Environmental metagenomics

Working with the command line

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What is Unix?

A family of computer operating systems (OSs)

- Linux, MacOS, Solaris, OpenBSD

Key characteristics

Multitasking: multiple software processes can run at the same time

Multiuser: several users can use the same computer at the same time

Multiprocessing: can use more than one computer processor

Portable: can be used in various hardware architectures

The Unix philosophy

"The idea that the power of a system comes more from the relationships among programs than from the programs themselves"

- Use of a large number of simple programs performing a limited, well-defined function
- Use of a command-line interpreter ("shell") to combine these programs to perform complex tasks
- Use of plain text for storing data
- Use of a hierarchical filesystem

The Unix shell (command-line interpreter)

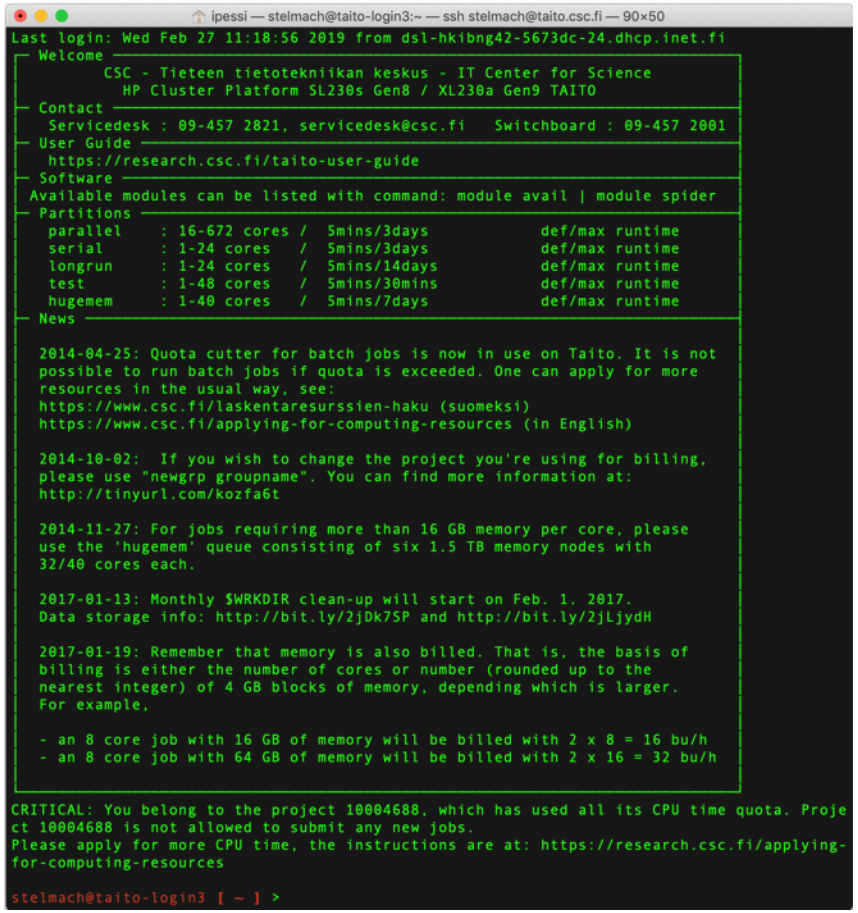
Interprets sequences of text

- Entered by a user
- From a file
- From a data stream

Primary interface before graphical user interfaces (GUIs) appeared

Still widely used today

- Efficient
- Low memory footprint
- Advanced scripting



Some basic Unix commands

pwd: **p**rint **w**orking **d**irectory (“where am I?”)

ls: **l**i**s**t (“show folder contents”)

mkdir: **m**a**k**e **dir**ectory (a.k.a. folder)

cd: **c**hange **d**irectory (“go to folder”)

cp: **c**o**p**y

mv: **m**o**v**e

rm: **r**e**m**ove

Some additional notes

Case-sensitive

- photo.jpg ≠ PHOTO.jpg

Does not like spaces and special characters in file/folder names

- genome report.txt ❌
- genome_report.txt ✅
- Tromsø.txt ❌
- Tromso.txt ✅

Some additional notes

Running commands

- Space after each “word” in the command
- Typed in a single line, one at a time
- After each command, hit “Enter” to execute it
- Lines starting with “#” are comments

Directory navigation:

- One dot (.) means “here”
- To go up one folder: ../
- To go up two folders: ../../

More advanced usage

Piping (|)

Stream redirection (>)

- Stdout (“output”): >
- Stderr (“error messages”): 2>
- Stdout + stderr: &>

Some tricks

- Tabulator
- History
- Wildcards

Variable assignment

```
> NUMBER_OF_CPUS=40
> echo $NUMBER_OF_CPUS
40
```

For/while loops

```
for FILE in file01 file02 file03; do
   mv $FILE.txt $FILE.old.txt
done

while read FILE; do
   rm $FILE.txt
done < files_to_remove.txt
```

How to learn UNIX?

By using it!

- Trial and error
- Don’t copy and paste it, type it

Ask the internet

- http://stackoverflow.com/
- http://stackexchange.com/
- http://askubuntu.com/
- Google!

Cheat sheets

- https://www.guru99.com/linux-commands-cheat-sheet.html

Manual (“man”) pages

- `man ls`

Online courses/tutorials

- http://codecademy.com

Let’s practice the command line a bit

https://github.com/karkman/physalia_metagenomics