then
        echo "The home directory ($dir) of user $user does not exist."
    else
        owner=$(stat -L -c "%U" "$dir")
        if [ "$owner" != "$user" ]; then
            echo "The home directory ($dir) of user $user is owned by $owner."
        fi
    fi
done
```

### Remediation:

Change the ownership of any home directories that are not owned by the defined user to the correct user.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

## 6.2.10 Ensure users' dot files are not group or world writable (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

While the system administrator can establish secure permissions for users' "dot" files, the users can easily override these.

### Rationale:

Group or world-writable user configuration files may enable malicious users to steal or modify other users' data or to gain another user's system privileges.

### Audit:

Run the following script and verify no results are returned:

```
#!/bin/bash

cat /etc/passwd | egrep -v '^(root|halt|sync|shutdown)' | awk -F: '($7 !=
"/sbin/nologin" && $7 != "/bin/false") { print $1 " " $6 }' | while read user
dir; do
    if [ ! -d "$dir" ]; then
        echo "The home directory ($dir) of user $user does not exist."
    else
        for file in $dir/.[A-Za-z0-9]*; do
            if [ ! -h "$file" -a -f "$file" ]; then
                fileperm=`ls -ld $file | cut -f1 -d" "`

                if [ `echo $fileperm | cut -c6` != "-" ]; then
                    echo "Group Write permission set on file $file"
                fi
                if [ `echo $fileperm | cut -c9` != "-" ]; then
                    echo "Other Write permission set on file $file"
                fi
            fi
        done
    fi
done
```









## Remediation:

Making global modifications to users' files without alerting the user community can result in unexpected outages and unhappy users. Therefore, it is recommended that a monitoring policy be established to report user dot file permissions and determine the action to be taken in accordance with site policy.

## Additional Information:

On some distributions the `/sbin/nologin` should be replaced with `/usr/sbin/nologin`.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			

### 6.2.11 Ensure no users have .forward files (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

The `.forward` file specifies an email address to forward the user's mail to.

#### Rationale:

Use of the `.forward` file poses a security risk in that sensitive data may be inadvertently transferred outside the organization. The `.forward` file also poses a risk as it can be used to execute commands that may perform unintended actions.

#### Audit:

Run the following script and verify no results are returned:







```
#!/bin/bash

cat /etc/passwd | egrep -v '^(root|halt|sync|shutdown)' | awk -F: '($7 !=
"/sbin/nologin" && $7 != "/bin/false") { print $1 " " $6 }' | while read user
dir; do
    if [ ! -d "$dir" ]; then
        echo "The home directory ($dir) of user $user does not exist."
    else
        if [ ! -h "$dir/.forward" -a -f "$dir/.forward" ]; then
            echo ".forward file $dir/.forward exists"
        fi
    fi
done
```

#### Remediation:

Making global modifications to users' files without alerting the user community can result in unexpected outages and unhappy users. Therefore, it is recommended that a monitoring policy be established to report user `.forward` files and determine the action to be taken in accordance with site policy.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>7 Email and Web Browser Protections</u></b> Email and Web Browser Protections			

## 6.2.12 Ensure no users have .netrc files (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The `.netrc` file contains data for logging into a remote host for file transfers via FTP.

### Rationale:

The `.netrc` file presents a significant security risk since it stores passwords in unencrypted form. Even if FTP is disabled, user accounts may have brought over `.netrc` files from other systems which could pose a risk to those systems.

### Audit:

Run the following script and verify no results are returned:






```
#!/bin/bash

cat /etc/passwd | egrep -v '^(root|halt|sync|shutdown)' | awk -F: '($7 !=
"/sbin/nologin" && $7 != "/bin/false") { print $1 " " $6 }' | while read user
dir; do
    if [ ! -d "$dir" ]; then
        echo "The home directory ($dir) of user $user does not exist."
    else
        if [ ! -h "$dir/.netrc" -a -f "$dir/.netrc" ]; then
            echo ".netrc file $dir/.netrc exists"
        fi
    fi
done
```

### Remediation:

Making global modifications to users' files without alerting the user community can result in unexpected outages and unhappy users. Therefore, it is recommended that a monitoring policy be established to report user `.netrc` files and determine the action to be taken in accordance with site policy.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16.4 Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b><u>16.14 Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

### *6.2.13 Ensure users' .netrc Files are not group or world accessible (Automated)*

**Profile Applicability:**

- Level 1 - Server
- Level 1 - Workstation

**Description:**

While the system administrator can establish secure permissions for users' `.netrc` files, the users can easily override these.

**Rationale:**

`.netrc` files may contain unencrypted passwords that may be used to attack other systems.

## Audit:

Run the following script and verify no results are returned:

```
#!/bin/bash

cat /etc/passwd | egrep -v '^(root|halt|sync|shutdown)' | awk -F: '($7 !=
"/sbin/nologin" && $7 != "/bin/false") { print $1 " " $6 }' | while read user
dir; do
    if [ ! -d "$dir" ]; then
        echo "The home directory ($dir) of user $user does not exist."
    else
        for file in $dir/.netrc; do
            if [ ! -h "$file" -a -f "$file" ]; then
                fileperm=`ls -ld $file | cut -f1 -d" "`
                if [ `echo $fileperm | cut -c5` != "-" ]; then
                    echo "Group Read set on $file"
                fi
                if [ `echo $fileperm | cut -c6` != "-" ]; then
                    echo "Group Write set on $file"
                fi
                if [ `echo $fileperm | cut -c7` != "-" ]; then
                    echo "Group Execute set on $file"
                fi
                if [ `echo $fileperm | cut -c8` != "-" ]; then
                    echo "Other Read set on $file"
                fi
                if [ `echo $fileperm | cut -c9` != "-" ]; then
                    echo "Other Write set on $file"
                fi
                if [ `echo $fileperm | cut -c10` != "-" ]; then
                    echo "Other Execute set on $file"
                fi
            fi
        done
    fi
done
```

## Remediation:







Making global modifications to users' files without alerting the user community can result in unexpected outages and unhappy users. Therefore, it is recommended that a monitoring policy be established to report user `.netrc` file permissions and determine the action to be taken in accordance with site policy.

## Additional Information:

While the complete removal of `.netrc` files is recommended if any are required on the system secure permissions must be applied.

On some distributions the `/sbin/nologin` should be replaced with `/usr/sbin/nologin`.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>3.3 Configure Data Access Control Lists</u></b> Configure data access control lists based on a user's need to know. Apply data access control lists, also known as access permissions, to local and remote file systems, databases, and applications.			
v7	<b><u>14.6 Protect Information through Access Control Lists</u></b> Protect all information stored on systems with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			
v6	<b><u>14.4 Protect Information With Access Control Lists</u></b> All information stored on systems shall be protected with file system, network share, claims, application, or database specific access control lists. These controls will enforce the principle that only authorized individuals should have access to the information based on their need to access the information as a part of their responsibilities.			



## 6.2.14 Ensure no users have .rhosts files (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

While no `.rhosts` files are shipped by default, users can easily create them.

### Rationale:

This action is only meaningful if `.rhosts` support is permitted in the file `/etc/pam.conf`. Even though the `.rhosts` files are ineffective if support is disabled in `/etc/pam.conf`, they may have been brought over from other systems and could contain information useful to an attacker for those other systems.

### Audit:

Run the following script and verify no results are returned:

```
#!/bin/bash

cat /etc/passwd | egrep -v '^(root|halt|sync|shutdown)' | awk -F: '($7 !=
"/sbin/nologin" && $7 != "/bin/false") { print $1 " " $6 }' | while read user
dir; do
    if [ ! -d "$dir" ]; then
        echo "The home directory ($dir) of user $user does not exist."
    else
        for file in $dir/.rhosts; do
            if [ ! -h "$file" -a -f "$file" ]; then
                echo ".rhosts file in $dir"
            fi
        done
    fi
done
```






### Remediation:

Making global modifications to users' files without alerting the user community can result in unexpected outages and unhappy users. Therefore, it is recommended that a monitoring policy be established to report user `.rhosts` files and determine the action to be taken in accordance with site policy.

## Additional Information:

On some distributions the `/sbin/nologin` should be replaced with `/usr/sbin/nologin`.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>16.4 <u>Encrypt or Hash all Authentication Credentials</u></b> Encrypt or hash with a salt all authentication credentials when stored.			
v6	<b>16.14 <u>Encrypt/Hash All Authentication Files And Monitor Their Access</u></b> Verify that all authentication files are encrypted or hashed and that these files cannot be accessed without root or administrator privileges. Audit all access to password files in the system.			

## 6.2.15 Ensure all groups in /etc/passwd exist in /etc/group (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Over time, system administration errors and changes can lead to groups being defined in /etc/passwd but not in /etc/group.

### Rationale:

Groups defined in the /etc/passwd file but not in the /etc/group file pose a threat to system security since group permissions are not properly managed.

### Audit:

Run the following script and verify no results are returned:










```
#!/bin/bash

for i in $(cut -s -d: -f4 /etc/passwd | sort -u ); do
  grep -q -P "^..*?:[^:]*:$i:" /etc/group
  if [ $? -ne 0 ]; then
    echo "Group $i is referenced by /etc/passwd but does not exist in
/etc/group"
  fi
done
```

### Remediation:

Analyze the output of the Audit step above and perform the appropriate action to correct any discrepancies found.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>5.1 Establish and Maintain an Inventory of Accounts</u></b> Establish and maintain an inventory of all accounts managed in the enterprise. The inventory must include both user and administrator accounts. The inventory, at a minimum, should contain the person's name, username, start/stop dates, and department. Validate that all active accounts are authorized, on a recurring schedule at a minimum quarterly, or more frequently.			
v8	<b><u>5.3 Disable Dormant Accounts</u></b> Delete or disable any dormant accounts after a period of 45 days of inactivity, where supported.			
v8	<b><u>6.2 Establish an Access Revoking Process</u></b> Establish and follow a process, preferably automated, for revoking access to enterprise assets, through disabling accounts immediately upon termination, rights revocation, or role change of a user. Disabling accounts, instead of deleting accounts, may be necessary to preserve audit trails.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

## 6.2.16 Ensure no duplicate UIDs exist (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Although the `useradd` program will not let you create a duplicate User ID (UID), it is possible for an administrator to manually edit the `/etc/passwd` file and change the UID field.

### Rationale:

Users must be assigned unique UIDs for accountability and to ensure appropriate access protections.

### Audit:

Run the following script and verify no results are returned:




```
#!/bin/bash

cat /etc/passwd | cut -f3 -d":" | sort -n | uniq -c | while read x ; do
[ -z "${x}" ] && break
set - $x
if [ $1 -gt 1 ]; then
    users=`awk -F: '($3 == n) { print $1 }' n=$2 /etc/passwd | xargs`
    echo "Duplicate UID ($2): ${users}"
fi
done
```

### Remediation:

Based on the results of the audit script, establish unique UIDs and review all files owned by the shared UIDs to determine which UID they are supposed to belong to.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

### 6.2.17 Ensure no duplicate GIDs exist (Automated)

#### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

#### Description:

Although the `groupadd` program will not let you create a duplicate Group ID (GID), it is possible for an administrator to manually edit the `/etc/group` file and change the GID field.

#### Rationale:

User groups must be assigned unique GIDs for accountability and to ensure appropriate access protections.

#### Audit:

Run the following script and verify no results are returned:

```
#!/bin/bash
cat /etc/group | cut -f3 -d":" | sort -n | uniq -c | while read x ; do
[ -z "${x}" ] && break
set - $x
if [ $1 -gt 1 ]; then
    groups=`awk -F: '($3 == n) { print $1 }' n=$2 /etc/group | xargs`
    echo "Duplicate GID ($2): ${groups}"
fi
done
```




#### Remediation:

Based on the results of the audit script, establish unique GIDs and review all files owned by the shared GID to determine which group they are supposed to belong to.

#### Additional Information:

You can also use the `grpck` command to check for other inconsistencies in the `/etc/group` file.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			



## 6.2.18 Ensure no duplicate user names exist (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Although the `useradd` program will not let you create a duplicate user name, it is possible for an administrator to manually edit the `/etc/passwd` file and change the user name.

### Rationale:

If a user is assigned a duplicate user name, it will create and have access to files with the first UID for that username in `/etc/passwd`. For example, if "test4" has a UID of 1000 and a subsequent "test4" entry has a UID of 2000, logging in as "test4" will use UID 1000. Effectively, the UID is shared, which is a security problem.

### Audit:

Run the following script and verify no results are returned:




```
#!/bin/bash

cat /etc/passwd | cut -f1 -d":" | sort -n | uniq -c | while read x ; do
[ -z "${x}" ] && break
set - $x
if [ $1 -gt 1 ]; then
uids=`awk -F: '($1 == n) { print $3 }' n=$2 /etc/passwd | xargs`
echo "Duplicate User Name ($2): ${uids}"
fi
done
```

### Remediation:

Based on the results of the audit script, establish unique user names for the users. File ownerships will automatically reflect the change as long as the users have unique UIDs.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b>4.1 <u>Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b>16 <u>Account Monitoring and Control</u></b> Account Monitoring and Control			

## 6.2.19 Ensure no duplicate group names exist (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

Although the `groupadd` program will not let you create a duplicate group name, it is possible for an administrator to manually edit the `/etc/group` file and change the group name.

### Rationale:

If a group is assigned a duplicate group name, it will create and have access to files with the first GID for that group in `/etc/group`. Effectively, the GID is shared, which is a security problem.

### Audit:

Run the following script and verify no results are returned:




```
#!/bin/bash

cat /etc/group | cut -f1 -d":" | sort -n | uniq -c | while read x ; do
[ -z "${x}" ] && break
set - $x
if [ $1 -gt 1 ]; then
    gids=`gawk -F: '($1 == n) { print $3 }' n=$2 /etc/group | xargs`
    echo "Duplicate Group Name ($2): ${gids}"
fi
done
```

### Remediation:

Based on the results of the audit script, establish unique names for the user groups. File group ownerships will automatically reflect the change as long as the groups have unique GIDs.

**CIS Controls:**

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			
v6	<b><u>16 Account Monitoring and Control</u></b> Account Monitoring and Control			

## 6.2.20 Ensure shadow group is empty (Automated)

### Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

### Description:

The shadow group allows system programs which require access the ability to read the `/etc/shadow` file. No users should be assigned to the shadow group.

### Rationale:

Any users assigned to the shadow group would be granted read access to the `/etc/shadow` file. If attackers can gain read access to the `/etc/shadow` file, they can easily run a password cracking program against the hashed passwords to break them. Other security information that is stored in the `/etc/shadow` file (such as expiration) could also be useful to subvert additional user accounts.

### Audit:







Run the following commands and verify no results are returned:

```
# grep ^shadow:[^:]*:[^:]*:[^:]+ /etc/group
# awk -F: '($4 == "<shadow-gid>") { print }' /etc/passwd
```

### Remediation:

Remove all users from the shadow group, and change the primary group of any users with shadow as their primary group.

## CIS Controls:

Controls Version	Control	IG 1	IG 2	IG 3
v8	<b><u>4.1 Establish and Maintain a Secure Configuration Process</u></b> Establish and maintain a secure configuration process for enterprise assets (end-user devices, including portable and mobile, non-computing/IoT devices, and servers) and software (operating systems and applications). Review and update documentation annually, or when significant enterprise changes occur that could impact this Safeguard.			
v7	<b><u>5.1 Establish Secure Configurations</u></b> Maintain documented, standard security configuration standards for all authorized operating systems and software.			
v6	<b><u>5.1 Minimize And Sparingly Use Administrative Privileges</u></b> Minimize administrative privileges and only use administrative accounts when they are required. Implement focused auditing on the use of administrative privileged functions and monitor for anomalous behavior.			

# Appendix: Recommendation Summary Table

Control		Set Correctly	
		Yes	No
<b>1</b>	<b>Initial Setup</b>		
<b>1.1</b>	<b>Filesystem Configuration</b>		
<b>1.1.1</b>	<b>Disable unused filesystems</b>		
1.1.1.1	Ensure mounting of cramfs filesystems is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.1.2	Ensure mounting of freevxfs filesystems is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.1.3	Ensure mounting of jffs2 filesystems is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.1.4	Ensure mounting of hfs filesystems is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.1.5	Ensure mounting of hfsplus filesystems is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.1.6	Ensure mounting of squashfs filesystems is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.1.7	Ensure mounting of udf filesystems is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.2	Ensure /tmp is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.3	Ensure nodev option set on /tmp partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.4	Ensure nosuid option set on /tmp partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.5	Ensure separate partition exists for /var (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.6	Ensure separate partition exists for /var/tmp (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.7	Ensure nodev option set on /var/tmp partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.8	Ensure nosuid option set on /var/tmp partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.9	Ensure noexec option set on /var/tmp partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.10	Ensure separate partition exists for /var/log (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.11	Ensure separate partition exists for /var/log/audit (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.12	Ensure separate partition exists for /home (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.13	Ensure nodev option set on /home partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.14	Ensure nodev option set on /dev/shm partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.15	Ensure nosuid option set on /dev/shm partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>

1.1.16	Ensure noexec option set on /dev/shm partition (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.17	Ensure nodev option set on removable media partitions (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.18	Ensure nosuid option set on removable media partitions (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.19	Ensure noexec option set on removable media partitions (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.20	Ensure sticky bit is set on all world-writable directories (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.1.21	Disable Automounting (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.2</b>	<b>Configure Software Updates</b>		
1.2.1	Ensure package manager repositories are configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
1.2.2	Ensure GPG keys are configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.3</b>	<b>Filesystem Integrity Checking</b>		
1.3.1	Ensure AIDE is installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.3.2	Ensure filesystem integrity is regularly checked (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.4</b>	<b>Secure Boot Settings</b>		
1.4.1	Ensure permissions on bootloader config are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.4.2	Ensure bootloader password is set (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.4.3	Ensure authentication required for single user mode (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.5</b>	<b>Additional Process Hardening</b>		
1.5.1	Ensure core dumps are restricted (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.5.2	Ensure XD/NX support is enabled (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
1.5.3	Ensure address space layout randomization (ASLR) is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.5.4	Ensure prelink is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.6</b>	<b>Mandatory Access Control</b>		
<b>1.6.1</b>	<b>Configure SELinux</b>		
1.6.1.1	Ensure SELinux is not disabled in bootloader configuration (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.6.1.2	Ensure the SELinux state is enforcing (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.6.1.3	Ensure SELinux policy is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.6.1.4	Ensure no unconfined daemons exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>1.6.2</b>	<b>Configure AppArmor</b>		
1.6.2.1	Ensure AppArmor is enabled in the bootloader configuration (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.6.2.2	Ensure all AppArmor Profiles are enforcing (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.6.3	Ensure SELinux or AppArmor are installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>



<b>1.7</b>	<b>Warning Banners</b>		
<b>1.7.1</b>	<b>Command Line Warning Banners</b>		
1.7.1.1	Ensure message of the day is configured properly (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.7.1.2	Ensure local login warning banner is configured properly (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.7.1.3	Ensure remote login warning banner is configured properly (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.7.1.4	Ensure permissions on /etc/motd are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.7.1.5	Ensure permissions on /etc/issue are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.7.1.6	Ensure permissions on /etc/issue.net are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.7.2	Ensure GDM login banner is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
1.8	Ensure updates, patches, and additional security software are installed (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
<b>2</b>	<b>Services</b>		
<b>2.1</b>	<b>inetd Services</b>		
2.1.1	Ensure xinetd is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.1.2	Ensure inetd is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>2.2</b>	<b>Special Purpose Services</b>		
<b>2.2.1</b>	<b>Time Synchronization</b>		
2.2.1.1	Ensure time synchronization is in use (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.1.2	Ensure ntp is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.1.3	Ensure chrony is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.2	Ensure X Window System is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.3	Ensure Avahi Server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.4	Ensure CUPS is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.5	Ensure DHCP Server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.6	Ensure LDAP server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.7	Ensure NFS and RPC are not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.8	Ensure DNS Server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.9	Ensure FTP Server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.10	Ensure HTTP server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.11	Ensure IMAP and POP3 server is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.12	Ensure Samba is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.13	Ensure HTTP Proxy Server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.14	Ensure SNMP Server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.15	Ensure mail transfer agent is configured for local-only mode (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.16	Ensure rsync service is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.2.17	Ensure NIS Server is not enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>

<b>2.3</b>	<b>Service Clients</b>		
2.3.1	Ensure NIS Client is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.3.2	Ensure rsh client is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.3.3	Ensure talk client is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.3.4	Ensure telnet client is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
2.3.5	Ensure LDAP client is not installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>3</b>	<b>Network Configuration</b>		
<b>3.1</b>	<b>Network Parameters (Host Only)</b>		
3.1.1	Ensure IP forwarding is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.1.2	Ensure packet redirect sending is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>3.2</b>	<b>Network Parameters (Host and Router)</b>		
3.2.1	Ensure source routed packets are not accepted (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.2.2	Ensure ICMP redirects are not accepted (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.2.3	Ensure secure ICMP redirects are not accepted (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.2.4	Ensure suspicious packets are logged (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.2.5	Ensure broadcast ICMP requests are ignored (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.2.6	Ensure bogus ICMP responses are ignored (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.2.7	Ensure Reverse Path Filtering is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.2.8	Ensure TCP SYN Cookies is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.2.9	Ensure IPv6 router advertisements are not accepted (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>3.3</b>	<b>TCP Wrappers</b>		
3.3.1	Ensure TCP Wrappers is installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.3.2	Ensure /etc/hosts.allow is configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.3.3	Ensure /etc/hosts.deny is configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.3.4	Ensure permissions on /etc/hosts.allow are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.3.5	Ensure permissions on /etc/hosts.deny are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>3.4</b>	<b>Uncommon Network Protocols</b>		
3.4.1	Ensure DCCP is disabled (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.4.2	Ensure SCTP is disabled (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.4.3	Ensure RDS is disabled (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.4.4	Ensure TIPC is disabled (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
<b>3.5</b>	<b>Firewall Configuration</b>		
<b>3.5.1</b>	<b>Configure IPv4 iptables</b>		
3.5.1.1	Ensure default deny firewall policy (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.5.1.2	Ensure loopback traffic is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.5.1.3	Ensure outbound and established connections are configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.5.1.4	Ensure firewall rules exist for all open ports (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>3.5.2</b>	<b>Configure IPv6 ip6tables</b>		
3.5.2.1	Ensure IPv6 default deny firewall policy (Automated)	<input type="checkbox"/>	<input type="checkbox"/>

3.5.2.2	Ensure IPv6 loopback traffic is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.5.2.3	Ensure IPv6 outbound and established connections are configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.5.2.4	Ensure IPv6 firewall rules exist for all open ports (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.5.3	Ensure iptables is installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
3.6	Ensure wireless interfaces are disabled (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
3.7	Disable IPv6 (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
<b>4</b>	<b>Logging and Auditing</b>		
<b>4.1</b>	<b>Configure System Accounting (auditd)</b>		
<b>4.1.1</b>	<b>Configure Data Retention</b>		
4.1.1.1	Ensure audit log storage size is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.1.2	Ensure system is disabled when audit logs are full (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.1.3	Ensure audit logs are not automatically deleted (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.2	Ensure auditd service is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.3	Ensure auditing for processes that start prior to auditd is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.4	Ensure events that modify date and time information are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.5	Ensure events that modify user/group information are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.6	Ensure events that modify the system's network environment are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.7	Ensure events that modify the system's Mandatory Access Controls are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.8	Ensure login and logout events are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.9	Ensure session initiation information is collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.10	Ensure discretionary access control permission modification events are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.11	Ensure unsuccessful unauthorized file access attempts are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.12	Ensure use of privileged commands is collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.13	Ensure successful file system mounts are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.14	Ensure file deletion events by users are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.15	Ensure changes to system administration scope (sudoers) is collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.16	Ensure system administrator actions (sudolog) are collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>

4.1.17	Ensure kernel module loading and unloading is collected (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.1.18	Ensure the audit configuration is immutable (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>4.2</b>	<b>Configure Logging</b>		
<b>4.2.1</b>	<b>Configure rsyslog</b>		
4.2.1.1	Ensure rsyslog Service is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.1.2	Ensure logging is configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.1.3	Ensure rsyslog default file permissions configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.1.4	Ensure rsyslog is configured to send logs to a remote log host (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.1.5	Ensure remote rsyslog messages are only accepted on designated log hosts. (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
<b>4.2.2</b>	<b>Configure syslog-ng</b>		
4.2.2.1	Ensure syslog-ng service is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.2.2	Ensure logging is configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.2.3	Ensure syslog-ng default file permissions configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.2.4	Ensure syslog-ng is configured to send logs to a remote log host (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.2.5	Ensure remote syslog-ng messages are only accepted on designated log hosts (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.3	Ensure rsyslog or syslog-ng is installed (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.2.4	Ensure permissions on all logfiles are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
4.3	Ensure logrotate is configured (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
<b>5</b>	<b>Access, Authentication and Authorization</b>		
<b>5.1</b>	<b>Configure cron</b>		
5.1.1	Ensure cron daemon is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.1.2	Ensure permissions on /etc/crontab are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.1.3	Ensure permissions on /etc/cron.hourly are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.1.4	Ensure permissions on /etc/cron.daily are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.1.5	Ensure permissions on /etc/cron.weekly are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.1.6	Ensure permissions on /etc/cron.monthly are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.1.7	Ensure permissions on /etc/cron.d are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.1.8	Ensure at/cron is restricted to authorized users (Automated)	<input type="checkbox"/>	<input type="checkbox"/>

<b>5.2</b>	<b>SSH Server Configuration</b>		
5.2.1	Ensure permissions on /etc/ssh/sshd_config are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.2	Ensure permissions on SSH private host key files are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.3	Ensure permissions on SSH public host key files are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.4	Ensure SSH Protocol is set to 2 (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.5	Ensure SSH LogLevel is appropriate (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.6	Ensure SSH X11 forwarding is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.7	Ensure SSH MaxAuthTries is set to 4 or less (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.8	Ensure SSH IgnoreRhosts is enabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.9	Ensure SSH HostbasedAuthentication is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.10	Ensure SSH root login is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.11	Ensure SSH PermitEmptyPasswords is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.12	Ensure SSH PermitUserEnvironment is disabled (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.13	Ensure only strong ciphers are used (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.14	Ensure only strong MAC algorithms are used (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.15	Ensure only strong Key Exchange algorithms are used (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.16	Ensure SSH Idle Timeout Interval is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.17	Ensure SSH LoginGraceTime is set to one minute or less (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.18	Ensure SSH access is limited (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.2.19	Ensure SSH warning banner is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>5.3</b>	<b>Configure PAM</b>		
5.3.1	Ensure password creation requirements are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.3.2	Ensure lockout for failed password attempts is configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.3.3	Ensure password reuse is limited (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.3.4	Ensure password hashing algorithm is SHA-512 (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>5.4</b>	<b>User Accounts and Environment</b>		
<b>5.4.1</b>	<b>Set Shadow Password Suite Parameters</b>		
5.4.1.1	Ensure password expiration is 365 days or less (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.4.1.2	Ensure minimum days between password changes is 7 or more (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.4.1.3	Ensure password expiration warning days is 7 or more (Automated)	<input type="checkbox"/>	<input type="checkbox"/>

5.4.1.4	Ensure inactive password lock is 30 days or less (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.4.1.5	Ensure all users last password change date is in the past (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.4.2	Ensure system accounts are non-login (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.4.3	Ensure default group for the root account is GID 0 (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.4.4	Ensure default user umask is 027 or more restrictive (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.4.5	Ensure default user shell timeout is 900 seconds or less (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
5.5	Ensure root login is restricted to system console (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
5.6	Ensure access to the su command is restricted (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
<b>6</b>	<b>System Maintenance</b>		
<b>6.1</b>	<b>System File Permissions</b>		
6.1.1	Audit system file permissions (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.2	Ensure permissions on /etc/passwd are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.3	Ensure permissions on /etc/shadow are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.4	Ensure permissions on /etc/group are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.5	Ensure permissions on /etc/gshadow are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.6	Ensure permissions on /etc/passwd- are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.7	Ensure permissions on /etc/shadow- are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.8	Ensure permissions on /etc/group- are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.9	Ensure permissions on /etc/gshadow- are configured (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.10	Ensure no world writable files exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.11	Ensure no unowned files or directories exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.12	Ensure no ungrouped files or directories exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.13	Audit SUID executables (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
6.1.14	Audit SGID executables (Manual)	<input type="checkbox"/>	<input type="checkbox"/>
<b>6.2</b>	<b>User and Group Settings</b>		
6.2.1	Ensure password fields are not empty (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.2	Ensure no legacy "+" entries exist in /etc/passwd (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.3	Ensure no legacy "+" entries exist in /etc/shadow (Automated)	<input type="checkbox"/>	<input type="checkbox"/>

6.2.4	Ensure no legacy "+" entries exist in /etc/group (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.5	Ensure root is the only UID 0 account (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.6	Ensure root PATH Integrity (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.7	Ensure all users' home directories exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.8	Ensure users' home directories permissions are 750 or more restrictive (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.9	Ensure users own their home directories (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.10	Ensure users' dot files are not group or world writable (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.11	Ensure no users have .forward files (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.12	Ensure no users have .netrc files (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.13	Ensure users' .netrc Files are not group or world accessible (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.14	Ensure no users have .rhosts files (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.15	Ensure all groups in /etc/passwd exist in /etc/group (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.16	Ensure no duplicate UIDs exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.17	Ensure no duplicate GIDs exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.18	Ensure no duplicate user names exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.19	Ensure no duplicate group names exist (Automated)	<input type="checkbox"/>	<input type="checkbox"/>
6.2.20	Ensure shadow group is empty (Automated)	<input type="checkbox"/>	<input type="checkbox"/>

# Appendix: Change History

Date	Version	Changes for this version
Dec 31, 2015	1.0.0	PUBLISHED - CIS Debian Linux 8 Benchmark
Nov 28, 2018	2.0.0	UPDATE - Ensure /etc/hosts.deny is configured - Updated from scored to not scored - Ticket #7409
Nov 28, 2018	2.0.0	UPDATE - Ensure /etc/hosts.allow is configured - Updated from scored to not scored - Ticket #7376
Nov 28, 2018	2.0.0	UPDATE - Ensure /etc/hosts.allow is configured - Corrected formatting errors - Ticket #7378
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH LogLevel is appropriate - Corrected formatting errors - Ticket #7310
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH Protocol is set to 2 - Corrected formatting issues - Ticket #7316
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH LogLevel is set to INFO - Updated title to: Ensure SSH LogLevel is appropriate - Ticket #7312
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH LogLevel is appropriate - Updated recommendation to include both VERBOSE and INFO as acceptable settings - Ticket #7312
Dec 3, 2018	2.0.0	ADD - Ensure permissions on SSH private host key files are configured - Recommendation added - Ticket #7442
Dec 3, 2018	2.0.0	ADD - Ensure permissions on SSH public host key files are configured - Recommendation added - Ticket #7443
Dec 3, 2018	2.0.0	ADD - Ensure only strong ciphers are used - Recommendation added - Ticket #7444
Dec 3, 2018	2.0.0	ADD - Ensure only strong Key Exchange algorithms are used - Recommendation added - Ticket #7445
Dec 3, 2018	2.0.0	UPDATE - Intended Audience - Added x64 platform - Ticket #7441



Dec 3, 2018	2.0.0	UPDATE - Ensure only approved MAC algorithms are used - Title changed to Ensure only strong MAC algorithms are used - Ticket #7450
Dec 3, 2018	2.0.0	UPDATE - Ensure only strong MAC algorithms are used - Change to blacklist of "weak" Algorithms. Updated listed algorithms to only include MAC Algorithms - Ticket #7302
Dec 3, 2018	2.0.0	UPDATE - Ensure only strong MAC algorithms are used - Corrected formatting errors - Ticket #7301
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH PermitUserEnvironment is disabled - Corrected formatting errors - Ticket #7303
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH PermitEmptyPasswords is disabled - Corrected formatting errors - Ticket #7304
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH root login is disabled - Corrected formatting errors - Ticket #7305
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH HostbasedAuthentication is disabled - Corrected formatting errors - Ticket #7306
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH IgnoreRhosts is enabled - Corrected formatting errors - Ticket #7307
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH MaxAuthTries is set to 4 or less - Corrected formatting errors - Ticket #7308
Dec 3, 2018	2.0.0	UPDATE - Ensure SSH X11 forwarding is disabled - Corrected formatting errors - Ticket #7309
Dec 4, 2018	2.0.0	UPDATE - Ensure logrotate is configured - Updated description, audit, and remediation - Ticket #7365
Dec 4, 2018	2.0.0	UPDATE - Ensure audit log storage size is configured - Changed from unscored to scored - Ticket #7369
Dec 4, 2018	2.0.0	UPDATE - Ensure audit log storage size is configured - Corrected formatting errors - Ticket #7370
Dec 4, 2018	2.0.0	UPDATE - Ensure SELinux or AppArmor are installed - SELinux packages needing to be installed updated - Ticket #7428

Dec 4, 2018	2.0.0	UPDATE - Ensure SSH Protocol is set to 2 - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH LogLevel is appropriate - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH X11 forwarding is disabled - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH MaxAuthTries is set to 4 or less - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH IgnoreRhosts is enabled - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH HostbasedAuthentication is disabled - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH root login is disabled - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH PermitEmptyPasswords is disabled - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH PermitUserEnvironment is disabled - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure only strong ciphers are used - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure only strong MAC algorithms are used - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure only strong Key Exchange algorithms are used - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH Idle Timeout Interval is configured - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH LoginGraceTime is set to one minute or less - Updated audit and automation to use sshd -T command - Ticket #7448

Dec 4, 2018	2.0.0	UPDATE - Ensure SSH access is limited - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 4, 2018	2.0.0	UPDATE - Ensure SSH warning banner is configured - Updated audit and automation to use sshd -T command - Ticket #7448
Dec 5, 2018	2.0.0	UPDATE - Collect Use of Privileged Commands - Audit and Remediation updated - Ticket #5254
Dec 5, 2018	2.0.0	REMOVE - Duplicate section in TCP Wrappers - Ticket #5252
Dec 5, 2018	2.0.0	UPDATE - Ensure Reverse Path Filtering is enabled - Corrected formatting errors - Ticket #7492
Dec 5, 2018	2.0.0	UPDATE - Ensure bogus ICMP responses are ignored - Corrected formatting errors - Ticket #7491
Dec 5, 2018	2.0.0	UPDATE - Ensure broadcast ICMP requests are ignored - Corrected formatting errors - Ticket #7490
Dec 5, 2018	2.0.0	UPDATE - Ensure suspicious packets are logged - Corrected formatting errors - Ticket #7488
Dec 5, 2018	2.0.0	UPDATE - Ensure suspicious packets are logged - Removed reference to Ubuntu in notes section - Ticket #7489
Dec 5, 2018	2.0.0	UPDATE - Ensure secure ICMP redirects are not accepted - Removed reference to Ubuntu in the notes section - Ticket #7455
Dec 5, 2018	2.0.0	REMOVE - IPv6 Section - IPv6 configuration has been incorporated into Network Parameters Section - Ticket #7487
Dec 5, 2018	2.0.0	REMOVE - Ensure IPv6 redirects are not accepted - Incorporated into "Ensure ICMP redirects are not accepted" - Ticket #7486
Dec 5, 2018	2.0.0	UPDATE - Ensure TCP Wrappers is installed - Change from not scored to Scored - Ticket #7456
Dec 5, 2018	2.0.0	ADD - Ensure IPv6 router advertisements are not accepted - Recommendation added - Ticket #7485
Dec 5, 2018	2.0.0	UPDATE - Ensure ICMP redirects are not accepted - Added configuration for IPv6 - Ticket #7483

Dec 5, 2018	2.0.0	UPDATE - Ensure IP forwarding is disabled - Added configuration for IPv6 - Ticket #7481
Dec 5, 2018	2.0.0	UPDATE - Ensure SELinux policy is configured - Removed reference to Ubuntu - Ticket #7437
Dec 5, 2018	2.0.0	UPDATE - Ensure separate partition exists for /tmp - Changed to Ensure /tmp is configured. Audit, Remediation and Automation updated - Ticket #7439
Dec 5, 2018	2.0.0	UPDATE - Ensure /tmp is configured - Change from Level 2 to Level 1 check - Ticket #7480
Dec 5, 2018	2.0.0	UPDATE - Ensure source routed packets are not accepted - Added configuration for IPv6 - Ticket #7414
Dec 5, 2018	2.0.0	UPDATE - Ensure packet redirect sending is disabled - Removed reference to Ubuntu bug - Ticket #7412
Dec 6, 2018	2.0.0	REMOVE - Ensure rsh server is not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7513
Dec 6, 2018	2.0.0	UPDATE - Ensure mounting of cramfs filesystems is disabled - Remediation Procedure updated - Ticket #7436
Dec 6, 2018	2.0.0	UPDATE - Ensure mounting of freevxfs filesystems is disabled - Remediation Procedure updated - Ticket #7436
Dec 6, 2018	2.0.0	UPDATE - Ensure mounting of jffs2 filesystems is disabled - Remediation Procedure updated - Ticket #7436
Dec 6, 2018	2.0.0	UPDATE - Ensure mounting of hfs filesystems is disabled - Remediation Procedure updated - Ticket #7436
Dec 6, 2018	2.0.0	UPDATE - Ensure mounting of hfsplus filesystems is disabled - Remediation Procedure updated - Ticket #7436
Dec 6, 2018	2.0.0	UPDATE - Ensure mounting of squashfs filesystems is disabled - Remediation Procedure updated - Ticket #7436
Dec 6, 2018	2.0.0	UPDATE - Ensure mounting of udf filesystems is disabled - Remediation Procedure updated - Ticket #7436

Dec 6, 2018	2.0.0	UPDATE - Ensure mounting of FAT filesystems is disabled - Remediation Procedure updated - Ticket #7436
Dec 6, 2018	2.0.0	UPDATE - Audit system file permissions - Removed reference to rpm package manager - Ticket #7248
Dec 6, 2018	2.0.0	UPDATE - Ensure AppArmor is not Disabled - Changed to "Ensure AppArmor is enabled in the bootloader". Audit, remediation, and automation updated - Ticket #7429
Dec 6, 2018	2.0.0	REMOVE - Ensure tftp server is not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7516
Dec 6, 2018	2.0.0	REMOVE - Ensure telnet server is not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7515
Dec 6, 2018	2.0.0	REMOVE - Ensure talk server is not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7514
Dec 6, 2018	2.0.0	REMOVE - Ensure time services are not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7512
Dec 6, 2018	2.0.0	REMOVE - Ensure echo services are not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7511
Dec 6, 2018	2.0.0	REMOVE - Ensure discard services are not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7510
Dec 6, 2018	2.0.0	REMOVE - Ensure daytime services are not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7509
Dec 6, 2018	2.0.0	REMOVE - Ensure chargen services are not enabled - Service is dependent upon inetd that is recommended to be uninstalled - Ticket #7508
Dec 6, 2018	2.0.0	ADD - Ensure inetd is not installed - Ticket #7506
Dec 6, 2018	2.0.0	UPDATE - Ensure xinetd is not enabled changed to: Ensure xinetd is not installed. Audit, Remediation, and Automation updated - Ticket #7507

Dec 6, 2018	2.0.0	UPDATE - Numbering in "Network Parameters" corrected - Ticket #7454
Dec 6, 2018	2.0.0	UPDATE - Ensure IMAP and POP3 server is not enabled - Change `dovecot` to `exim4`. Audit, Remediation, and Automation updated - Ticket #7387
Dec 6, 2018	2.0.0	UPDATE - Ensure wireless interfaces are disabled - Removed erroneous character encoding - Ticket #7373
Dec 6, 2018	2.0.0	ADD - Configure IPv4 iptables - Ticket #7497
Dec 6, 2018	2.0.0	ADD - Configure IPv6 ip6tables - Ticket #7496
Dec 6, 2018	2.0.0	UPDATE - Firewall Configuration - Move IPv4 Recommendations under "new" Configure IPv4 iptables section - Ticket #7495
Dec 6, 2018	2.0.0	UPDATE - Disable IPv6 - Changed from Scored to Unscored - Ticket #7498
Dec 6, 2018	2.0.0	UPDATE - Ensure TCP SYN Cookies is enabled - Corrected formatting errors - Ticket #7493
Dec 7, 2018	2.0.0	UPDATE - Ensure DCCP is disabled - Remediation Procedure updated - Ticket #7494
Dec 7, 2018	2.0.0	UPDATE - Ensure SCTP is disabled - Remediation Procedure updated - Ticket #7494
Dec 7, 2018	2.0.0	UPDATE - Ensure RDS is disabled - Remediation Procedure updated - Ticket #7494
Dec 7, 2018	2.0.0	UPDATE - Ensure TIPC is disabled - Remediation Procedure updated - Ticket #7494
Dec 7, 2018	2.0.0	UPDATE - Ensure xinetd is not installed - include check for inetutils-inetd - Ticket #7506
Dec 11, 2018	2.0.0	UPDATE - Ensure password expiration warning days is 7 or more - Corrected formatting errors - Ticket #7533
Dec 12, 2018	2.0.0	UPDATE - Ensure message of the day is configured properly - Updated audit procedure - Ticket #7416

Dec 12, 2018	2.0.0	UPDATE - Ensure local login warning banner is configured properly - Updated audit procedure - Ticket #7415
Dec 12, 2018	2.0.0	UPDATE - Ensure remote login warning banner is configured properly - Updated audit procedure - Ticket #7413
Dec 12, 2018	2.0.0	UPDATE - Ensure nosuid option set on /tmp partition - Updated from unscored to scored - Ticket #7411
Dec 12, 2018	2.0.0	UPDATE - Ensure GDM login banner is configured - Updated audit procedure, remediation procedure, and automation - Ticket #7410
Dec 12, 2018	2.0.0	UPDATE - Ensure ntp is configured - Updated audit procedure - Ticket #7395
Dec 12, 2018	2.0.0	UPDATE - Ensure chrony is configured - Updated audit procedure - Ticket #7393
Dec 12, 2018	2.0.0	UPDATE - Ensure DHCP Server is not enabled - Updated audit procedure and rationale statement - Ticket #7391
Dec 12, 2018	2.0.0	UPDATE - Ensure NFS and RPC are not enabled - Updated audit procedure - Ticket #7389
Dec 12, 2018	2.0.0	UPDATE - Ensure permissions on /etc/cron.hourly are configured - Updated audit procedure - Ticket #7233
Dec 12, 2018	2.0.0	UPDATE - Ensure permissions on /etc/cron.daily are configured - Updated audit procedure - Ticket #7233
Dec 12, 2018	2.0.0	UPDATE - Ensure permissions on /etc/cron.weekly are configured - Updated audit procedure - Ticket #7233
Dec 12, 2018	2.0.0	UPDATE - Ensure permissions on /etc/cron.monthly are configured - Updated audit procedure - Ticket #7233
Dec 12, 2018	2.0.0	UPDATE - Ensure permissions on /etc/cron.d are configured - Updated audit procedure - Ticket #7233
Dec 12, 2018	2.0.0	UPDATE - Ensure access to the su command is restricted - Updated Description and Rationale Statement - Ticket #7292

Dec 13, 2018	2.0.0	UPDATE - Ensure iptables is installed - Corrected formatting errors - Ticket #7374
Dec 13, 2018	2.0.0	UPDATE - Logging and Auditing - Updated overview to account for no wheel group in a default Debian 8 install - Ticket #7372
Dec 13, 2018	2.0.0	UPDATE - Ensure SSH LogLevel is appropriate - Corrected formatting errors - Ticket #7313
Dec 13, 2018	2.0.0	UPDATE - Ensure password hashing algorithm is SHA-512 - Updated audit procedure - Ticket #7299
Dec 13, 2018	2.0.0	UPDATE - Ensure password expiration warning days is 7 or more Ensure password expiration warning days is 7 or more - Corrected formatting errors - Ticket #7298
Dec 13, 2018	2.0.0	UPDATE - Ensure default group for the root account is GID 0 - Corrected formatting errors - Ticket #7296
Dec 13, 2018	2.0.0	UPDATE - Ensure default user shell timeout is 900 seconds or less - Corrected formatting errors - Ticket #7295
Dec 13, 2018	2.0.0	UPDATE - Configure Software Updates - Updated overview to correct erroneous reference - Ticket #6126
Dec 13, 2018	2.0.0	UPDATE - All Benchmark Recommendations have been mapped to CIS Controls version 7 - Ticket #7484
Dec 13, 2018	2.0.0	REMOVE - Ensure mounting of vfat filesystems is disabled - Ticket #7542
Dec 13, 2018	2.0.0	UPDATE - Ensure mounting of udf filesystems is disabled - Updated audit procedure - Ticket #7548
Dec 13, 2018	2.0.0	UPDATE - Ensure mounting of jffs2 filesystems is disabled - Updated audit procedure - Ticket #6091
Dec 20, 2018	2.0.0	UPDATE - Ensure SELinux or AppArmor are installed - Updated remediation procedure, removed install package selinux-policy-default - Ticket #7601
Dec 27, 2018	2.0.0	UPDATE - Audit system file permissions - Corrected formatting errors - Ticket #7631



Dec 27, 2018	2.0.0	UPDATE - Ensure no world writable files exist Accepted - Corrected formatting errors - Ticket #7629
Dec 27, 2018	2.0.0	UPDATE - Ensure no unowned files or directories exist - Corrected formatting errors - Ticket #7627
Dec 27, 2018	2.0.0	UPDATE - Ensure no ungrouped files or directories exist - Corrected formatting errors - Ticket #7625
Dec 27, 2018	2.0.0	UPDATE - Audit SUID executables - Corrected formatting errors - Ticket #7622
Dec 27, 2018	2.0.0	UPDATE - Audit SGID executables - Corrected formatting errors - Ticket #7620
Dec 27, 2018	2.0.0	UPDATE - Ensure nosuid option set on /tmp partition - Updated Remediation Procedure to include systemd configuration option - Ticket #7616
Dec 27, 2018	2.0.0	UPDATE - Ensure nodev option set on /tmp partition - Update Remediation Procedure to include systemd configuration option - Ticket #7615
Dec 28, 2018	2.0.0	UPDATE - Ensure SELinux or AppArmor are installed - Updated remediation procedure to include additional apparmor packages - Ticket #7645
Dec 28, 2018	2.0.0	UPDATE - Section 3.2 - corrected numbering of sub-sections - Ticket #7608
May 31, 2019	2.0.0.1	UPDATE - Section 5.2.13 Ensure only strong ciphers are used - Corrected spelling errors
May 31, 2019	2.0.0.1	UPDATE - 5.2.14 Ensure only strong MAC algorithms are used - Corrected spelling errors
May 31, 2019	2.0.0.1	UPDATE - 5.2.15 Ensure only strong Key Exchange algorithms are used - Corrected spelling errors
May 31, 2019	2.0.0.1	UPDATE - 5.1.3 Ensure permissions on /etc/cron.hourly are configured - Corrected Automation error

May 31, 2019	2.0.0.1	UPDATE - 5.1.4 Ensure permissions on /etc/cron.daily are configured - Corrected Automation error
May 31, 2019	2.0.0.1	UPDATE - 5.1.5 Ensure permissions on /etc/cron.weekly are configured - Corrected Automation error
May 31, 2019	2.0.0.1	UPDATE - 5.1.6 Ensure permissions on /etc/cron.monthly are configured - Corrected automation error
May 31, 2019	2.0.0.1	UPDATE - 5.1.7 Ensure permissions on /etc/cron.d are configured - Corrected automation error
Jul 16, 2019	2.0.1	UPDATE - Ensure ntp is configured - Corrected Automated Assessment Content (Ticket 8752)
Jul 16, 2019	2.0.1	UPDATE - Ensure IPv6 default deny firewall policy - Corrected Automated Assessment Content (Ticket 8754)
Jul 16, 2019	2.0.1	UPDATE - Ensure bootloader password is set - Corrected Automated Assessment Content (Ticket 8753)
Jul 21, 2019	2.0.1	UPDATE - Ensure events that modify the system's network environment are collected - Corrected Audit and Remediation (Ticket 8787)
May 21, 2021	2.0.2	UPDATE - 4.1.17 Ensure kernel module loading and unloading - Corrected AAC
May 21, 2021	2.0.2	Mapped to CIS Controls v8
May 24, 2021	2.0.2	Published