

UNIVERSITY OF BERGEN

UNIX Day 1



Scientific Computing group, IT department

UNIVERSITY OF BERGEN



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Agenda

- Course goals, Zoom interaction, breaks
- What is Unix?
- Basic Concepts of UNIX
- Command Line Interface
- Secure Shell (SSH)
- Basic UNIX Commands (ls, mkdir, cd, cp, pwd, vim, rm etc.)
- Recap
- Exercise and Homework



Course goals

Learn most important tools

Learn about shell scripts

Practice, practice, practice

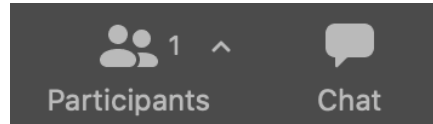
(Most commands are not harmful!)

Zoom interaction

Course is being recorded for internal use only!

Mute your mic! You may switch off video.

Ask questions for help in chat.



We use the participants list to check if we can continue ✅, should repeat ⏮, wait a bit longer ❌

Schedule / breaks, style

Will make a short break at ~ 09:50, ~ 10:50 & ~ 11:50.

Course ends latest 12:30.

Blending of a bit "lecturing" and hands-on exercises.

Ask questions on topic as soon as possible.

Ask general questions in Q & A ~ 12:00.

→ Dhanya

What is UNIX?

- UNIX is an Operating System (OS)
- OS means the program which make the computer work
- UNIX was first developed in 1960s by AT&T
- UNIX is a stable, multi-user, multitasking System
- Machine Independent
- Types of UNIX: Sun Solaris, LINUX/GNU, Mac OS



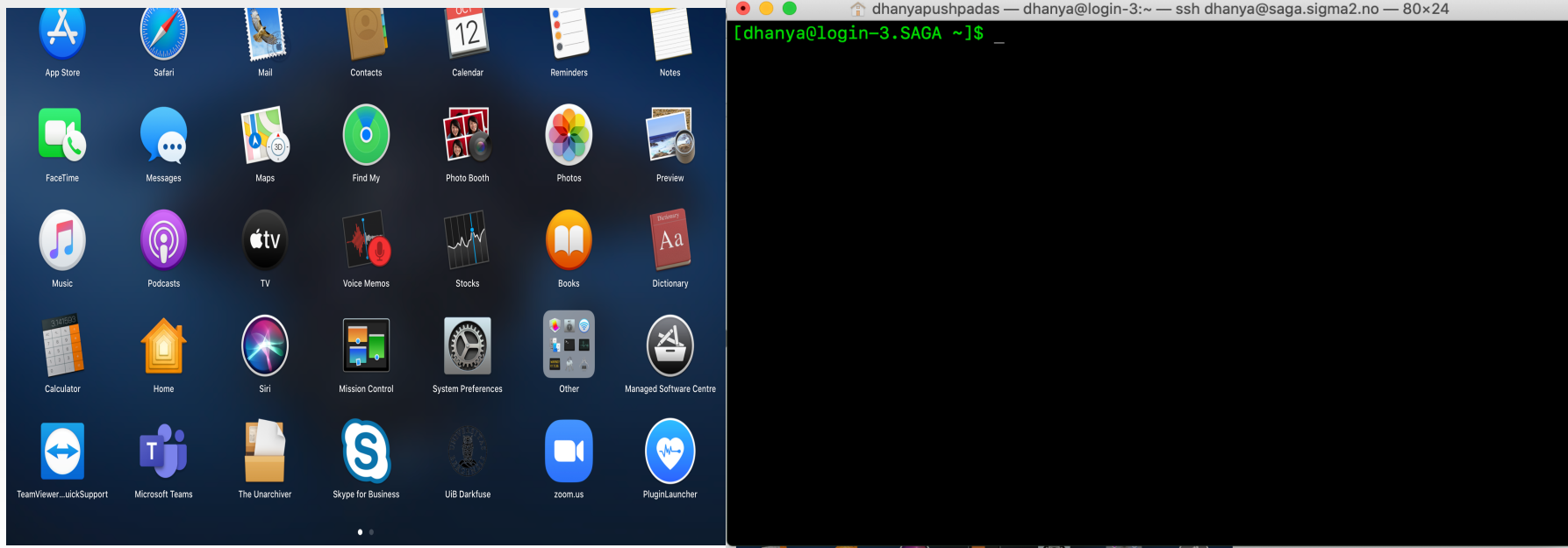
Basic UNIX Concept

- UNIX System has hierarchical directory structure
- The hard disk is divided into directories
- The topmost directory is represented with '/' that consists subdirectories grouped according to the functions
- Each user has a unique username, and their own space, called *HOME*



Command Line Interface (CLI) vs Graphical User Interface (GUI)

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Knowledge of UNIX CLI is required for remote sessions



Command Line Interface (CLI)

- CLI is the *shell*, a text Interface to the OS
- Interprets and execute the commands by passing them to the OS
- It is a program where the users can type commands
- The UNIX shell is both CLI and a scripting language
- Variant shells bash, sh, tcsh, zsh etc.
- ***bash*** is the only supported shell at the metacenter
- **CLI : POWERFUL, HIGH PRECISION, FEWER RESOURCES**



Secure Shell (SSH)

- *'Secure shell is a de facto standard for remote logins and encrypted file transfers.'* [SSH communications inc.]
- Founded in 1995 by Tatu Ylonen, a researcher at Helsinki University of Technology, Finland
- Originally introduced for UNIX terminals as a replacement for the insecure remote access
- SSH Tools: Windows- Putty, TeraTerm, SecureCRT
- UNIX The RedHat Linux package and OpenBSD come along with tools such as ssh, sshd(daemon), scp(secure copy), sftp(secure ftp), etc
- Open Source SSH client : openSSH



Logging into SAGA

Mac and Linux Users – Open a Terminal

```
$ ssh <username>@<machinename>
```

Machine name is **saga.sigma2.no**



→ Thomas

Login (Windows)

PuTTY

→ Dhanya

Where are we?

\$hostname

show or set the system's host name

Path to directory

\$pwd

print name of current/working directory



→ Thomas

ls – list directory contents

Example 1:

```
$ ls
```

```
benchmarks  go      log.txt  projects  teaching  
bin          jobs    nrec     python3.7.list  tickets
```

ls – list directory contents

Example 2:

```
$ ls -F
```

```
benchmarks/  go/      log.txt   projects/  teaching/  
bin/         jobs/    nrec/     python3.7.list  tickets/
```

ls – list directory contents

Example 3:

```
$ ls -l
```

```
total 8
```

```
drwxrwsr-x 4 thomarov thomarov_g 2 May 28 11:04 benchmarks
```

```
drwxrwsr-x 2 thomarov thomarov_g
```

```
3 Mar 9 2020 bin
```

...

permissions
& type

?

owner
(user)

owner
(group)

size

time

name

Program arguments

`ls -l / ls -F`

Syntax: `ls [OPTION]... [FILE]...`

`$ man ls`

(type key `q` to quit man)

ls – list directory contents

Exercises

1. Show the contents of `.` (`ls .`)
2. Show the contents of `..` (`ls ..`)
3. Show the contents of `/` (`ls /`)

man cheat sheet

q to quit man (and help modus)

h to enter help modus

e to scroll one line down (cursor-down may work too)

y to scroll one line up (curser-up may work too)

f to scroll one page down (f – forward)

b to scroll one page up (b – backward)

g/G to jump to the start/end of the man page

/PATTERN<ENTER> to search for PATTERN

n to jump to next line with PATTERN

man – Exercises

1. Show the man page of `ls`
2. Who wrote the `man` tool originally and when?
3. Bonus: How many lines contain the string *sort* in the man page for `ls`?

mkdir - make directories

Example:

```
$ mkdir jobs
```

(usually no output unless it fails)

```
$ ls
```

```
jobs
```

mkdir - make directories

Examples 2+3:

```
$ mkdir jobs/pre/1
```

```
mkdir: cannot create directory  
'jobs/pre/1': No such file or  
directory
```

```
$ mkdir -p jobs/pre/1
```

mkdir - make directories

Exercises

1. Create a directory for `jobs`
2. Create a small directory tree (`jobs/preproc`,
`jobs/simulations`, `jobs/simulations/1`,
`jobs/simulations/2`, `jobs/postproc`)
3. What's the result of `mkdir -p /forrest/tree1`?

→ Dhanya

Change Directory

\$cd

Create File

\$touch

Create a file or change file timestamps



→ Thomas

history – displays the command history

Example

```
$ history
```

```
2 2020-09-15T22:38:57 module avail MAFFT
```

```
...
```

```
988 2020-10-11T23:45:23 mkdir /forrest/tree1
```

```
989 2020-10-11T23:45:31 mkdir -p /forrest/tree1
```

! [NUMBER] <ENTER> – runs the command again

Example

```
$ !2
```

```
module avail MAFFT
```

```
----- /cluster/modulefiles/all ----  
-----
```

```
MAFFT/7.427-intel-2018b-with-extensions
```

```
MAFFT/7.429-GCC-8.2.0-2.31.1-with-extensions
```

```
MAFFT/7.453-GCC-8.3.0-with-extensions
```

```
MAFFT/7.453-iccifort-2019.5.281-with-extensions
```

```
...
```

history / ! [NUMBER] <ENTER>

Exercises

1. Show the history of commands you ran
2. Show the history of the last 10 commands
(use `man` to find out how)
3. Repeat the last `mkdir` command

cp – copy files and directories

Example

```
$ cp foo foo2
```

```
$ ls -F -l
```

```
total 10
```

drwxrwsr-x	2	thomarob	thomarob_g	0	Oct	16	00:23	A/
drwxrwsr-x	3	thomarob	thomarob_g	1	Oct	16	00:23	B/
-rw-rw-r--	1	thomarob	thomarob_g	0	Oct	16	00:23	bar
-rw-rw-r--	1	thomarob	thomarob_g	4244	Oct	16	00:25	foo
-rw-rw-r--	1	thomarob	thomarob_g	4244	Oct	16	00:25	foo2

cp – copy files and directories

Example 2

```
$ cp foo A
```

```
$ ls -F -l A
```

```
total 5
```

```
-rw-rw-r-- 1 thomarob thomarob_g 4244 Oct 16 00:27 foo
```

cp – copy files and directories

Example 3

```
$ cp A A2
```

```
cp: omitting directory 'A'
```

```
$ ls
```

```
A  B  bar  foo  foo2
```

```
$ man cp
```

Google: [cp explained directories](#)

cp – copy files and directories

Example 3*

```
$ cp -r A A2
```

```
$ ls -l
```

```
total 11
```

```
drwxrwsr-x 2 thomarob thomarob_g 1 Oct 16 00:27 A
drwxrwsr-x 2 thomarob thomarob_g 1 Oct 16 00:31 A2
drwxrwsr-x 4 thomarob thomarob_g 2 Oct 16 00:39 B
-rw-rw-r-- 1 thomarob thomarob_g 0 Oct 16 00:23 bar
-rw-rw-r-- 1 thomarob thomarob_g 4244 Oct 16 00:25 foo
-rw-rw-r-- 1 thomarob thomarob_g 4244 Oct 16 00:25 foo2
```

cp – copy files and directories

Exercises

1. Copy a file
2. Copy a directory

→ Dhanya

Text Editor

vim, nano, emacs etc.

Vim: Vi IMproved, a programmers text editor

\$vim <filename>

Quit	>	:q
Save and quit.	>	:wq
Quit without saving	>	:q!



→ Thomas

less – opposite of more

Example

```
$ less foo
```

(hit key `q` to quit)

Same key commands as `man`.

less cheat sheet

q to quit less (and help modus)

h to enter help modus

e to scroll one line down (cursor-down may work too)

y to scroll one line up (curser-up may work too)

f to scroll one page down (f – forward)

b to scroll one page up (b – backward)

g/G to jump to the start/end of the man page

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less – opposite of more

Exercises

I. Show content of a file with `less`

mv – move (rename) files

Example

```
$ ls
```

```
A  A2  B  bar  foo  foo2
```

```
$ mv foo2 foo3
```

```
$ ls
```

```
A  A2  B  bar  foo  foo3
```

mv – move (rename) files

Example 2

```
$ mv foo foo3
```

```
$ ls
```

```
A  A2  B  bar  foo3
```

Be careful! Original foo3 is gone.

mv – move (rename) files

Example 3

```
$ mv -n bar foo3
```

(No output!)

```
$ ls
```

```
A  A2  B  bar  foo3
```

mv – move (rename) files

Example 4

```
$ mv bar A
```

(No output!)

```
$ ls
```

```
A  A2  B  foo3
```

mv – move (rename) files

Example 5

```
$ mv A2 A
```

(No output!)

```
$ ls
```

```
A  B  foo3
```

mv – move (rename) files

Example 6

```
$ touch a1 a2 a3
```

```
$ ls
```

```
A  a1  a2  a3  B  foo3
```

```
$ mv *3 B
```

mv – move (rename) files

Exercises

1. Rename a file
2. Move a file to a directory
3. Move a directory to a directory
4. Create a few files and move them

→ Dhanya

Delete Files and Directory

\$rm <filename>

\$rm -r <directoryname>



Recap

- Intro UNIX & login to remote machine
- `hostname`, `pwd`, `ls`, `man`, `mkdir`, `cd`,
`touch`, `history`, `cp`, `vim`, `less`, `mv`, `rm`

Homework A

Look at the manual pages of the commands

Changing to some directory and other and move to parent directory

Copy some files

Delete the copied file

Edit some textfiles

Copy the directory data from /cluster/projects/nn9988k/UNIX



Homework B (spend an hour or two)

- Repeat login, command examples & exercises
- What's the difference between `cat` and `less`?
- Try the game `bashcrawl`

```
cp -r /cluster/projects/nn9988k/bashcrawl $HOME
```

```
cd $HOME/bashcrawl
```

```
ls
```

```
...
```