Bioinformatics Practical
Part 1

Introduction to the Linux command line and Bash scripting

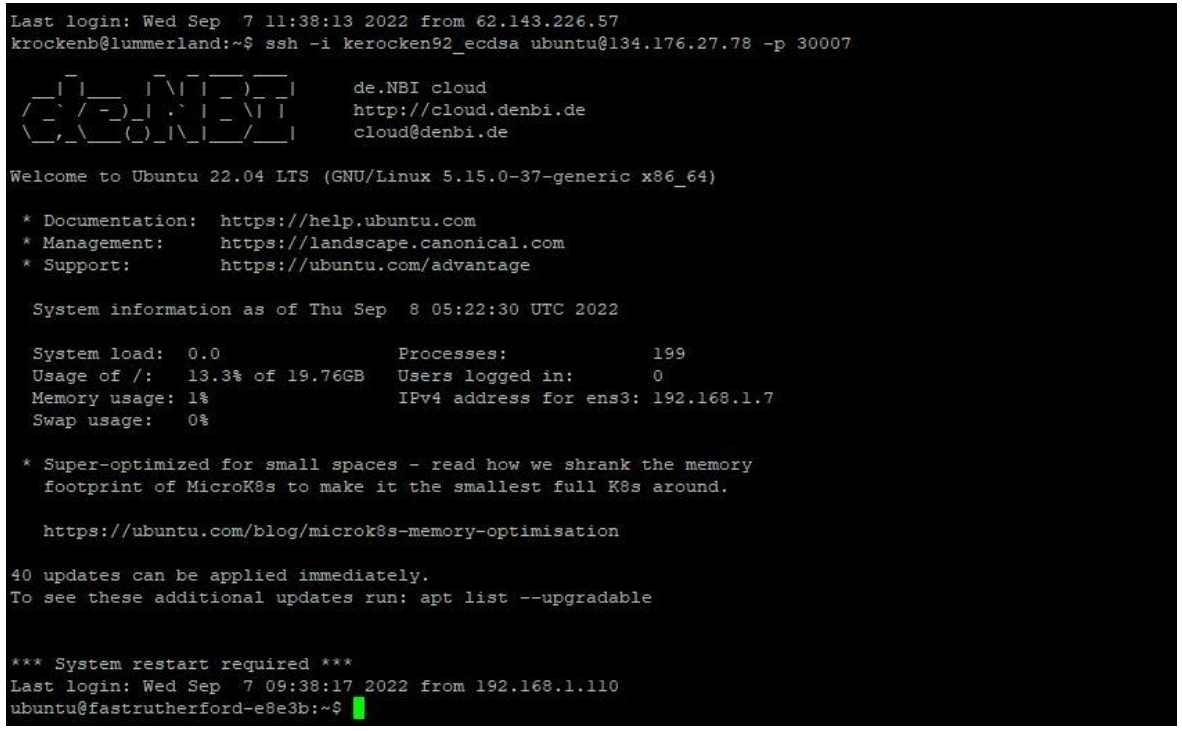
MP235

Linux

- Wide array of operating systems based on the Linux kernel
- Free and open-source
- Reliable, modular and fast

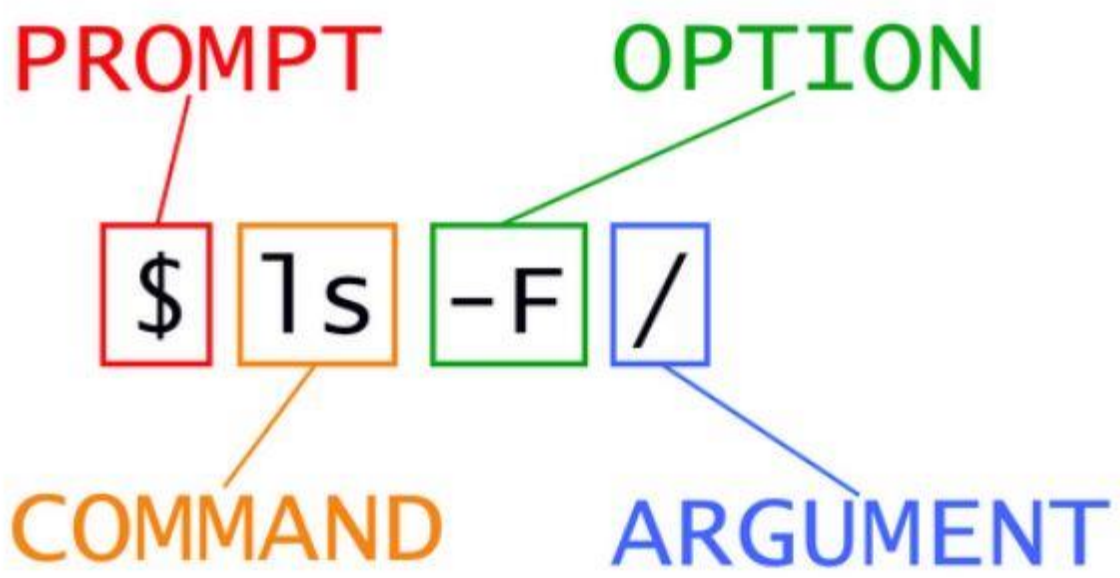
- Widely used for special applications such as high-performance computing and web servers

Command Line Interfaces



- Allows for automation and efficient interaction with the machine
- Shell mediates between user and machine
- Standard shell in Linux is called Bash

Command Syntax



- Short and long form options
- Short options start with „-“ and can be strung together
- Long options often start with „--“
- Both commands and options can take arguments

The Linux File system

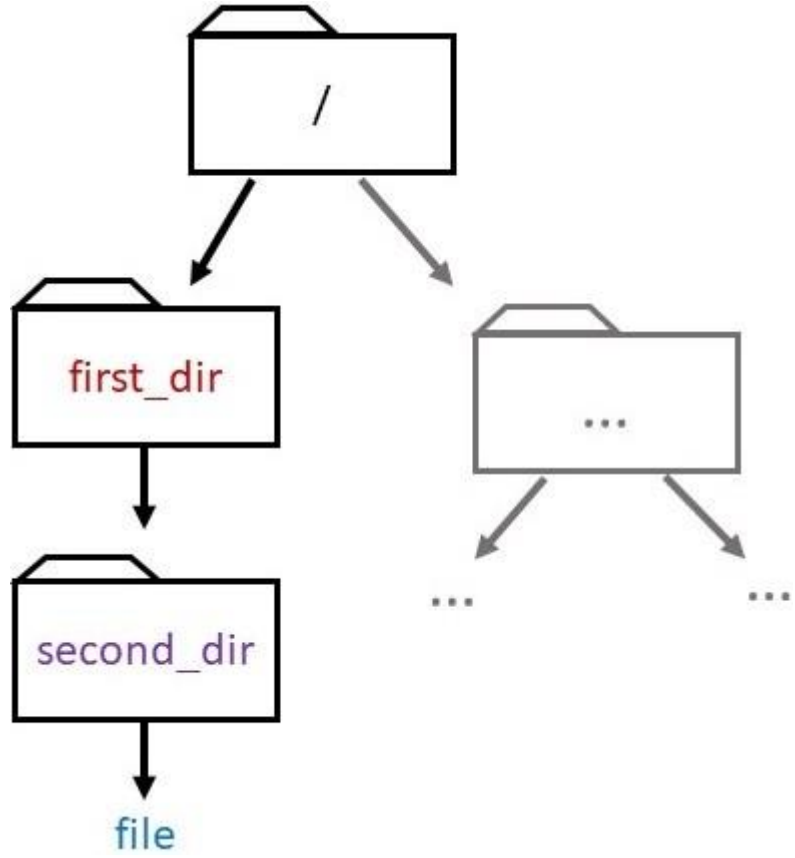
- Hierarchical organization of files
- Each file is associated with an **absolute path** starting from the **root directory**

/first_directory/second_directory/file

root

parent directory

subdirectory



The Linux File system

- You always operate from some location within the file system!
- The default location is your home directory
- The current location at any point in time is called the working directory
- **relative paths** start from **your working directoy**
  (do not start with “ / ”)

directory_within_working_directory/file

Navigating the File System

pwd shows your present working directory

ls lists contents of your working directory

cd changes the working directory

ll = ls -laF

Shortcuts

`/`	**the root directory**
`~`	**your home directory**
`-`	**the last directory you were in**
`.`	**the present working directory**
`..`	**the parent directory of the working directory**

Exercise 6.4

practical exercise

Exercise 6.5

theoretical exercise

Exercises of Section 1

Working With Files and Directories

mkdir	**create a directory**
touch	**create a file**
mv	**move files and directories within the file system**
cp	**copy files and directories**
rm	**remove files and directories**

Exercises of Section 2

Pipes and Filters

`wc`	count characters, words and lines
`sort`	sort contents
`uniq`	filter out adjacent matches
`|`	redirect output into another command
`>`	redirect output into a file
`>>`	???

Displaying Contents

echo	**print a string onto the screen**
cat	**print contents of a file**
less	**browse through content of a file**
head	**print the first few lines of a file**
tail	**print the last few lines of a file**

Exercises of Section 3

Loops

Iterate over a list of items.

Very useful when performing repetitive tasks.

```
for item in list_of_items
do
    operation_using $item
done
```

Exercises for Section 4

Bash Scripting

- Save sequences of shell commands for later usage in a file ending in .sh
- Fewer chances for typos
- Better reproducibility
- Easier debugging an rerunning of pipelines

- Write comments to let users (your future self) know what the script does!

```
# Everything behind this symbol does not get
# interpreted by the shell
```

Bash Scripting

`nano` **opens text editor**

`bash` **runs a bash script**

Within nano:

`Ctrl+X (^X)` **closes nano**

`Ctrl+O (^O)` **saves progress**

`Alt+U (M-U)` **undo last change**

Exercises for Section 5

Finding Things

```
grep      find lines containing a pattern

special symbols:
^     find pattern at the beginning of the line
$     find pattern at the end of the line

find      find files and directories
```

Exercises for Section 6