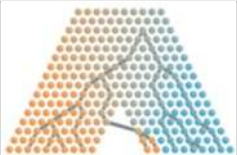


UNIX primer

Some tips and tricks on the **Command Line**

Angélica Cuevas & Angela P. Fuentes-Pardo

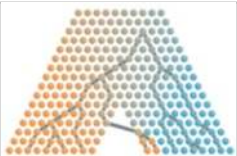
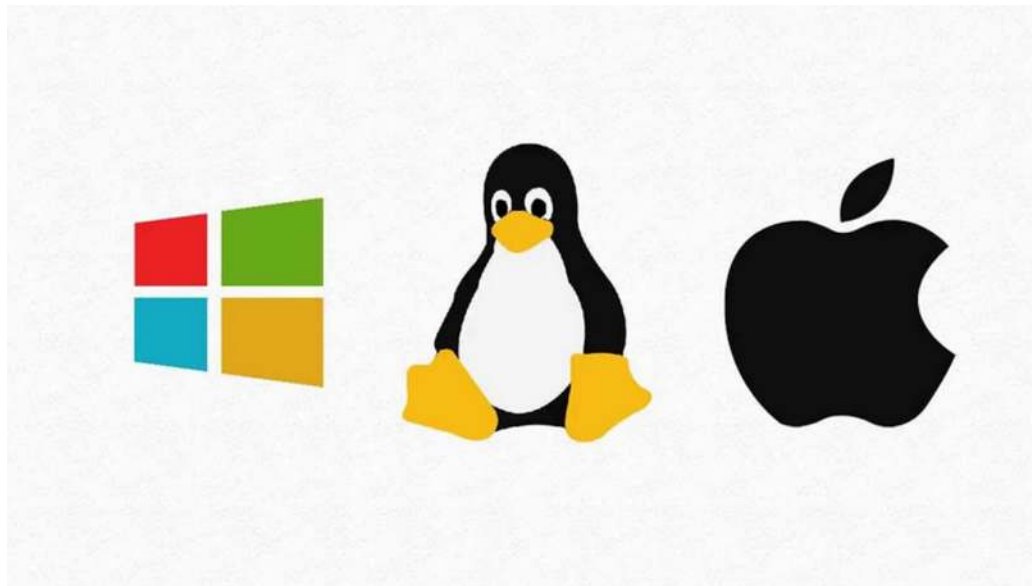
June 05, 2022



Population and Speciation Genomics Workshop - Cesky Krumlov 2022

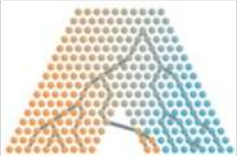
What is UNIX?

- Operating system



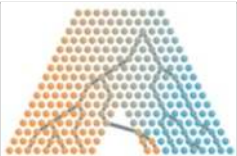
Why UNIX?

- Scripting
- Powerful tools
- Easy remote access
- A GUI (Graphical User Interface) is not available for many programs
- Compatibility



Learning goals

- Navigate in the UNIX environment
- Create, move and delete directories
- Create, move, delete and edit files
- Use basic UNIX commands
- Know where to find help



The Terminal

```
angelimc — angelimc@login-2:~ — ssh angelimc@saga.sigma2.no — 83x30
Last login: Tue May 31 10:31:33 on console
[bio88172:~ angelimc$ [angelimc@login-1.SAGA /cluster/work/users/angelimc/rad_island]
s_Nov2020/data_uploaded_submission/raw_reads]$ cp /nird/projects/nird/NS9003K/proje
cts/sparrow/angelica/raw_data/RAD_seq.2015/RAD_Samples_Raw/RAD_ISLANDS/RAD17_35_R1.
[fastq.gz .
[angelimc@login-1.SAGA ~]$ ssh angelimc@saga.sigma2.no
angelimc@saga.sigma2.no's password:
Last login: Tue Jan 25 14:02:06 2022 from 186.31.3.22
Welcome to saga.sigma2.no!

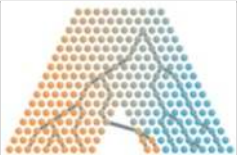
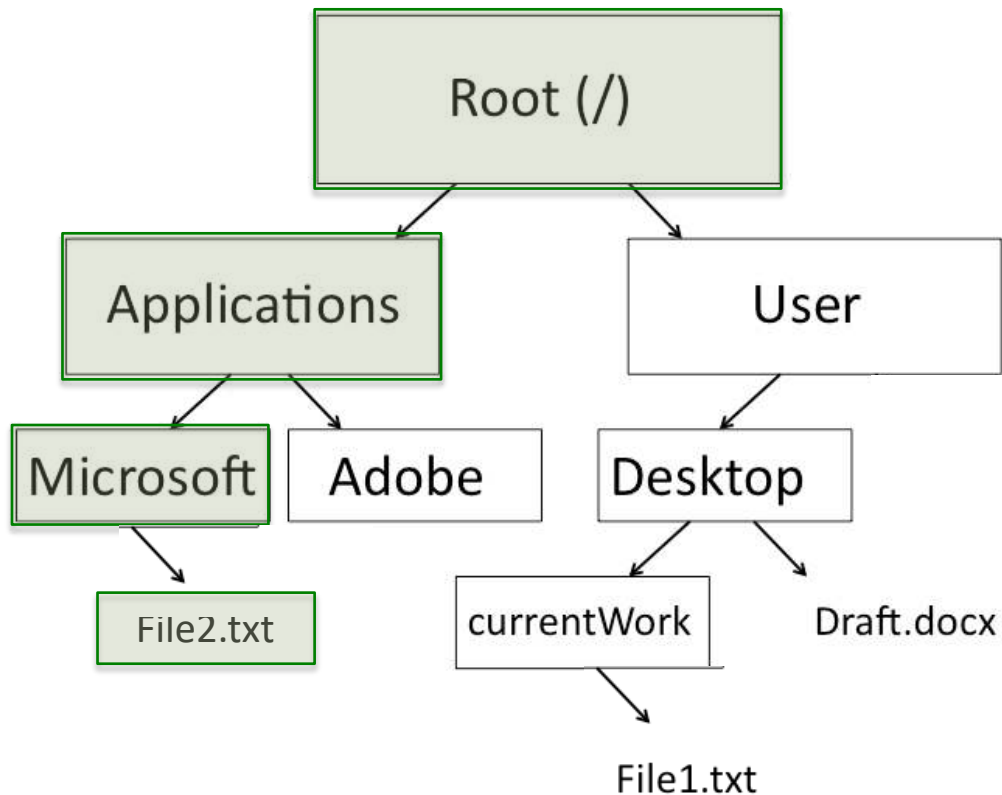
Documentation: https://documentation.sigma2.no/
Support email: support@nris.no
Request resources:
https://www.sigma2.no/content/apply-e-infrastructure-resources/
~~~~~
Latest news from: https://opslog.sigma2.no/

o 2022-05-31: Betzy downtime 13th June – 15th June
o 2022-05-23: Saga downtime 30.5.22
o 2022-05-12: Betzy down
o 2022-05-06: FRAM slow filesystem
o 2022-05-03: FRAM power outage
~~~~~
NOTE: The $USERWORK autocleanup period is at least 21 days and up to 42 days if suf
ficient storage is available.
WARNING: Your home directory ($HOME) is only backed up if it has quotas enforced.
For more info see: https://documentation.sigma2.no/files\_storage/backup.ht
ml
~~~~~
~ (base) [angelimc@login-2.SAGA ~]$
```

(the Command Line, Shell, Prompt)

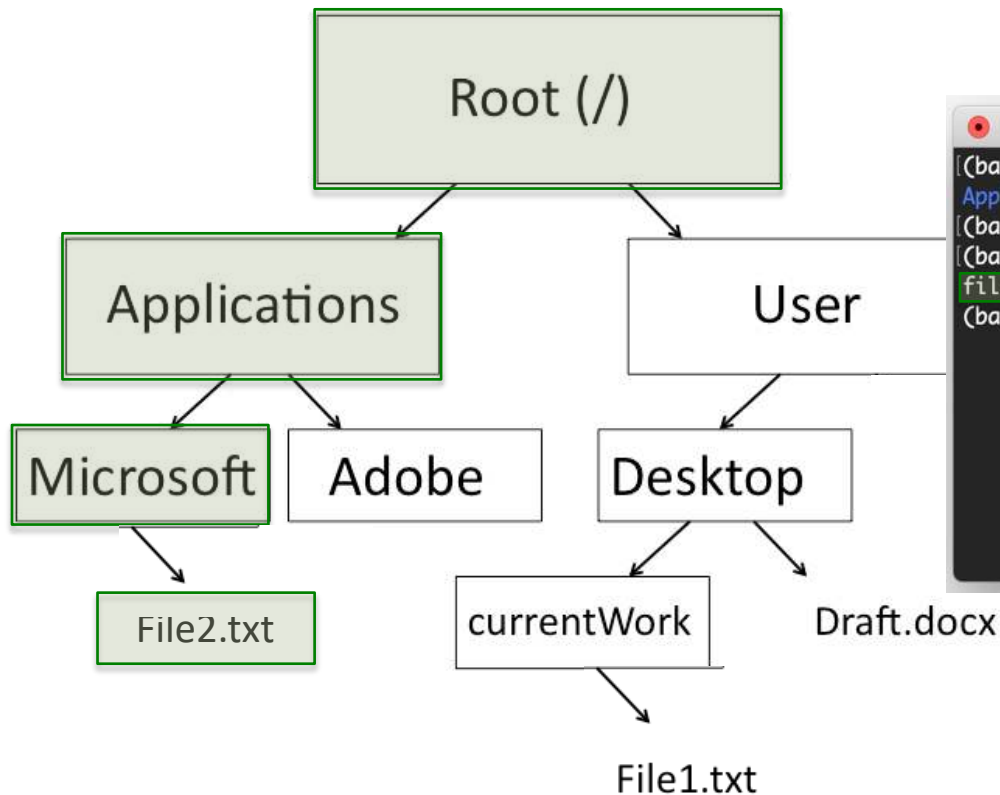


PATHS: Absolute vs. Relative

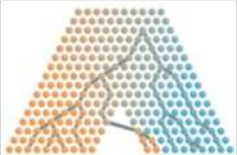


PATHS: Absolute vs. Relative

In the **Command Line**

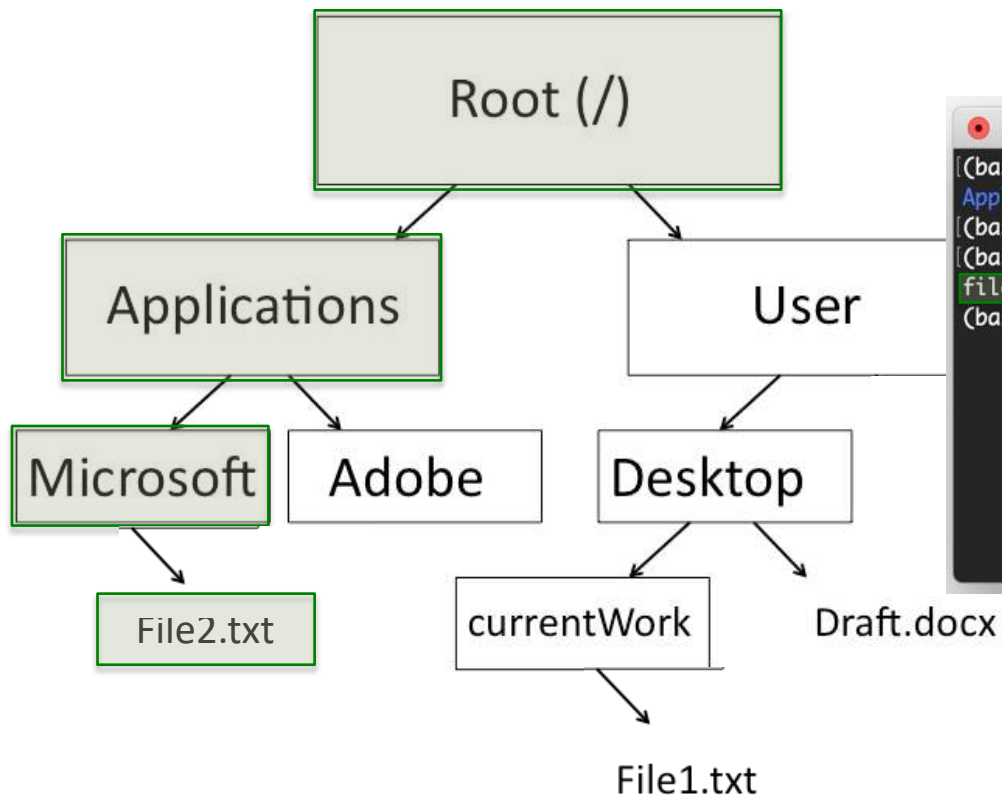


```
angelimc — angelimc@login-2:~/Root/Applications/Microsoft — ssh
(base) [angelimc@login-2.SAGA ~/Root]$ ls
Applications  User
(base) [angelimc@login-2.SAGA ~/Root]$ cd Applications/Microsoft/
(base) [angelimc@login-2.SAGA ~/Root/Applications/Microsoft]$ ls
file2.txt
(base) [angelimc@login-2.SAGA ~/Root/Applications/Microsoft]$
```



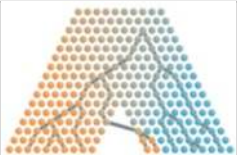
PATHS: Absolute vs. Relative

In the **Command Line**



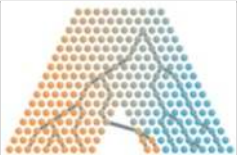
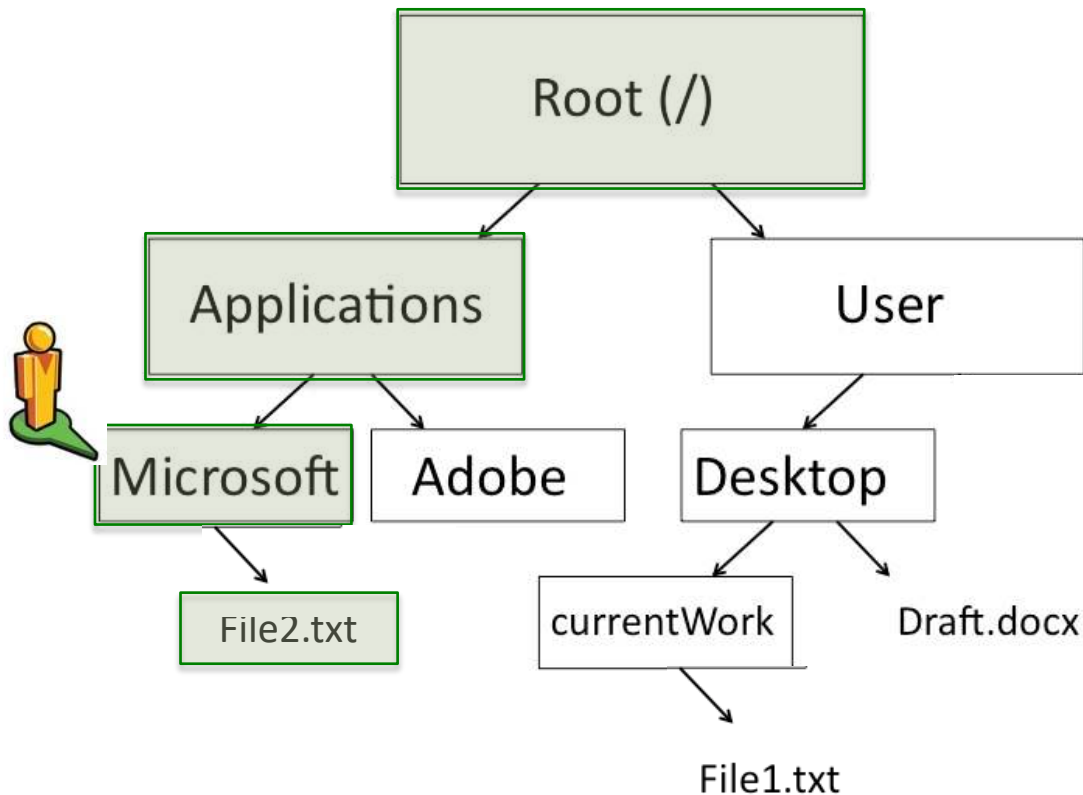
```
angelimc — angelimc@login-2:~/Root/Applications/Microsoft — ssh
(base) [angelimc@login-2.SAGA ~/Root]$ ls
Applications  User
(base) [angelimc@login-2.SAGA ~/Root]$ cd Applications/Microsoft/
(base) [angelimc@login-2.SAGA ~/Root/Applications/Microsoft]$ ls
file2.txt
(base) [angelimc@login-2.SAGA ~/Root/Applications/Microsoft]$
```

/Applications/Microsoft



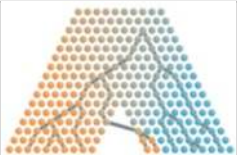
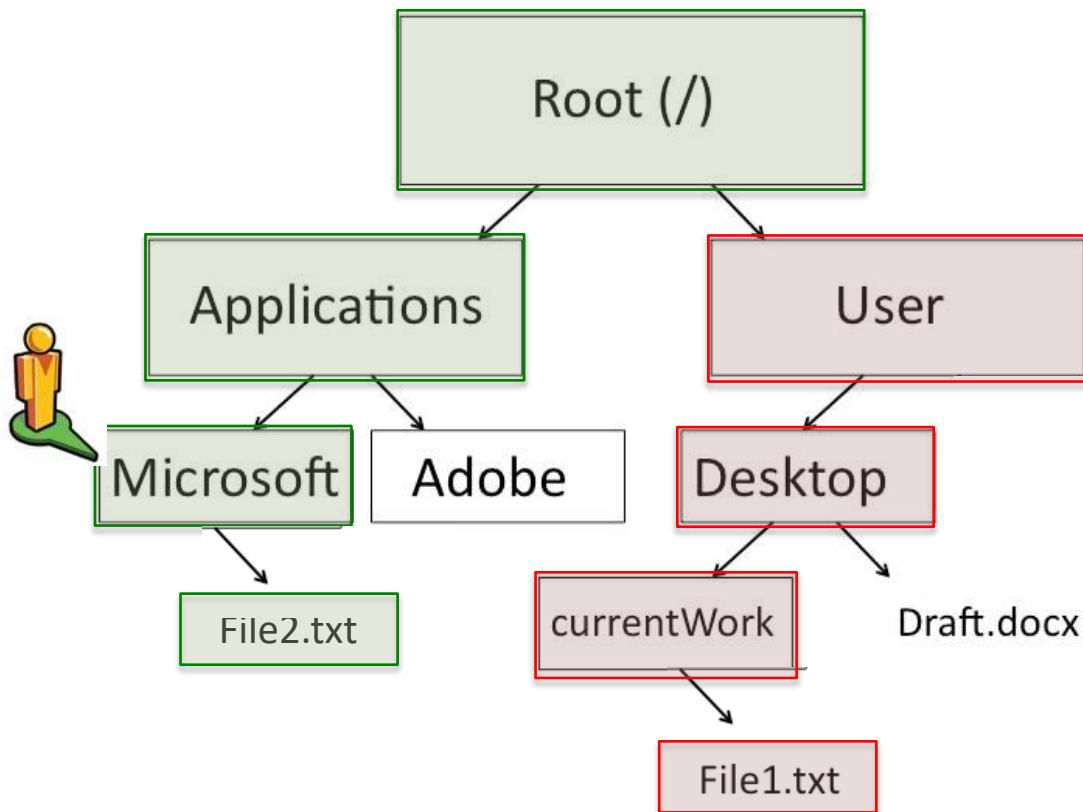
PATHS: Absolute vs. Relative

In the **Command Line**



PATHS: Absolute vs. Relative

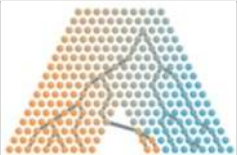
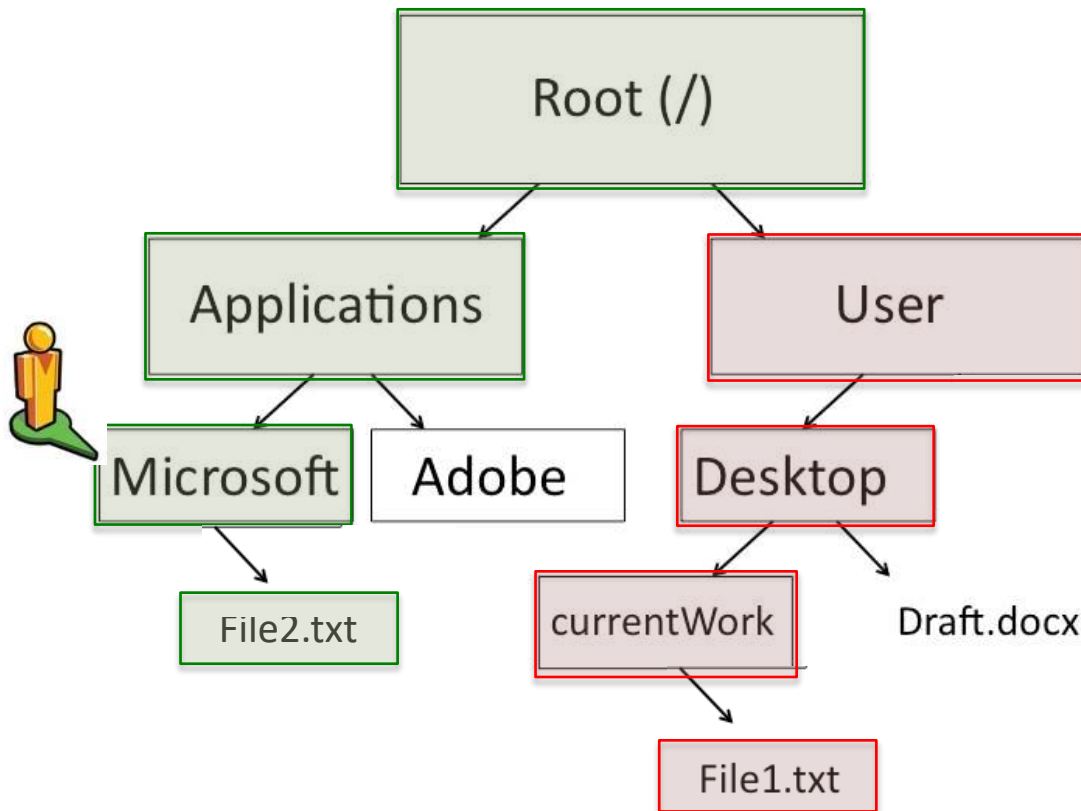
In the **Command Line**



PATHS: Absolute vs. Relative

In the **Command Line**

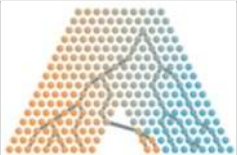
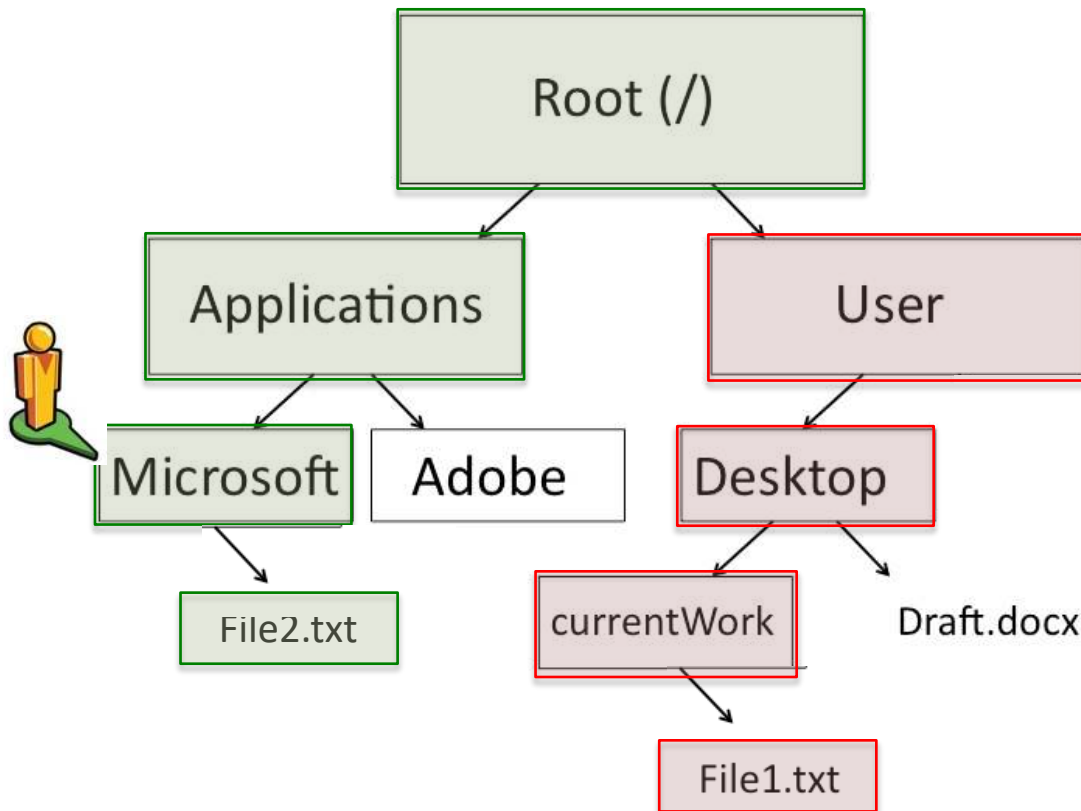
`/User/Desktop/currentWork`



PATHS: Absolute vs. Relative

In the **Command Line**

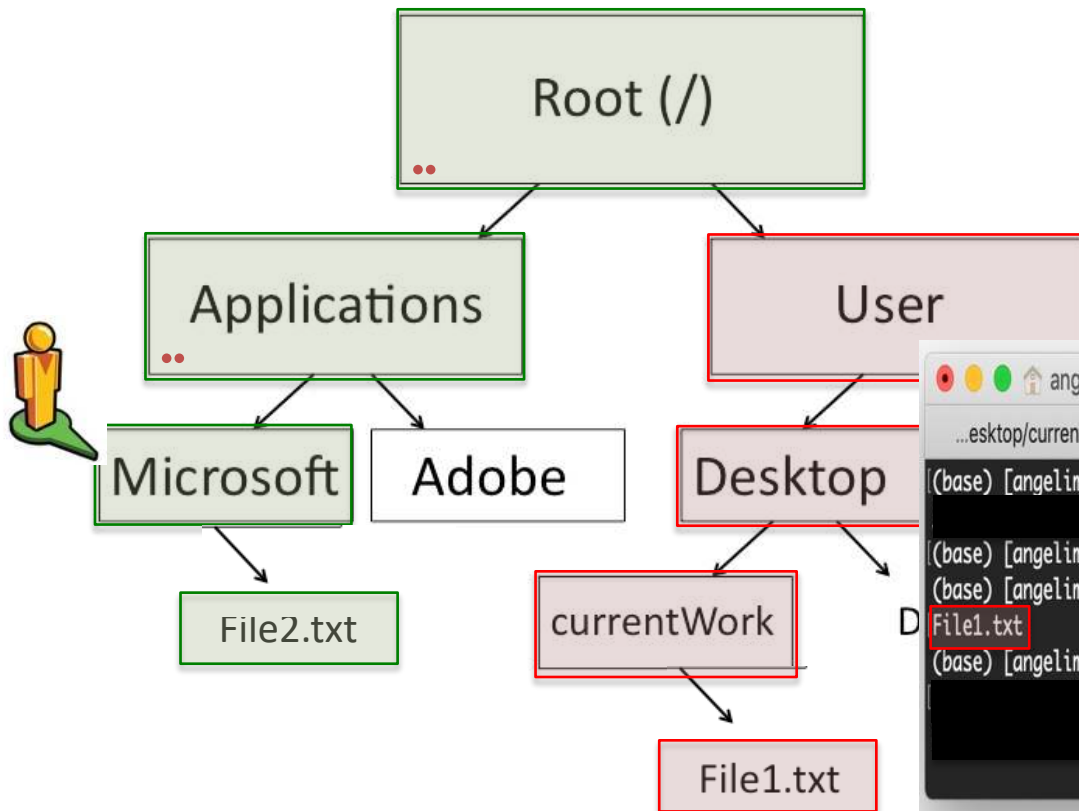
`pwd` → print working directory
`cd` → change directory
`ls` → list



PATHS: Absolute vs. Relative

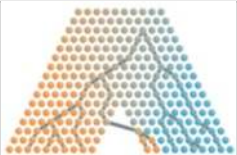
In the **Command Line**

`pwd` → print working directory
`cd` → change directory
`ls` → list



```
angelimc — angelimc@login-2:~/Root/User/Desktop/currentWork — ssh angelimc@saga.sigma2.no...
...esktop/currentWork — ssh angelimc@saga.sigma2.no /Applications — -bash

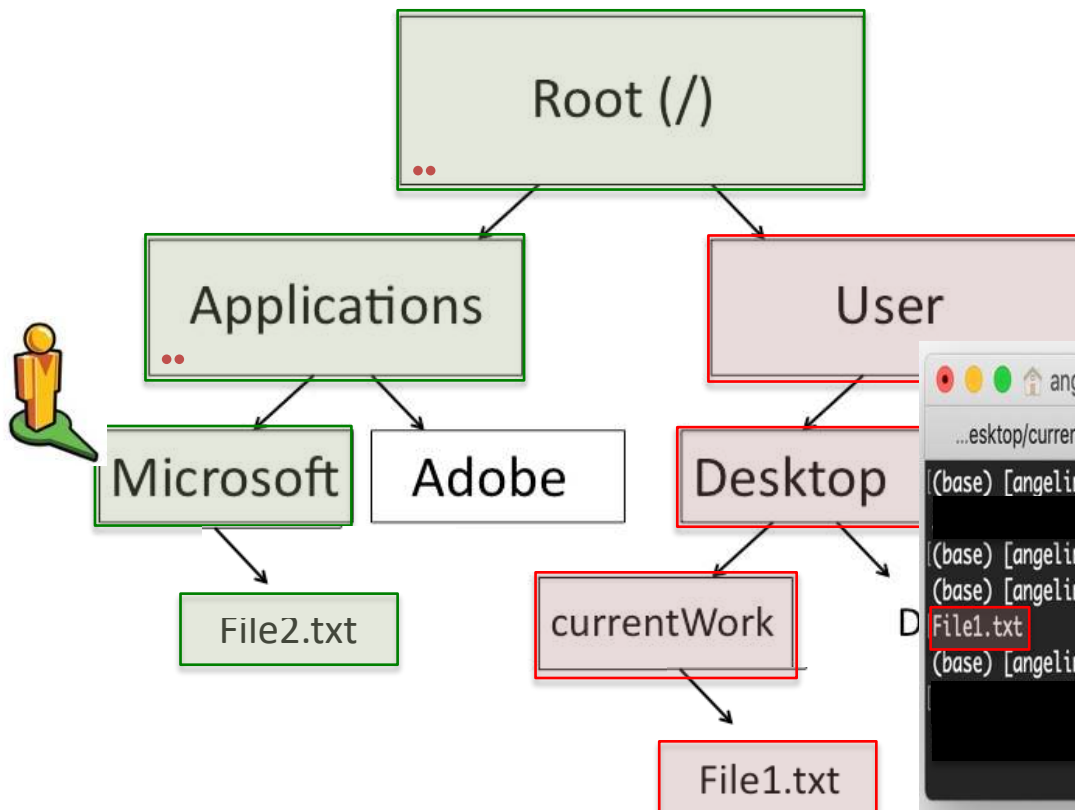
(base) [angelimc@login-2.SAGA ~/Root/Applications/Microsoft]$ pwd
~/Applications/Microsoft
(base) [angelimc@login-2.SAGA ~/Root/Applications/Microsoft]$ cd ../../User/Desktop/currentWork/
(base) [angelimc@login-2.SAGA ~/Root/User/Desktop/currentWork]$ ls
File1.txt
(base) [angelimc@login-2.SAGA ~/Root/User/Desktop/currentWork]$ pwd
~/User/Desktop/currentWork
```



PATHS: Absolute vs. Relative

In the **Command Line**

`pwd` → print working directory
`cd` → change directory
`ls` → list



```
angelimc — angelimc@login-2:~/Root/User/Desktop/currentWork — ssh angelimc@saga.sigma2.no...
...esktop/currentWork — ssh angelimc@saga.sigma2.no /Applications — -bash

(base) [angelimc@login-2.SAGA ~/Root/Applications/Microsoft]$ pwd
~/Applications/Microsoft
(base) [angelimc@login-2.SAGA ~/Root/Applications/Microsoft]$ cd ../../User/Desktop/currentWork/
(base) [angelimc@login-2.SAGA ~/Root/User/Desktop/currentWork]$ ls
File1.txt
(base) [angelimc@login-2.SAGA ~/Root/User/Desktop/currentWork]$ pwd
~/User/Desktop/currentWork
```

`../../User/Desktop/currentWork`



A CHEAT SHEET ... and the internet is your best friend!

Unix/Linux Command Reference

FOSSwire.com

File Commands	System Info
ls - directory listing ls -al - formatted listing with hidden files cd <i>dir</i> - change directory to <i>dir</i> cd - change to home pwd - show current directory mkdir <i>dir</i> - create a directory <i>dir</i> rm <i>file</i> - delete <i>file</i> rm -r <i>dir</i> - delete directory <i>dir</i> rm -f <i>file</i> - force remove <i>file</i> rm -rf <i>dir</i> - force remove directory <i>dir</i> * cp <i>file1 file2</i> - copy <i>file1</i> to <i>file2</i> cp -r <i>dir1 dir2</i> - copy <i>dir1</i> to <i>dir2</i> ; create <i>dir2</i> if it doesn't exist mv <i>file1 file2</i> - rename or move <i>file1</i> to <i>file2</i> if <i>file2</i> is an existing directory, moves <i>file1</i> into directory <i>file2</i> ln -s <i>file link</i> - create symbolic link <i>link</i> to <i>file</i> touch <i>file</i> - create or update <i>file</i> cat > <i>file</i> - places standard input into <i>file</i> more <i>file</i> - output the contents of <i>file</i> head <i>file</i> - output the first 10 lines of <i>file</i> tail <i>file</i> - output the last 10 lines of <i>file</i> tail -f <i>file</i> - output the contents of <i>file</i> as it grows, starting with the last 10 lines	date - show the current date and time cal - show this month's calendar uptime - show current uptime w - display who is online whoami - who you are logged in as finger <i>user</i> - display information about <i>user</i> uname -a - show kernel information cat /proc/cpuinfo - cpu information cat /proc/meminfo - memory information man <i>command</i> - show the manual for <i>command</i> df - show disk usage du - show directory space usage free - show memory and swap usage whereis <i>app</i> - show possible locations of <i>app</i> which <i>app</i> - show which <i>app</i> will be run by default
Process Management	Compression
ps - display your currently active processes top - display all running processes kill <i>pid</i> - kill process id <i>pid</i> killall <i>proc</i> - kill all processes named <i>proc</i> * bg - lists stopped or background jobs; resume a stopped job in the background fg - brings the most recent job to foreground fg <i>n</i> - brings job <i>n</i> to the foreground	tar cf <i>file.tar files</i> - create a tar named <i>file.tar</i> containing <i>files</i> tar xf <i>file.tar</i> - extract the files from <i>file.tar</i> tar czf <i>file.tar.gz files</i> - create a tar with Gzip compression tar xzf <i>file.tar.gz</i> - extract a tar using Gzip tar cjf <i>file.tar.bz2</i> - create a tar with Bzip2 compression tar xjf <i>file.tar.bz2</i> - extract a tar using Bzip2 gzip <i>file</i> - compresses <i>file</i> and renames it to <i>file.gz</i> gzip -d <i>file.gz</i> - decompresses <i>file.gz</i> back to <i>file</i>
File Permissions	Network
chmod <i>octal file</i> - change the permissions of <i>file</i> to <i>octal</i> , which can be found separately for user, group, and world by adding: • 4 - read (r) • 2 - write (w) • 1 - execute (x) Examples: chmod 777 - read, write, execute for all chmod 755 - rwx for owner, rx for group and world For more options, see man chmod .	ping <i>host</i> - ping <i>host</i> and output results whois <i>domain</i> - get whois information for <i>domain</i> dig <i>domain</i> - get DNS information for <i>domain</i> dig -x <i>host</i> - reverse lookup <i>host</i> wget <i>file</i> - download <i>file</i> wget -c <i>file</i> - continue a stopped download
SSH	Installation
ssh <i>user@host</i> - connect to <i>host</i> as <i>user</i> ssh -p <i>port user@host</i> - connect to <i>host</i> on port <i>port</i> as <i>user</i> ssh-copy-id <i>user@host</i> - add your key to <i>host</i> for <i>user</i> to enable a keyed or passwordless login	Install from source: ./configure make make install dpkg -i <i>pkg.deb</i> - install a package (Debian) rpm -Uvh <i>pkg.rpm</i> - install a package (RPM)
Searching	Shortcuts
grep <i>pattern files</i> - search for <i>pattern</i> in <i>files</i> grep -r <i>pattern dir</i> - search recursively for <i>pattern</i> in <i>dir</i> <i>command</i> grep <i>pattern</i> - search for <i>pattern</i> in the output of <i>command</i> locate <i>file</i> - find all instances of <i>file</i>	Ctrl+C - halts the current command Ctrl+Z - stops the current command, resume with fg in the foreground or bg in the background Ctrl+D - log out of current session, similar to exit Ctrl+W - erases one word in the current line Ctrl+U - erases the whole line Ctrl+R - type to bring up a recent command !! - repeats the last command exit - log out of current session
	* use with extreme caution.



EVOLUTION AND GENOMICS

Intensive and immersive training opportunities

WORKSHOPS LEARNING PEOPLE APPLY INFORMATION

LINKS

- [Amazon instances IP addresses](#)
- [Map of important locations in Český Krumlov](#)

SCHEDULE

Week 1 : 5-11 June, 2022

DATE	DAY	TIME	PRESENTER	TOPIC	LOCATION
5 Jun	Sunday	4p – 6p	Workshop Team	UNIX primer (optional)	Prelate
		7p – 10p	Everyone	Reception dinner	Hotel Zlaty Andel
6 Jun	Monday	9a – 10:30a	Workshop Team	Workshop introduction	Egon Schiele
		10:30a – 12p	Michael Matschiner	Likelihood and probability	Egon Schiele
		12p – 12:15p	Everyone	Group photo	Outside Prelate



Population and Speciation Genomics Workshop - Cesky Krumlov 2022

```
ssh wpsg@ec2-XX-XXX-XXX-XXX.compute-1.amazonaws.com
```

WPSG2022 AMI IP addresses

File Edit View Insert Format Data Tools Extensions Help

View only

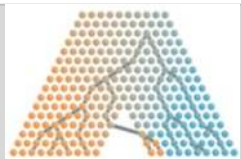
	A	B	C	D	E	F	G	H	I
1	Last Name	First Name	Instance name	Instance ID	Instance state	Instance type	Status check	Public DNS	Launch time
2	Abush	Zinaw	WPSG 1.0	i-0b8ebcee4c8afa4bb	Running	t3.xlarge	2/2 checks passed	ec2-44-200-40-67.compute-1.amazonaws.com	2022/05/31 14:34 GMT+2
3	Agnieszka	Lipinska	WPSG 1.0	i-0f508e5ee1c6f5af0	Running	t3.large	2/2 checks passed	ec2-44-203-148-243.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
4	Albertien	van Heerden	WPSG 1.0	i-0695fab01f918ac7b	Running	t3.large	2/2 checks passed	ec2-54-172-182-168.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
5	Alexander	Brandt	WPSG 1.0	i-0cc305fd706a4438d	Running	t3.large	2/2 checks passed	ec2-44-202-43-70.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
6	Alistair	Hudson	WPSG 1.0	i-0d17f868f7ab44ed2	Running	t3.large	2/2 checks passed	ec2-35-172-133-194.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
7	Amanda	Lazdina	WPSG 1.0	i-0bfe0452838268d85	Running	t3.large	2/2 checks passed	ec2-3-85-56-171.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
8	Anastasiia	Mykhailenko	WPSG 1.0	i-0b8ebcee4c8afa4bb	Running	t3.xlarge	2/2 checks passed	ec2-44-200-40-67.compute-1.amazonaws.com	2022/05/31 14:34 GMT+2
9	Annabelle	de Vries	WPSG 1.0	i-0f508e5ee1c6f5af0	Running	t3.large	2/2 checks passed	ec2-44-203-148-243.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
10	Bárbara	Rocha Venancio Meyer	WPSG 1.0	i-0695fab01f918ac7b	Running	t3.large	2/2 checks passed	ec2-54-172-182-168.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
11	Cecilia	Padilla Iglesias	WPSG 1.0	i-0cc305fd706a4438d	Running	t3.large	2/2 checks passed	ec2-44-202-43-70.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
12	Charlotte	Wright	WPSG 1.0	i-0d17f868f7ab44ed2	Running	t3.large	2/2 checks passed	ec2-35-172-133-194.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
13	Colette	Blyth	WPSG 1.0	i-0bfe0452838268d85	Running	t3.large	2/2 checks passed	ec2-3-85-56-171.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
14	Conor	Gilligan	WPSG 1.0	i-0b8ebcee4c8afa4bb	Running	t3.xlarge	2/2 checks passed	ec2-44-200-40-67.compute-1.amazonaws.com	2022/05/31 14:34 GMT+2
15	Daniela	Souza	WPSG 1.0	i-0f508e5ee1c6f5af0	Running	t3.large	2/2 checks passed	ec2-44-203-148-243.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
16	Darren	O'Connell	WPSG 1.0	i-0695fab01f918ac7b	Running	t3.large	2/2 checks passed	ec2-54-172-182-168.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
17	Emile	Cavalet-Giorsa	WPSG 1.0	i-0cc305fd706a4438d	Running	t3.large	2/2 checks passed	ec2-44-202-43-70.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
18	Emmanuel	Tergemina	WPSG 1.0	i-0d17f868f7ab44ed2	Running	t3.large	2/2 checks passed	ec2-35-172-133-194.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
19	Eva	Paulus	WPSG 1.0	i-0bfe0452838268d85	Running	t3.large	2/2 checks passed	ec2-3-85-56-171.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
20	Francesco	Giannelli	WPSG 1.0	i-0b8ebcee4c8afa4bb	Running	t3.xlarge	2/2 checks passed	ec2-44-200-40-67.compute-1.amazonaws.com	2022/05/31 14:34 GMT+2
21	Grégoire	Vernaz	WPSG 1.0	i-0f508e5ee1c6f5af0	Running	t3.large	2/2 checks passed	ec2-44-203-148-243.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
22	Hiranya	Sudasinghe	WPSG 1.0	i-0695fab01f918ac7b	Running	t3.large	2/2 checks passed	ec2-54-172-182-168.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
23	Isabel	Blasco-Costa	WPSG 1.0	i-0cc305fd706a4438d	Running	t3.large	2/2 checks passed	ec2-44-202-43-70.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2
24	Jack	Harper	WPSG 1.0	i-0d17f868f7ab44ed2	Running	t3.large	2/2 checks passed	ec2-35-172-133-194.compute-1.amazonaws.com	2022/06/04 17:18 GMT+2

Participant instance IPs

Organiser instance IPs

Hints

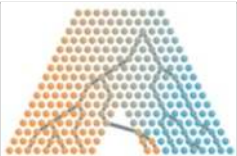
Explore



~ — wpsg@ip-172-31-86-44: ~ — ssh wpsg@ec2-54-172-182-168.compute-1.amazonaws.com

/Applications — -bash

```
bio88172:~ angelimc$ ssh wpsg@ec2-54-172-182-168.compute-1.amazonaws.com  
wpsg@ec2-54-172-182-168.compute-1.amazonaws.com's password: 
```



Population and Speciation Genomics Workshop - Cesky Krumlov 2022

```
[bio88172:~ angelimc$ ssh wpsg@ec2-54-172-182-168.compute-1.amazonaws.com
[wpsg@ec2-54-172-182-168.compute-1.amazonaws.com's password:
```

```
#####
##  Workshop on Population & Speciation Genomics 2022  ##
##                🌴🏖️🍹 Summer Edition 🍹🏖️🌴                ##
##                  Cesky Krumlov                  ##
##                  @evomics #evomics2022          ##
#####
```

Welcome to Ubuntu 20.04.4 LTS (5.13.0-1025-aws).

System information as of Sun Jun 5 12:23:57 CEST 2022

System load:	0.15	Processes:	167
Usage of /:	30.2% of 484.64GB	Users logged in:	1
Memory usage:	18%	IPv4 address for docker0:	172.17.0.1
Swap usage:	0%	IPv4 address for ens5:	172.31.86.44

* Ubuntu Pro delivers the most comprehensive open source security and compliance features.

<https://ubuntu.com/aws/pro>

Last login: Sun Jun 5 12:23:24 2022 from 90.178.205.213

(base) wpsg@ip-172-31-86-44: [~]\$

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6 Jun	Monday	9a – 10:30a	Workshop Team	Workshop introduction	Egon Schiele
		10:30a – 12p	Michael Matschiner	Likelihood and probability	Egon Schiele
		12p – 12:15p	Everyone	Group photo	Outside Prelate



Population and Speciation Genomics Workshop - Cesky Krumlov 2022

UNIX PRIMER

UNIX primer: tips, tricks, and more!

Angelica Cuevas, Angela P. Fuentes-Pardo, Julia M.I. Barth. 05th June 2022

- [UNIX primer slides](#)

Background and Objectives

Welcome everyone!

We have prepared this UNIX activity to get all of you to the same level, as you will use the Terminal a lot during this workshop. Depending on your level, this activity will take more or less time.

