

Lab 1

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Exercise 1

(a) Use the `lsb_release` command to print all the distribution details.

According to the man page of `lsb_release` it can print information about the Linux Standard Base and the distribution, which is being used.

When passed the `-a` option, it prints all the distribution details.

```
moritzpfeffer@debian:~$ man lsb_release
Lots of text
```

```
moritzpfeffer@debian:~$ lsb_release -a
No LSB modules are available.
Distributor ID: Debian
Description: Debian GNU/Linux 9.13 (stretch)
Release: 9.13
Codename: stretch
```

(b) Use the `uname` command to print the kernel release info.

In man page of `uname` the `-r` option is for printing the kernel release info.

```
moritzpfeffer@debian:~$ man uname
Lots of text
```

```
moritzpfeffer@debian:~$ uname -r
4.9.0-16-686
```

Exercise 2

(a) Determine the shell that is used by default by using the `echo` command and the `$SHELL` environment variable.

The value of an environment variable can be simply accessed by command `echo`.

```
moritzpfeffer@debian:~$ echo $SHELL
/bin/bash
```

This shows that the default shell is *bash* located at */bin/bash*.

(b) List all the directories found in the *\$PATH* environment variable.

```
moritzpfeffer@debian:~$ echo $PATH
/usr/local/bin:/usr/bin:/bin:/usr/local/games:/usr/games
```

Thus, the directories in *\$PATH* are:

- */usr/local/bin*
- */usr/bin*
- */bin*
- */usr/local/games*
- */usr/games*

Exercise 3

List the number of scripts that run

(a) at run level S, (b) run level 2, and (c) run level 5.

In the man page of *wc* the *-l* option shows the number of lines of data fed to the command.

To count the files in a directory, pipe *ls* with *wc -l*.

Scripts of each run level [can be found in /etc/rc.x files](#).

```
moritzpfeffer@debian:/etc$ ls /etc/rcS.d/ | wc -l
10
moritzpfeffer@debian:/etc$ ls /etc/rc2.d/ | wc -l
20
moritzpfeffer@debian:/etc$ ls /etc/rc5.d/ | wc -l
20
```

Therefore, at run level S **10** scripts are running, at run level 2 **20** scripts and at level 5 **20** scripts.

Exercise 4

Research the difference between *systemd* and *init* (System V *init*)

(a) describe in your own words the difference between these systems

I will describe five differences between *systemd* and *init*.

One important motivation for *systemd* was to speed up boot times. To achieve this *systemd* starts services **on demand** and in **parallel**, while *init* starts services **serially**. [1]

Secondly *init* starts services through shell script, while *systemd* recommends *.service* files. Thus, I would say that *init* uses an **imperative** approach (scripts), whereas *systemd* prefers a **declarative** one. [2]

Thirdly, systemd's .service files and other unit files can be grouped into **targets**, which **replace init's runlevels**.

Furthermore, systemd contains many more components than init. For example, it features a ntp-implementation called systemd-timesyncd and systemd-timer which can run recurring tasks like cron does.

Thus, the fourth difference is that **systemd is less focused and larger** than the original init. [3]

Fifthly, as for SystemV, all of these programs are open and understandable scripts, while systemd is a complex system of large compiled binary executables that are not understandable without access to the source code.

Although it's open source, it is just less convenient. [4]

(b) determine which of the two is used by the operating system you have installed in VirtualBox. How can you tell?

The [archlinux wiki on systemd](#) tells us that systemctl is the "main command used to introspect and control systemd is systemctl". By entering "systemctl" into the terminal and executing it i confirm that it is present in the VM. From that i infer that systemd is used.

Additionally, systemd or init will run as the first process in operating system and according to man page, the PID should be 1.

```
fangwenliao@debian:~$ ps -e | less -X
PID TTY          TIME CMD
  1 ?            00:00:01 systemd
```

or

```
fangwenliao@debian:~$ ps -ef | less -X
UID          PID  PPID  C STIME TTY          TIME CMD
root           1      0  0  21:22 ?           00:00:01 /sbin/init
```

```
fangwenliao@debian:/sbin$ ls -l init
lrwxrwxrwx 1 root root 20 Jul  8 15:07 init -> /lib/systemd/systemd
```