Introduction to Linux Commands

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Introduction

Linux is an Operating System, similar to Microsoft Windows and MAC OS. It is completely open source and free. Several distributions (flavors) exist, including, but not limited to Ubuntu, Kali Linux, Red Hat Enterprise Linux (RHEL), CentOS, etc.

Linux Servers are used across the vast majority of the servers online due to their fast, secure, and free characteristics.

Linux Shell

One way to interact with the Operating System is through the Graphical User Interface. However, this is not the only way. As a matter of fact, most Linux servers online cannot be accessed through a GUI. An alternative is using the Command Line Interface, which allows the user to interact with the Operating System through commands. The Linux Shell is then a program that takes these commands from the user and sends them to the Operating System to Process.

Basic Linux Commands

In this lecture, we go over some of the Linux commands, especially those that we will use in this course:

- **pwd** - Short for Print Working Directory. As the name states, this command prints the absolute path to the current directory.
- **ls** - List files and directories. There are many flags that can be used with this command. An example is `ls -lah:`

1. `-l`: Lists files in the long format (permissions, file and directory owners, file and directory size, date modified, etc).
2. `-a`: Includes hidden directories and files.
3. `-h`: Prints sizes in a human-readable format.

```
ubuntu@ip-172-31-38-137:~$ pwd
/home/ubuntu
ubuntu@ip-172-31-38-137:~$ ls -lah
total 28K
drwxr-xr-x 4 ubuntu ubuntu 4.0K Jan  6 08:30 .
drwxr-xr-x 3 root   root   4.0K Jan  6 08:26 ..
-rw-r--r-- 1 ubuntu ubuntu  220 Feb 25  2020 .bash_logout
-rw-r--r-- 1 ubuntu ubuntu 3.7K Feb 25  2020 .bashrc
drwx------ 2 ubuntu ubuntu 4.0K Jan  6 08:30 .cache
-rw-r--r-- 1 ubuntu ubuntu  807 Feb 25  2020 .profile
drwx------ 2 ubuntu ubuntu 4.0K Jan  6 08:26 .ssh
ubuntu@ip-172-31-38-137:~$
```

- **man -** Displays the user manual for any Linux command (i.e., `man ls` displays information about the ls command).
- **mkdir -** used to create directories. `mkdir /home/ubuntu/directories` Creates the directory `/home/ubuntu/directories`. The `-p` flag ensures that intermediate directories are created when needed. For example, creating the `/home/ubuntu/directories/directory1/subdirectory1` without the `-p` flag will not succeed if the `directory1` directory does not exist. `mkdir -p /home/ubuntu/directories/directory1/subdirectory1`

```
ubuntu@ip-172-31-38-137:~$ mkdir /home/ubuntu/directories
ubuntu@ip-172-31-38-137:~$ mkdir /home/ubuntu/directories/directory1/subdirectory1
mkdir: cannot create directory ‘/home/ubuntu/directories/directory1/subdirectory1’: No such file or directory
ubuntu@ip-172-31-38-137:~$ mkdir -p /home/ubuntu/directories/directory1/subdirectory1
ubuntu@ip-172-31-38-137:~$ ls -lah
total 32K
drwxr-xr-x 5 ubuntu ubuntu 4.0K Jan  6 08:31 .
drwxr-xr-x 3 root   root   4.0K Jan  6 08:26 ..
-rw-r--r-- 1 ubuntu ubuntu  220 Feb 25  2020 .bash_logout
-rw-r--r-- 1 ubuntu ubuntu 3.7K Feb 25  2020 .bashrc
drwx------ 2 ubuntu ubuntu 4.0K Jan  6 08:30 .cache
-rw-r--r-- 1 ubuntu ubuntu  807 Feb 25  2020 .profile
drwx------ 2 ubuntu ubuntu 4.0K Jan  6 08:26 .ssh
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:31 directories
ubuntu@ip-172-31-38-137:~$
```

- **cd** - Short for ***Change Directory***, used to navigate between directories. For instance, `cd /home/ubuntu/directories/directory1/subdirectory1` will navigate the user to the directory `/home/ubuntu/directories/directory1/subdirectory1`. `cd ..` navigates the user to the previous directory.

```
ubuntu@ip-172-31-38-137:~$ cd /home/ubuntu/directories/directory1/subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1/subdirectory1$ cd ..
ubuntu@ip-172-31-38-137:~/directories/directory1$ pwd
/home/ubuntu/directories/directory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 12K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:31 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:31 ..
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:31 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ pwd
/home/ubuntu/directories/directory1
ubuntu@ip-172-31-38-137:~/directories/directory1$
```

- **touch** - used to create a file. For instance `touch newFile.txt`

```
ubuntu@ip-172-31-38-137:~/directories/directory1$ touch newFile.txt
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 12K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:35 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:31 ..
-rw-rw-r-- 1 ubuntu ubuntu    0 Jan  6 08:35 newFile.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:31 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$
```

- **cp** - Copy files and directories from the source to the destination. For example, `cp /home/ubuntu/directories/directory1/newFile.txt /home/ubuntu/directories` copies the `newFile.txt` file from its old directory to `/home/ubuntu/directories`.

```
ubuntu@ip-172-31-38-137:~/directories/directory1$ cp /home/ubuntu/directories/directory1/newFile.txt /home/ubuntu/directories
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 12K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:35 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu    0 Jan  6 08:35 newFile.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:31 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ cd ..
ubuntu@ip-172-31-38-137:~/directories$ pwd
/home/ubuntu/directories
ubuntu@ip-172-31-38-137:~/directories$ ls -lah
total 12K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 .
drwxr-xr-x 5 ubuntu ubuntu 4.0K Jan  6 08:31 ..
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:35 directory1
-rw-rw-r-- 1 ubuntu ubuntu    0 Jan  6 08:36 newFile.txt
ubuntu@ip-172-31-38-137:~/directories$
```

- **mv** - Move files and directories from the source to the destination. For example, `mv /home/ubuntu/directories/directory1/newFile.txt /home/ubuntu/directories/directory1/subdirectory1` moves the `newFile.txt` file from its current directory to `/home/ubuntu/directories/directory1/subdirectory1`.

```
ubuntu@ip-172-31-38-137:~/directories/directory1$ pwd
/home/ubuntu/directories/directory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 12K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:35 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu    0 Jan  6 08:35 newFile.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:31 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ mv /home/ubuntu/directories/directory1/newFile.txt /home/ubuntu/directories/directory1/subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 12K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:38 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ cd subdirectory1/
ubuntu@ip-172-31-38-137:~/directories/directory1/subdirectory1$ ls -lah
total 8.0K
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:38 ..
-rw-rw-r-- 1 ubuntu ubuntu    0 Jan  6 08:35 newFile.txt
ubuntu@ip-172-31-38-137:~/directories/directory1/subdirectory1$
```

- **echo -** Writes characters to **the console.** The "**echo**" command also allows writing content to a file.
    1. Write to the console: `echo 'hello world!'` prints “hello world!” to the console.
    2. Write to file: `echo 'hello world!' > file.txt` prints “hello world!” to a file named **file.txt**
- **cat** - Prints the content of a file to the console. `cat file.txt`

```
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 12K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:39 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ echo 'hello world!'
hello world!
ubuntu@ip-172-31-38-137:~/directories/directory1$ echo 'hello world!' > file.txt
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 16K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:39 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu   13 Jan  6 08:39 file.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ cat file.txt
hello world!
ubuntu@ip-172-31-38-137:~/directories/directory1$
```

- **nano** - Text Editor. `nano file.txt`. Allows us to access and edit a file. `nano` allows the creation of a file if it doesn’t exist: `nano nanoFile.txt`

```
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 16K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:39 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu   13 Jan  6 08:39 file.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ nano nanoFile.txt
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 20K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:40 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu   13 Jan  6 08:39 file.txt
-rw-rw-r-- 1 ubuntu ubuntu   24 Jan  6 08:40 nanoFile.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ cat nanoFile.txt
I am created using nano
ubuntu@ip-172-31-38-137:~/directories/directory1$
```

- **chmod** - Modify the set of permissions for a file or directory. Currently, `nanoFile.txt` has read/write permissions. Modify the permissions of `nanoFile.txt` to read-only `chmod 400 nanoFile.txt`. As you can see, the permissions clearly changed giving the user only read permissions. Now attempting to modify the content of the file won't work.

```
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 20K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:40 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu   13 Jan  6 08:39 file.txt
-rw-rw-r-- 1 ubuntu ubuntu   24 Jan  6 08:40 nanoFile.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ chmod 400 nanoFile.txt
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 20K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:40 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu   13 Jan  6 08:39 file.txt
-r-------- 1 ubuntu ubuntu   24 Jan  6 08:40 nanoFile.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$
```

Code	Permission	User
0400	Read	Owner
0200	Write	Owner
0100	Execute / Search	Owner
0040	Read	Group
0020	Write	Group
0010	Execute / Search	Group

Code	Permission	User
0004	Read	Others
0002	Write	Others
0001	Execute / Search	Others

- **chown** - Changes the ownership of a file or directory. Currently, `nanoFile.txt` is owned by the `ubuntu` user that created the file. Change the ownership of the `nanoFile.txt` file to `root` `chown root:root nanoFile.txt`. This command cannot be performed without root privileges, which brings us to the next command.
- **sudo** - Short for “SuperUser Do”. Performs a command with root permissions or privileges. Similar to “Run as Administrator” on Windows. `sudo chown root:root nanoFile.txt`. This command is now performed using root privileges. Since we are logged in using the `ubuntu` user, we are no longer able to see the contents of the file without using `sudo`.

```
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 20K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:41 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu   13 Jan  6 08:39 file.txt
-r-------- 1 ubuntu ubuntu   24 Jan  6 08:40 nanoFile.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$ chown root:root nanoFile.txt
chown: changing ownership of 'nanoFile.txt': Operation not permitted
ubuntu@ip-172-31-38-137:~/directories/directory1$ sudo chown root:root nanoFile.txt
ubuntu@ip-172-31-38-137:~/directories/directory1$ ls -lah
total 20K
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:41 .
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 ..
-rw-rw-r-- 1 ubuntu ubuntu   13 Jan  6 08:39 file.txt
-r-------- 1 root   root     24 Jan  6 08:40 nanoFile.txt
drwxrwxr-x 2 ubuntu ubuntu 4.0K Jan  6 08:38 subdirectory1
ubuntu@ip-172-31-38-137:~/directories/directory1$
```

- **rm** - Delete files or directories. `rm -rf /home/ubuntu/directories`
  1. `-r` remove the directory and all subdirectories and files.
  2. `-f` remove the desired files and directories without prompt.

```
ubuntu@ip-172-31-38-137:~$ ls -lah
total 36K
drwxr-xr-x 6 ubuntu ubuntu 4.0K Jan  6 08:42 .
drwxr-xr-x 3 root   root   4.0K Jan  6 08:26 ..
-rw-r--r-- 1 ubuntu ubuntu  220 Feb 25  2020 .bash_logout
-rw-r--r-- 1 ubuntu ubuntu 3.7K Feb 25  2020 .bashrc
drwx------ 2 ubuntu ubuntu 4.0K Jan  6 08:30 .cache
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:40 .local
-rw-r--r-- 1 ubuntu ubuntu  807 Feb 25  2020 .profile
drwx------ 2 ubuntu ubuntu 4.0K Jan  6 08:26 .ssh
-rw-r--r-- 1 ubuntu ubuntu    0 Jan  6 08:42 .sudo_as_admin_successful
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:36 directories
ubuntu@ip-172-31-38-137:~$ rm -rf /home/ubuntu/directories
ubuntu@ip-172-31-38-137:~$ ls -lah
total 32K
drwxr-xr-x 5 ubuntu ubuntu 4.0K Jan  6 08:43 .
drwxr-xr-x 3 root   root   4.0K Jan  6 08:26 ..
-rw-r--r-- 1 ubuntu ubuntu  220 Feb 25  2020 .bash_logout
-rw-r--r-- 1 ubuntu ubuntu 3.7K Feb 25  2020 .bashrc
drwx------ 2 ubuntu ubuntu 4.0K Jan  6 08:30 .cache
drwxrwxr-x 3 ubuntu ubuntu 4.0K Jan  6 08:40 .local
-rw-r--r-- 1 ubuntu ubuntu  807 Feb 25  2020 .profile
drwx------ 2 ubuntu ubuntu 4.0K Jan  6 08:26 .ssh
-rw-r--r-- 1 ubuntu ubuntu    0 Jan  6 08:42 .sudo_as_admin_successful
ubuntu@ip-172-31-38-137:~$
```