Lab 1 – The Linux Command Line

18th September 2024

Introduction

The aim of this lab is to spend time getting some practice on the Linux/Unix command line. This will consist of two steps:

- Installing a Linux VM
- Running a series of commands on the VM to verify that you are comfortable using the Linux/Unix command line

Installing a VM

Before you can start using Linux, you'll need to set up Linux on a VM. (Note that you can skip this section if you're using a Linux machine already.) These instructions will assume that you use VirtualBox.

Platform-Specific Instructions

For detailed VirtualBox installation and VM setup instructions, please use the appropriate platform-specific guide for your system:

- **Windows 11 users:** See Lab1-Setup-Windows11.pdf
- **Windows 10 users:** See Lab1-Setup-Windows10.pdf
- **macOS Intel users:** See Lab1-Setup-macOS-Intel.pdf
- **macOS Apple Silicon (M1/M2/M3) users:** See Lab1-Setup-macOS-AppleSilicon.pdf
- **Linux users:** See Lab1-Setup-Linux.pdf

These guides provide complete step-by-step instructions for installing VirtualBox and creating your VM with the correct settings for your platform.

Note that VirtualBox still doesn't work on Arm-based Macs (and may never, since it is architected with the assumption that it will be running on an x86 machine). So if you are using a Arm machine, your options are:

- Using a lab machine
- Using a virtualisation platform that runs on macOS (e.g. VMWare or QEMU)

Assuming you are using VirtualBox, download Ubuntu Server 22.04 from:
https://ubuntu.com/download/server

We'll install it with a similar configuration to last year. Run VirtualBox, and click 'New' at the top to create a new VM. You will be asked to make a few choices when setting up the VM:

- Give the VM a name of your choice
- Set the type to 'Linux' and the version to 'Ubuntu (64-bit)'
- Recent versions of Ubuntu seem to need a minimum of at least 2GB of RAM and at least 2 CPU cores, so be sure to set that at this stage

- Create a hard disk that's about 10GB

It's also a good idea to set your network settings before going any further – click 'Settings' and then 'Network' and then set the following in the 'Adapter 1' tab:

- Make sure 'Enable network adapter' is checked
- 'Attached to' is set to 'Bridged adapter'
- 'Cable connected' is checked (you might need to click 'Advanced' to see this)

Save the settings and then run the VM by clicking 'Start' at the top of VirtualBox. The first time you run the VM, you will be given the option to choose an ISO file to boot from. Use this to select the Ubuntu ISO you downloaded earlier.

During the installation, you will be asked to provide quite a lot of details. Most of the defaults will be fine, but be sure to:

- Choose to install the minimal version of Ubuntu Server (not the full version)
- Create a user account for yourself, and make a note of the username and password
- Once installation is complete, reboot as instructed

After installation is complete, you should be able to log in using the username and password you created during the installation.

Commands to Run

The rest of this lab involves running commands in the Linux VM to check that you are comfortable with using the command line. For each of the commands below, make sure you understand what it does and what the output means. If you're not sure, try looking at the manual page for the command (e.g. `man ls` for the `ls` command).

Basic Navigation and File Operations

```
pwd
ls
ls -l
ls -la
cd /
pwd
ls
cd /home
ls
cd ~
pwd
```

Creating and Managing Files

```
mkdir testdir
cd testdir
touch testfile.txt
echo "Hello, World!" > testfile.txt
cat testfile.txt
cp testfile.txt testfile2.txt
```

```
ls
mv testfile2.txt renamed.txt
ls
rm testfile.txt
ls
cd ..
rmdir testdir
```

System Information

```
uname -a
hostname
whoami
date
uptime
df -h
free -h
```

Process Management

```
ps
ps aux
top
# Press 'q' to quit top
```

Network Commands

```
ip addr show
ping -c 3 google.com
# If ping doesn't work, try:
ping -c 3 8.8.8.8
```

Package Management

```
sudo apt update
sudo apt upgrade
# You may be prompted for your password
# and asked to confirm the upgrade
```

Text Processing

```
echo "This is a test" | grep test
echo "This is a test" | sed 's/test/example/'
echo "word1 word2 word3" | awk '{print $2}'
```

File Permissions

```
touch testperm.txt
ls -l testperm.txt
chmod 755 testperm.txt
ls -l testperm.txt
chmod 644 testperm.txt
ls -l testperm.txt
rm testperm.txt
```

Finding Files

```
find /etc -name "*.conf" 2>/dev/null | head -5
which python3
whereis bash
```

Completion

Once you have successfully run all the commands above and understood their output, you have completed this lab. Your VM is now set up and ready for use in future labs. Make sure to keep this VM as you will need it for subsequent labs in this module.

Additional Practice (Optional)

If you finish early and want additional practice, try these more advanced commands:

```
# Create a simple shell script
echo '#!/bin/bash' > myscript.sh
echo 'echo "Hello from a script!"' >> myscript.sh
chmod +x myscript.sh
./myscript.sh

# Use pipes and redirection
ls -la | grep "^d" > directories.txt
cat directories.txt

# Archive and compress
tar -czf backup.tar.gz testdir/
tar -tzf backup.tar.gz
```

Remember that the goal of this lab is to ensure you are comfortable with the Linux command line, as all future labs will require you to work in this environment.