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LAB 4: LINUX FILE PERMISSIONS AND OWNERSHIP

- **File Permissions**

Linux file permissions determine who can read, write, or execute files. Permissions are divided into three types: • Read (r): Permission to read the file. • Write (w): Permission to modify or delete the file. • Execute (x): Permission to run the file as a program.

- **User Types**

Owner: The user who created the file. • Group: Users who belong to the same group as the file's group. • Others: All other users.

- **Permission Representation**

Permissions are displayed as a string of ten characters: • Example: -rwxr-xr—

The first character indicates the type (- for file, d for directory). o the next three characters are for the owner, the following three for the group, and the last three for others.

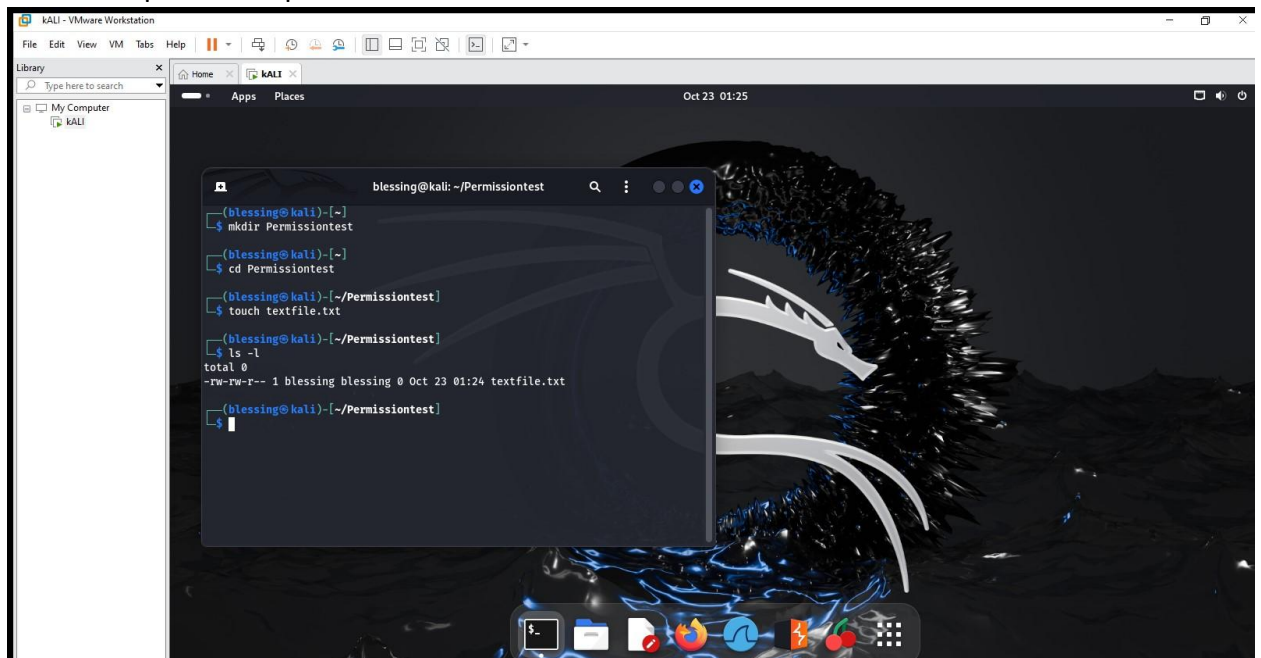
Commands to learn: ls -l: List files with permissions. • chmod: Change file permissions. • chown: Change file ownership. • chgrp: Change group ownership

INSTRUCTIONS TO FOLLOW

- **Viewing File Permissions**

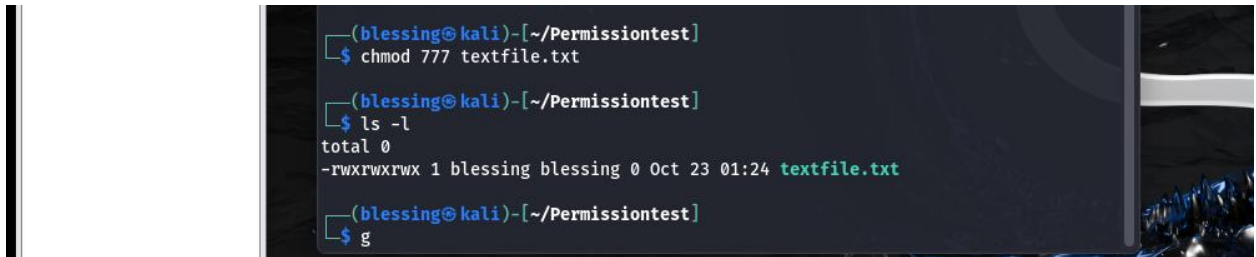
- i. Check Current Permissions
- a. Create New Directory PermissionTest using mkdir command
- b. Navigate into the new directory using cd
- c. Create a new file textfile.txt with the touch command
- d. List the permissions with ls -l command

Below is a pictorial representation of the above commands:

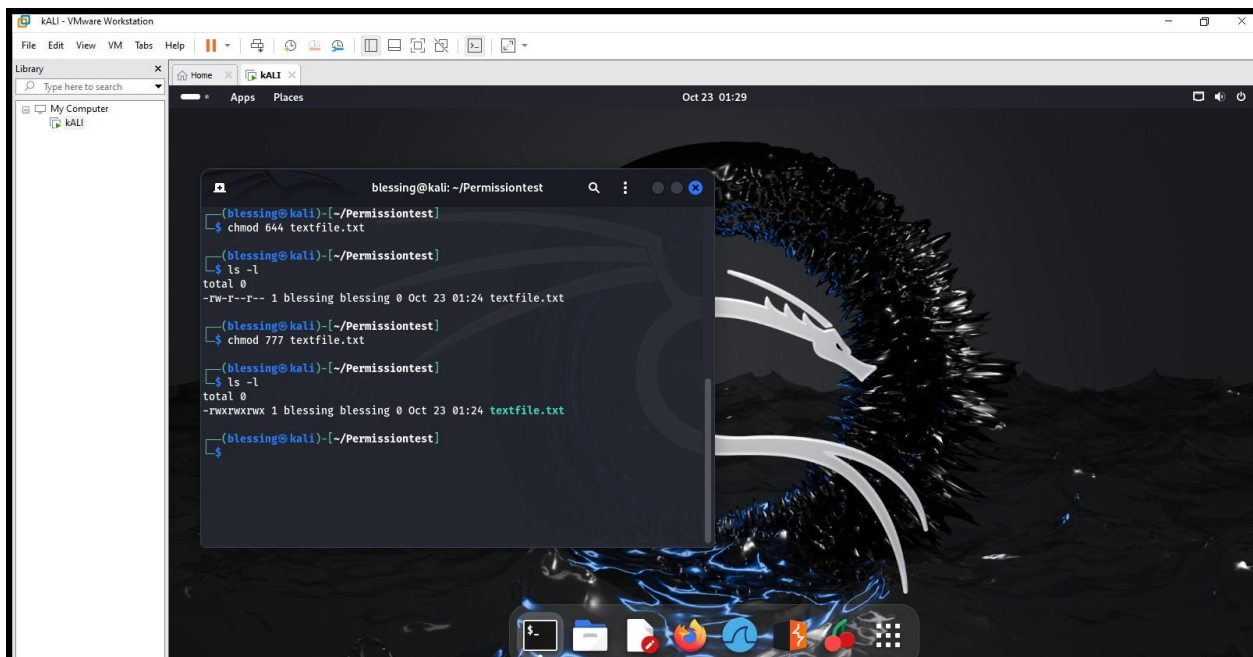


- Modifying Permissions

- Change File Permissions
- Verify the Changes



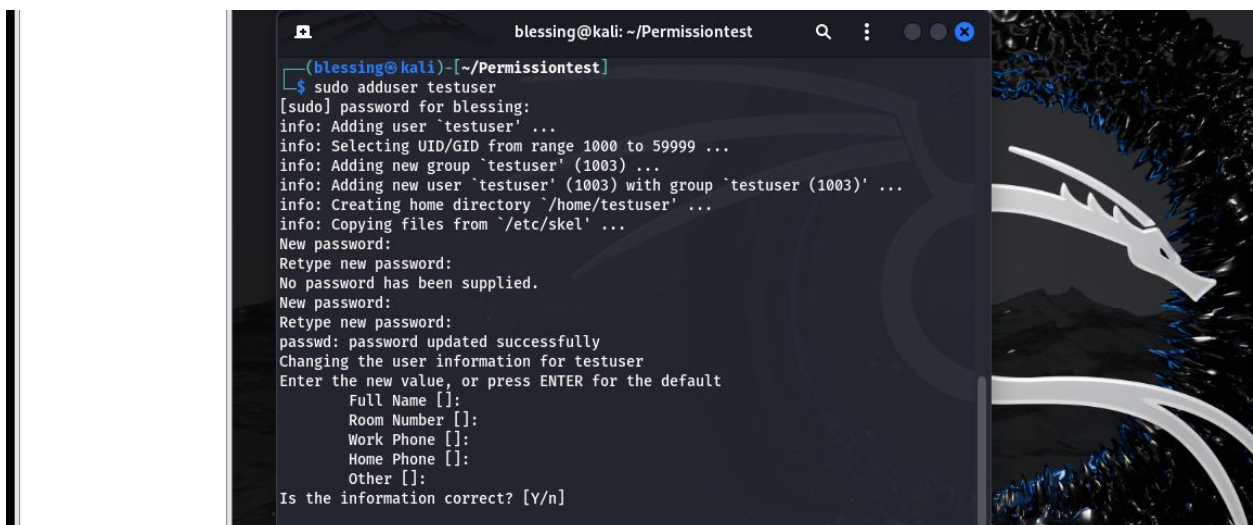
- Revert Permissions
- Check Permissions again
- Experiment with permissions



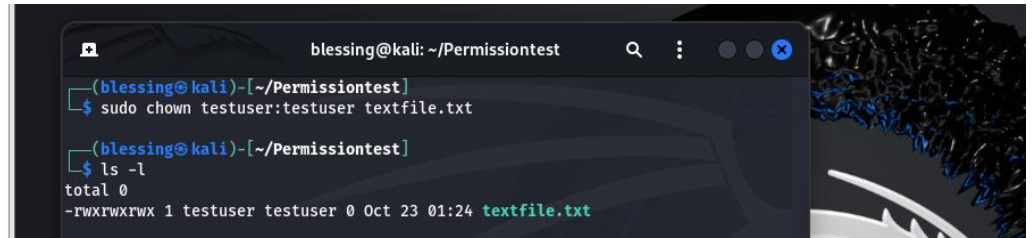
- **Changing Ownership**

- i. Change file ownership

- a. Create new user testuser using the sudo adduser command
 - b. Change the ownership of textfile.txt to testuser

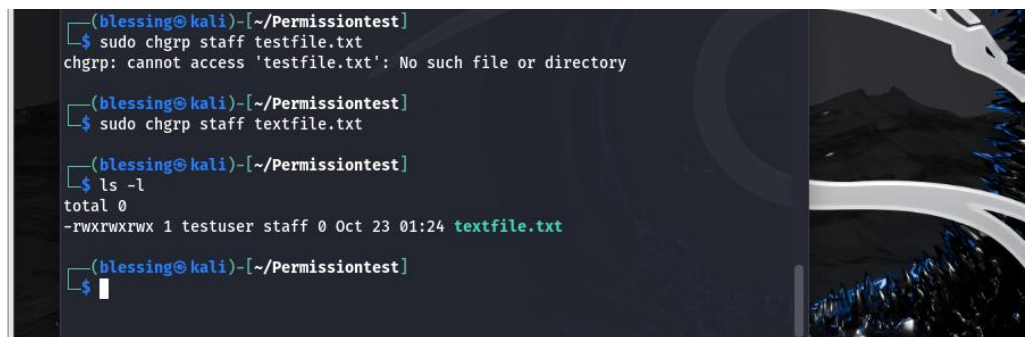


- c. Verify ownership with ls -l command



```
blissing@kali: ~/Permissiontest
(blessing@kali)-[~/Permissiontest]
$ sudo chown testuser:testuser textfile.txt
(blessing@kali)-[~/Permissiontest]
$ ls -l
total 0
-rwxrwxrwx 1 testuser testuser 0 Oct 23 01:24 textfile.txt
```

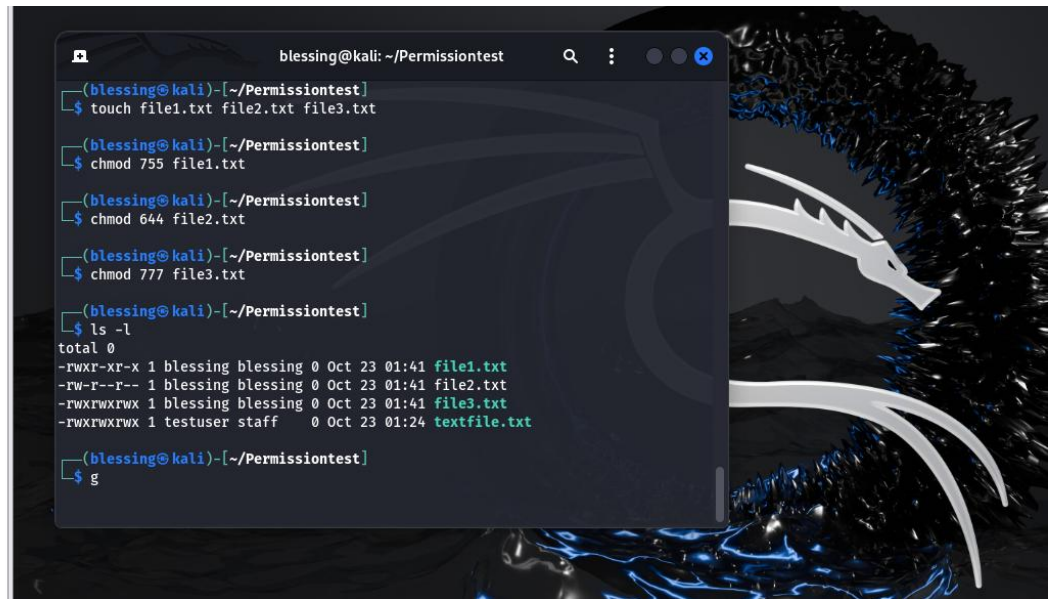
- i. Change Group ownership
 - a. Change group ownership to another group called staff with the sudo chgrp command
 - b. Check ownership and permissions again



```
(blessing@kali)-[~/Permissiontest]
$ sudo chgrp staff testfile.txt
chgrp: cannot access 'testfile.txt': No such file or directory
(blessing@kali)-[~/Permissiontest]
$ sudo chgrp staff textfile.txt
(blessing@kali)-[~/Permissiontest]
$ ls -l
total 0
-rwxrwxrwx 1 testuser staff 0 Oct 23 01:24 textfile.txt
(blessing@kali)-[~/Permissiontest]
$
```

- **Practical Exercises**

- i. Create and modify permissions
 - a. Create three new files
 - b. Set different permissions for them
 - c. Verify the permissions

A terminal window titled 'blessing@kali: ~/Permissiontest' is shown against a dark background with a blue dragon illustration. The terminal displays the following commands and output:

```
(blessing@kali)-[~/Permissiontest]
$ touch file1.txt file2.txt file3.txt

(blessing@kali)-[~/Permissiontest]
$ chmod 755 file1.txt

(blessing@kali)-[~/Permissiontest]
$ chmod 644 file2.txt

(blessing@kali)-[~/Permissiontest]
$ chmod 777 file3.txt

(blessing@kali)-[~/Permissiontest]
$ ls -l
total 0
-rwxr-xr-x 1 blessing blessing 0 Oct 23 01:41 file1.txt
-rw-r--r-- 1 blessing blessing 0 Oct 23 01:41 file2.txt
-rwxrwxrwx 1 blessing blessing 0 Oct 23 01:41 file3.txt
-rwxrwxrwx 1 testuser staff 0 Oct 23 01:24 textfile.txt

(blessing@kali)-[~/Permissiontest]
$ g
```

- **Ownership Challenge**

- Create a directory named Project and set your current user as the owner
- `mkdir Project`
`sudo chown $USER:$USER`
- Verify the ownership with `ls -ld Project` command.

NOTE: The difference between `ls -l` and `ls -ld` is that `ls -ld` will display only the directory it is directed to display and not all the files and directories like the `ls -l` command will do.

LAB 5: LINUX DISTRIBUTION: EXPLAINED EASY

Firstly, *LINUX* means Lovable Intellect Not Using XP (with the XP meaning experience).” Linux was built by and named after Linus Torvalds. Linux is an *open-source operating system* for servers, computers, mainframes, mobile systems, and embedded systems. Requests from device software are handled by Linux and relayed to computer hardware.” An *operating system (OS)* is a piece of software that manages the computer’s hardware resources.

The Linux operating system consists of the following components:

- **Bootloader:** A bootloader's purpose is to manage the booting process of the computer and the Linux Kernel startup. It helps in managing systems that boot more than one Operating System (OS). For easy understanding, this is the welcome screen that appears and disappears as the operating system (OS) boots.
- **Kernel:** Kernel is the heart of the Linux system. Without it, the OS cannot function. It handles the network access, schedules applications, manages basic peripheral devices and files. The kernel is the OS's lowest level.
- **Init system:** It manages the launch process once the kernel is loaded (such as GRUB or GRand Unified Bootloader).” A process is an instance of a program running on a computer, and the Init system initializes the system to enable it to run other processes.” Init is a daemon program that is responsible for controlling daemons and bootstrapping the user space that is, it acts as the starting point to all other processes running on the system.
- **Applications:** This is the variety of software that is installed during and after the initial Linux installation that allows the completion of a directive. A lot of Linux distributions include thousands of different applications such as desktop utilities, programming languages to multi-user business suites.
- **Daemons:** This refers to program that runs in the background, that is, secondary services (printing, sound, scheduling, e.t.c).
- **Desktop environment:** This is the part where users interact that is, it is a series of apps and UI controls with which users interact when using Linux as a desktop platform. Examples of some desktop environment are Gnome, Cinnamon, Pantheon, e.t.c). Each desktop has its own layout which includes pre-installed apps (file managers, config tools, web browsers, games, e.t.c).
- **Graphical server:** This is the software that manages how graphics display on a computer. It is commonly known as the [X Window System](#), also known as X11 or X.

How the Linux OS Works?

Linux is used to manage several services, such as process scheduling, application scheduling, fundamental peripheral devices, and file systems. Linux can run any type of program you're used to either on Windows or macOS.

Benefits of Linux OS

- **Open Source:** This means that it is free to download and it allows permissions such read, write and execute.
- **Secure:** With the use of a password, Linux is more secure than the Windows OS..
- **License expenses:** Linux doesn't necessarily need precise license costs like the Microsoft Windows and Apple macOS. This means that though it has a charge system it can also be used for free.
- **Revive outdated computer systems:** - Linux, which makes use of out-of-date technologies (like firewalls, backup servers, low-end systems, etc.,) can revive old and out-of-date PCs.
- **Reliability:** Linux is stable meaning that it can function properly in several situations without issues.
- **Easy to update:** Linux provides faster and simpler software updates than Windows does.
- **Lightweight:** Linux is convenient. Linux has far less system requirements than other OSs. Linux requires a smaller memory footprint and storage space.
- **Easy to manage:** With customization, features are easily added or removed. No restart is required after installing and removing apps as it is in Windows.
- **Easy to Install:** The Linux installation procedure is easier and faster than that of Windows and other operating systems.
- **Rich Distribution Options:** Linux distributions options are rich which includes Fedora, Ubuntu, Arch Linux, Debian, Linux Mint, etc.
- **Community Assistance:** Linux users can get assistance from variety of places such as online forums, web pages and AI assist.
- **Ideal for Programming:** Linux is popularly used by programmers, so it helps when there an error. That means any issue can be easily solved.
- **Stability:** Linux systems hardly suffer from performance issues or failures.
- **Privacy:** Linux does not gather a lot of information from users in-order to protect the users.
- **Executable File Types:** Linux supports almost all file types for execution.
- **Multitasking:** This means that it can execute numerous processes concurrently without slowing down the system.

- **Networking:** Linux allows networking with powerful networking functionality. The backup of a network is much quicker than other tasks.

DISADVANTAGES OF LINUX OS

- **System Compatibility:** Some hardware devices receive limited or no support in Linux due to several factors. To avoid this issue, it is important to confirm that your hardware devices are compatible with Linux before installation.
- **A Steep Learning Curve:** Unlike Windows and macOS Linux has a harsher learning curve than other operating systems. Linux frequently requires command-line interfaces for certain duties, such as software installation and system configuration which may affect users that are used to the GUIs.
- **Software inter-operability:** Another disadvantage of Linux is that not all software and applications are readily accessible. Though, users can easily solve this issue using several methods.

“The LibreOffice suite, for instance, provides equivalent functionality to Microsoft Office, while GIMP can be used as an alternative to Adobe Photoshop.”

“Users can utilize compatibility layers, such as Wine, to execute select Windows applications on Linux. Wine does not support all Windows applications, but it can provide a solution for users who need to execute a specific program.”

This fragmentation may result in compatibility issues between different distributions. Some software applications, for instance, may only be available in specific package formats that may not be compatible with all distributions. This results in incompatibility issues when attempting to install software on various distributions, which is extremely aggravating for users.

With the increasing prevalence of Linux and the community's efforts to standardize aspects of the ecosystem, this concern may diminish in the near future.

- **Commercial Support:** Linux doesn't have the same level of commercial support as other OSs. This can make it difficult for users to get help when OS errors arise. For example, a user may be unable to locate a commercial support team that can assist them with Linux troubleshooting.
- **Poor Gaming Support:** Games do not support Linux natively. Gaming developers have little interest in it because Linux is not a widely used platform for games. Recently though, the number of games developed for Linux has increased.

LINUX DISTRIBUTION: TOP TYPES AND USES

1. **Ubuntu:** Ubuntu is a free and open-source Linux distribution that comes in multiple editions: Desktop, Server, and Core for IoT devices and robots. Ubuntu is easy to use. It is derived from Debian. It comes with free software like LibreOffice, Firefox, Thunderbird, and Transmission, as well as games like Sudoku and chess. The OS is known to be more secure than Windows. It has a much lower risk of exposure to viruses.
2. **Fedora:** Fedora OS is known for being a stable and dependable. Fedora has a lot of graphical tools and useful software for office work, virus protection, system management, playing media, learning, and other things. It is very popular among users.
3. **Debian:** Debian is also a stable Linux distribution, but it also lets early adopters try out packages that aren't quite ready yet. In comparison to the alternatives, Debian provides the most packages. The same version can be used for a long time because the time it takes to upgrade Debian is long. This keeps you from having to upgrade software often and restart your server to make the changes take effect.
4. **Linux Mint:** Since it came out in 2006, Mint has become one of the most popular Linux distributions. If you use Windows, you will be familiar with its user interface. When switching to a new Linux distribution, there may be a learning curve, but Mint's simple UI and ease of use can help to reduce that. Also, it includes many useful apps by default, such as Firefox, LibreOffice, and others. It has an effective app management tool. You can search for and install software visually using an internal software manager that works like the App Store.
5. **OpenSUSE:** "OpenSUSE gives its users a stable environment and works well with almost all of the best Linux desktop apps. The distribution is simple in software management. You can search for tools on software.opensuse.org and install them directly from there. OpenSUSE is a great choice for both home and business use because it has so many benefits. If you don't want to, you don't have to keep updating your operating system after installing the distro. You can just install it and use it."
6. **Manjaro:** Manjaro which was released in 2011, has quickly become one of the most popular Linux distributions. Manjaro is good in supporting hardware devices over other distributions. It automatically scans your hardware and installs the needed drivers and packages.

7. **Elementary:** Elementary OS, which was also released in 2011, distinguishes itself from other distributions by including its own desktop environment called *Pantheon*. It has its own user interface and apps as well. Elementary OS has a minimalist design that focuses on simplicity, making it simple to learn. This minimalist design allows users to focus on what is important and increases productivity.
8. **OS Zorin:** For those new to Linux distributions, Zorin OS is a good place to start. Its user interface looks like Windows, and in Zorin's premium editions of OS 9, you can change the user interface to look like Apple's Mac OS. One of Zorin's strengths is its speed, and its operating system supports over 55 languages.
9. **Kali Linux:** Kali Linux is the best distribution for ethical hacking objectives. Frankly, no other distribution can compete with Kali Linux. The release includes a variety of tools that may be used for ethical hacking. Device categories include wireless assaults, stress testing, online applications, vulnerability analysis, and exploration instruments, among others.

Because Kali Linux is derived from the Debian Testing branch, the majority of packages are imported from the Debian repository. In prior versions, updates were not sent in an unreliable manner. In the most recent version, however, it has worked with Offensive Security and Cloudflare to ensure that all upgrades are successfully transmitted.

Kali Linux is free and comes in numerous languages for user compatibility.

“Kali Linux is installed on a variety of platforms, including Chromebook, Raspberry Pi, BeagleBone, and others. This is one of its major features. In addition, with the introduction of Kali NeHunter, Android cellphones are now supported. Regular rolling updates, tried-and-true hacking tools, vast learning materials, and a solid Debian foundation are some of the advantages of adopting Kali Linux.”

“It is the most extensively used distribution for penetration testing on a global scale. The quantity of built-in penetration tools makes ethical hackers' lives easier. In addition to providing a sophisticated platform for penetration testing, it also provides learning opportunities for budding ethical hackers. Additionally, it has an active community and adequate documentation.”

10. **IPFire:** IPFire is a fortified open-source Linux distribution whose main role is as a firewall and router. IPFire's primary objective is your safety. Simple to configure, the firewall engine and intrusion detection system prevent attackers from accessing your network.

“IPFire employs a Stateful Packet Inspection (SPI) firewall that is based on Netfilter, the Linux packet filtering framework. It swiftly filters packets and has throughputs of tens of gigabits per second.”

When an attacker is found, alerts are generated and the offender is immediately blocked.

