Linux Basics

Ashish Thapa

Topics Covered

- SSH
- Bandit overthewire
- Where to practice if there is no linux machine
- What is shell
- most common used commands in linux
- linux filesystem explained
- permissions
- Redirections and piping
- where are my configuration files
- Environment variables
- how to install packages
- building apps from scratch
- Multiplexing and editors
- Process management

bandit over the wire

https://overthewire.org/wargames/bandit/

```
ssh bandit0@bandit.labs.overthewire.org -p 2220
```

password: `bandit0`

SSH (Secure Shell Protocol)

- Network protocol that uses cryptographic means
- SSH is enabled on linux through `openssh-server`
- `private key` and `public key` generated with `ssh-keygen`

```
Further Resources
what are private and public keys: https://www.preveil.com/blog/public-and-private-key/
```

How to connect to server that accepts SSH connection

- Head to your Terminal (cmd, powershell, fish, alacritty, iTerm etc)

```
ssh username@host -p 1234
```

```
ssh ashish@hpc.ku.edu.np -p 3434
```

- useful flags
  - for verbose(detailed) output

    ```
    ssh -vvv username@host -p 1234
    ```

  - Run one command and exit

    ```
    ssh username@host -p 2345 'command'
    ```

    ```
    ssh ashish@hpc.ku.edu.np -p 3434 'ls'
    ```

```
further Resources
Connect to server without Typing password: https://linuxhint.com/ssh-using-private-key-linux/
ssh config file: https://linuxhint.com/ssh-config-file/
```

To practice if you don't have a linux machine?

- Windows
  - install Windows Subsystem for Linux
  - use virtualbox and install linux there
- Macintosh
  - already has a POSIX complaint shell like Zsh, bash etc

Basics of Linux

Shell

- interface between user and operating system tools.
  - Example of CLI shells: `command prompt` , `powershell` , `bash` , `nushell`, `zsh`
  - Example of Graphical shells: `X Window manager`, `Finder`, `Windows shell (DE), startmenu , taskbar`
- Linux Shells
  - POSIX complaint : bash , zsh
  - Non POSIX complaint: fish, nushell

```
What is POSIX complaint shell : https://en.wikipedia.org/wiki/POSIX
```

Commonly used commands on Linux Shells

- `pwd` : present working directory
- `ls` : list files
- `mkdir` : make directory
- `cd` : change directory
- `rm` : remove files and directory
- `man` : manual pages
- `help` : find help

> Install a tool `tldr` which gives examples for most use cases for that command .
> Example: `tldr find` , `tldr youtube-dl`

```
Most used commands in linux: https://linuxjourney.com/lesson/the-shell
```

Linux Directory Structure explained

name	type	Description
bin	Symlink	Shortcut of /usr/bin/ that contains executables
boot	Dir	contains configuration of bootloader, tools to mount filesystem
dev	Dir	contains device files
etc	Dir	contains systemwide configuration of linux tools

```
https://askubuntu.com/questions/1103937/explain-in-linux-and-unix-everything-is-a-file
```

name	type	Description
home	Dir	Contains User specific directories
lib	Symlink	Shortcut of /usr/lib/ which contains library files `*.so` similar to `.dll` in windows
opt	Dir	Generally used to store proprietary apps such as google chrome, clion etc
proc	Dir	contains information relating to process that is currently running
root	Dir	root specific directory
sbin	Symlink	system executables also might be symlink to /usr/bin

name	type	Description
home	Dir	Contains User specific directories
tmp	Dir	Temporary files
usr	Dir	contains utilities and applications + system executables
var	Dir	contains variable data, that changes during operation such as logs

Permissions

- Permissions on linux are on three levels
- user permissions, group permissions, and other permissions
- each level can either read, write or execute

```
r -> read | w -> write | x -> execute | d -> directory
```

`> ls -la`

`wallpapers drwxr-xr-x`

`drwxr-xr-x` can be divided into `d` | `rwx` | `r-x` | `r-x`

```
changing owner, group and permissions : https://www.oreilly.com/library/view/running-linux-third/156592469X/ch04s14.html

chown command explained: https://www.computerhope.com/unix/uchown.htm
```

Piping / Redirecions

- Redirection of output to some other destination
- `|` , `>` , `<` , `&>` etc

```
Bash manual for Redirections : https://www.gnu.org/savannah-checkouts/gnu/bash/manual/bash.html#Redirections
```

Where are my configuration files

- Home directory is represented by `~`
- usually configuration files are stored as hidden files , files that start with `dot(.)` . `ls -a` shows hidden files too.
- usually inside `.config` folder.
- configuration has its own markup languages too such as yaml, json, toml or its own type.

Environment variables

- `$HOME`, `$USER`, `$PATH` etc

```
https://www.geeksforgeeks.org/environment-variables-in-linux-unix/

https://linuxize.com/post/how-to-add-directory-to-path-in-linux/
```

Installing packages

- every popular distribution has one of the package manager for managing dependencies, installing software and removing them.
    - depends on Distribion of linux.
- Debian based: `apt`
- Arch based: `pacman`
- Fedora based: `dnf`
- .Appimage, .deb , .rpm files can be installed appropriately.

Building apps from scratch

Ubuntu : `sudo apt-get install build-essential`

- contains `make` , `g++` , `gcc` , `libc6-dev` , etc

```
https://itsfoss.com/install-software-from-source-code/
```

Multiplexing and Editing

Multiplexing

- Multiple things might need to be run at a same time.
- Multiplexing can help in that case `tmux`

Editing configuration files

- editors such as `Nano`, `vi` are present

```
https://linuxize.com/post/how-to-use-nano-text-editor/
https://www.hamvocke.com/blog/a-quick-and-easy-guide-to-tmux/
```

Process management

- `top`, `ps`

```
https://www.geeksforgeeks.org/process-management-in-linux/
```

other topics to explore

- cron jobs : https://phoenixnap.com/kb/set-up-cron-job-linux
  to write cron jobs view: https://crontab.guru/
- networking tools in linux : https://www.geeksforgeeks.org/linux-networking-tools/
- sh scripting : https://ryanstutorials.net/bash-scripting-tutorial/
- system logs : https://stackify.com/linux-logs/