SciLifeLab
UPPSALA

Linux Introduction

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Enabler for Life Sciences

SciLifeLab
UPPSALA

Linux **Introduction**

You will not learn this now.
Google it or look at lecture slides when you need it.

Practice makes perfect :)

Enabler for Life Sciences

SciLifeLab UPPSALA

UPPMAX

- Uppsala Multidisciplinary Center for Advanced Computational Science
  - (Uppsala supercomupter center)
- Clusters
  - Milou
  - Tintin
- Uses Linux

SciLifeLab UPPSALA

UPPMAX

- Uppsala Multidisciplinary Center for Advanced Computational Science
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  - **Milou**
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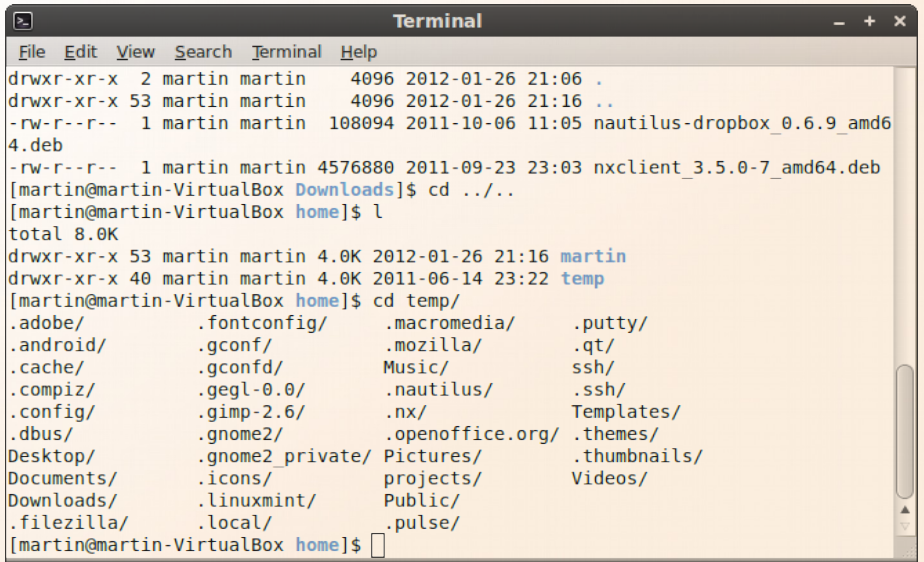
Why Text?

- UPPMAX is only accessible through SSH (Secure Shell) for security and speed
  - Command Line Interface (CLI)

- Scary at first, but wonderful to work with
  - Automation and scripts
  - Super computing not possible without it



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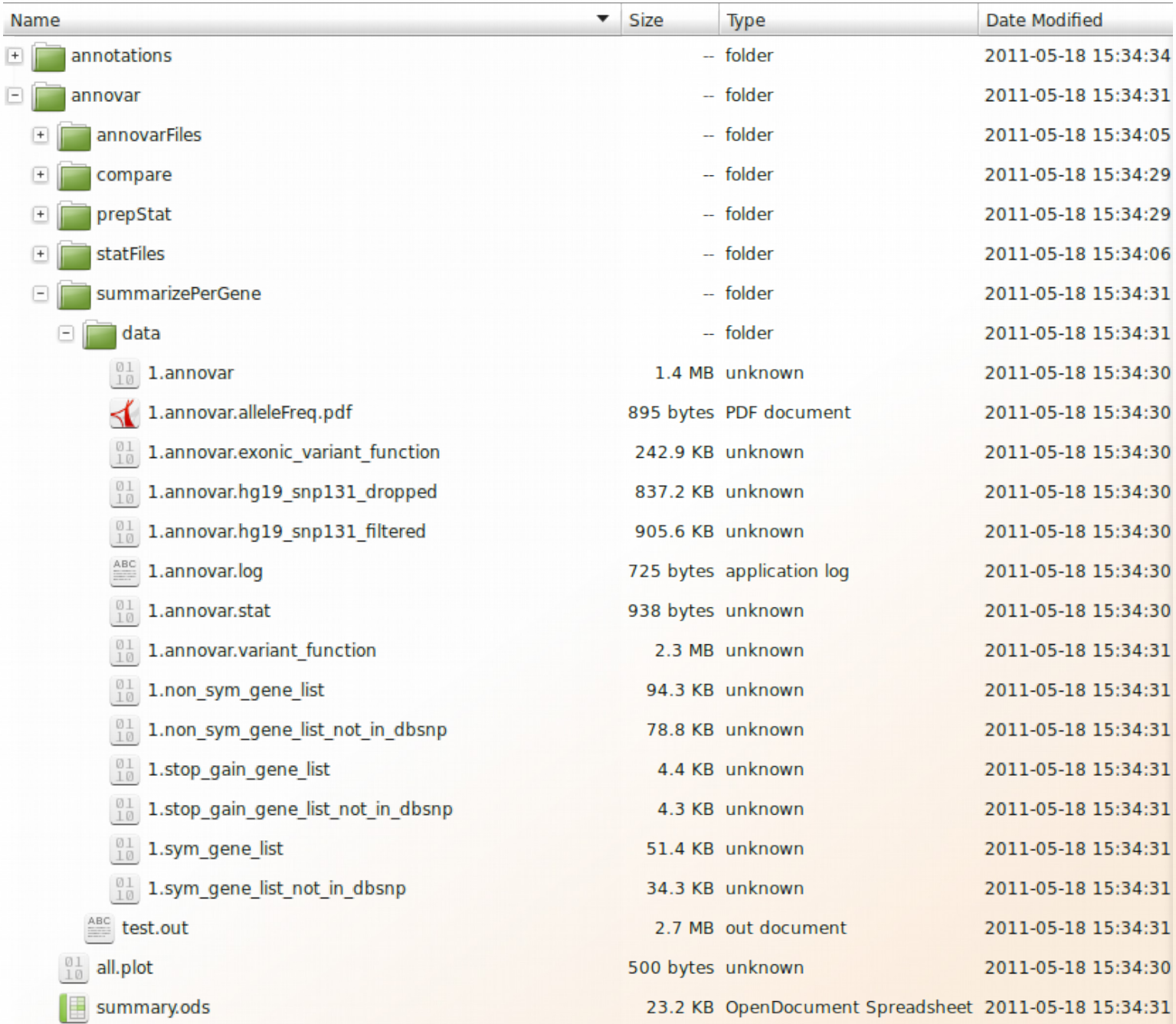
Navigation Commands



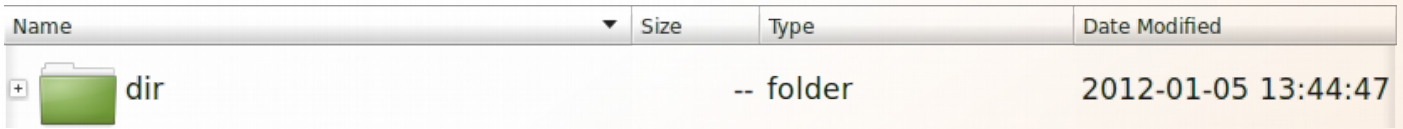
Navigation Commands

- ls – list the content of a directory

Navigation Commands

- ls – list the content of a directory

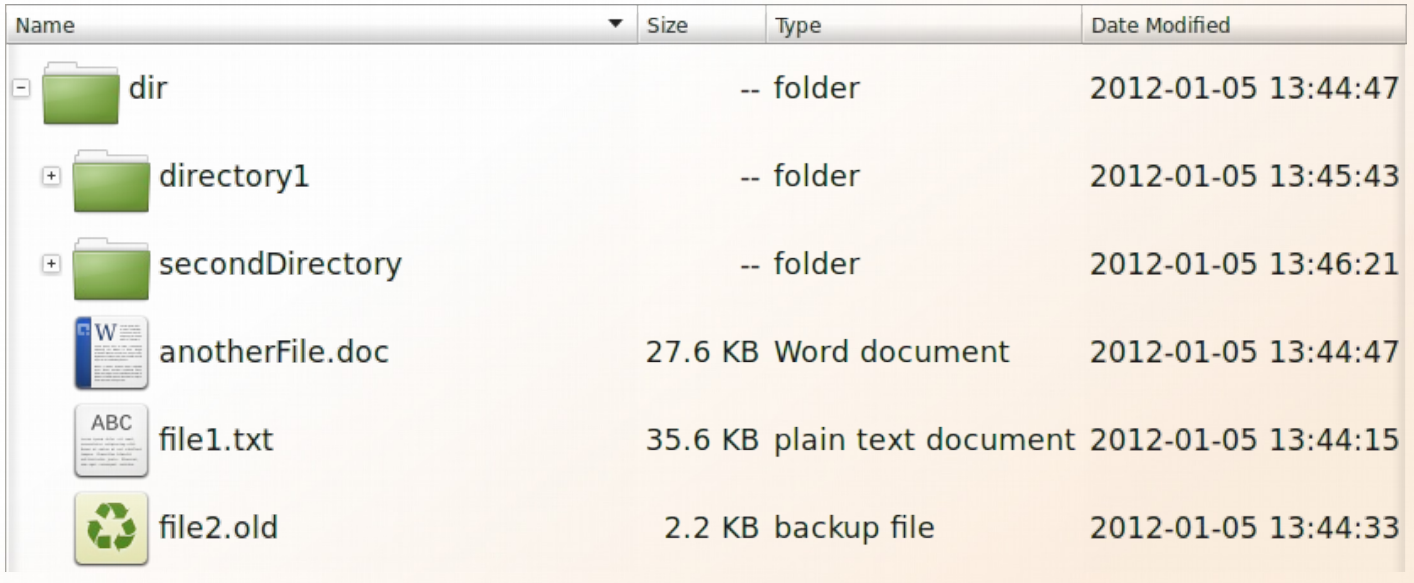
```
[dahlo@kalkyl4 dir]$
```



Navigation Commands

- ls – list the content of a directory

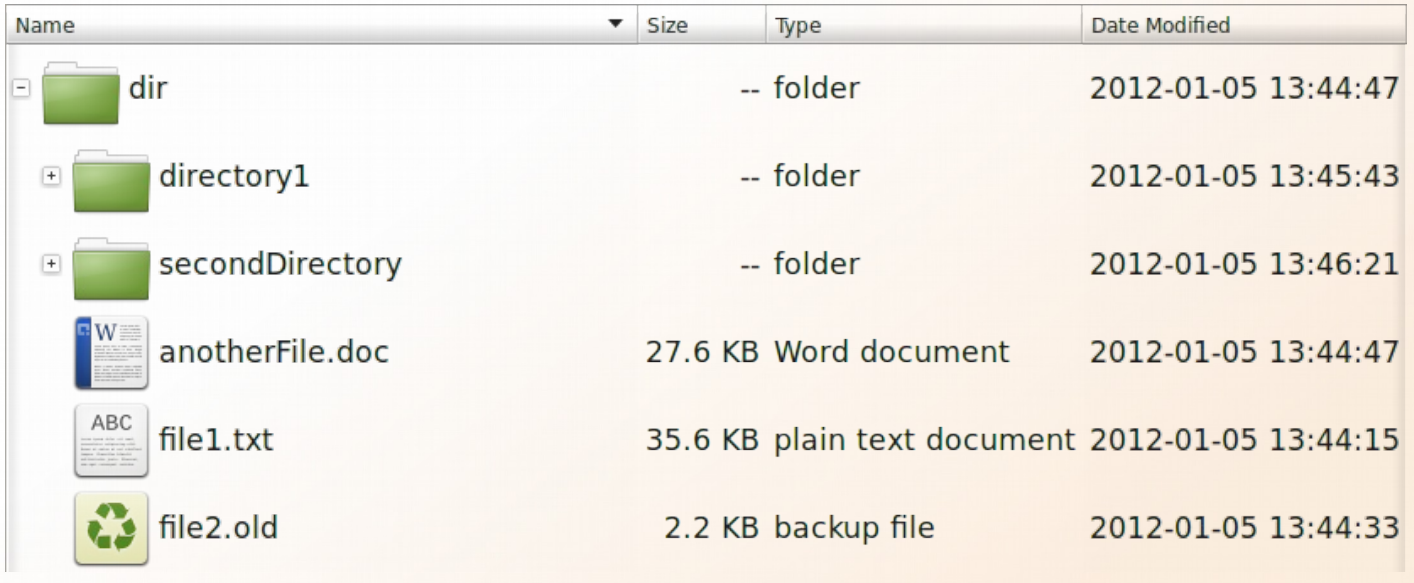
```
[dahlo@kalkyl4 dir]$ ls
anotherFile.doc  directory1  file1.txt  file2.old  secondDirectory
```



Navigation Commands

- ls – list the content of a directory

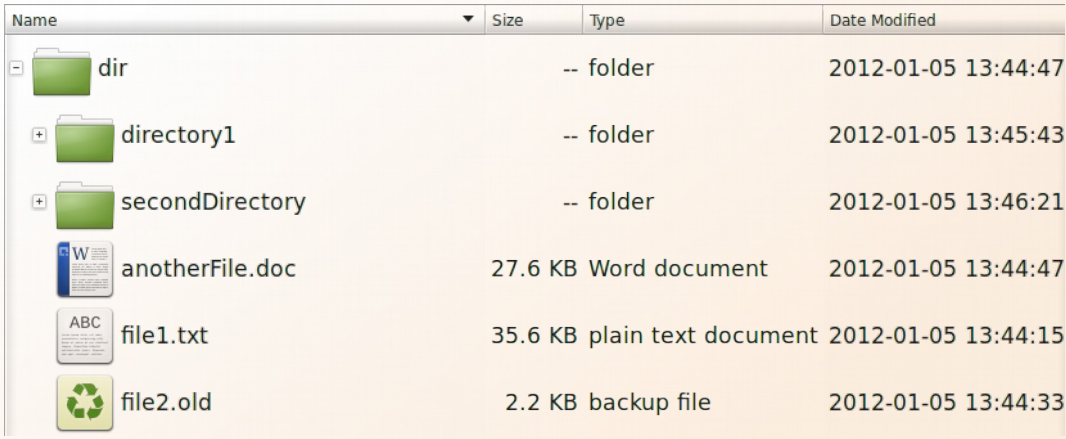
```
[dahlo@kalkyl4 dir]$ ls -l
total 192
-rw-r--r-- 1 dahlo uppmax 28214 Jan  5 13:44 anotherFile.doc
drwxr-xr-x 2 dahlo uppmax  4096 Jan  5 13:45 directory1
-rw-r--r-- 1 dahlo uppmax 36458 Jan  5 13:44 file1.txt
-rw-r--r-- 1 dahlo uppmax  2273 Jan  5 13:44 file2.old
drwxr-xr-x 2 dahlo uppmax  4096 Jan  5 13:46 secondDirectory
```



Navigation Commands

- cd – change working directory
  - cd <directory name> = down
  - cd .. = up

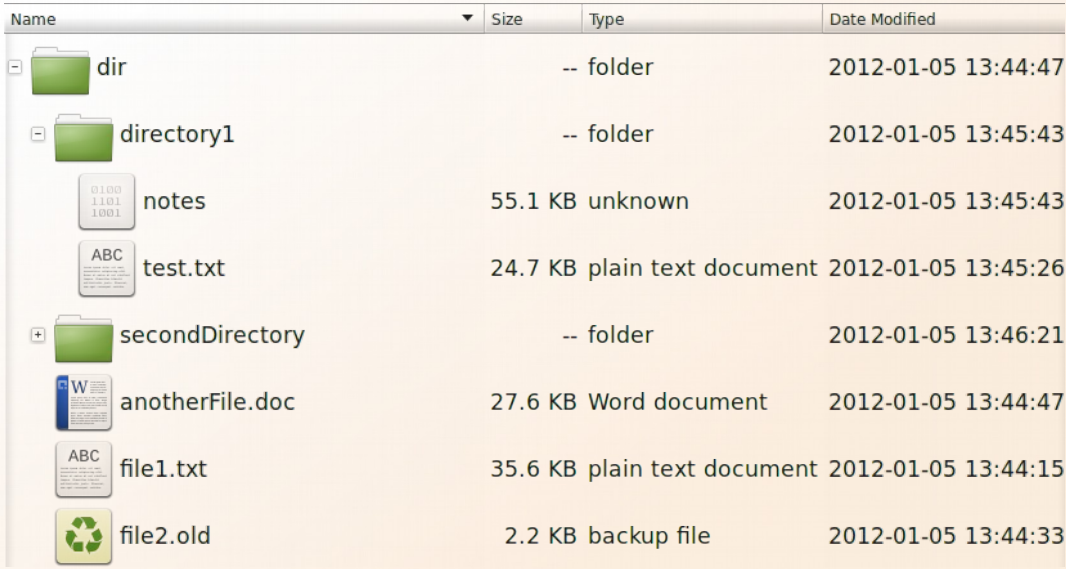
```
[dahlo@kalkyl4 dir]$ cd directory1
[dahlo@kalkyl4 directory1]$
```



Navigation Commands

- cd – change working directory
  - cd <directory name> = down
  - cd .. = up

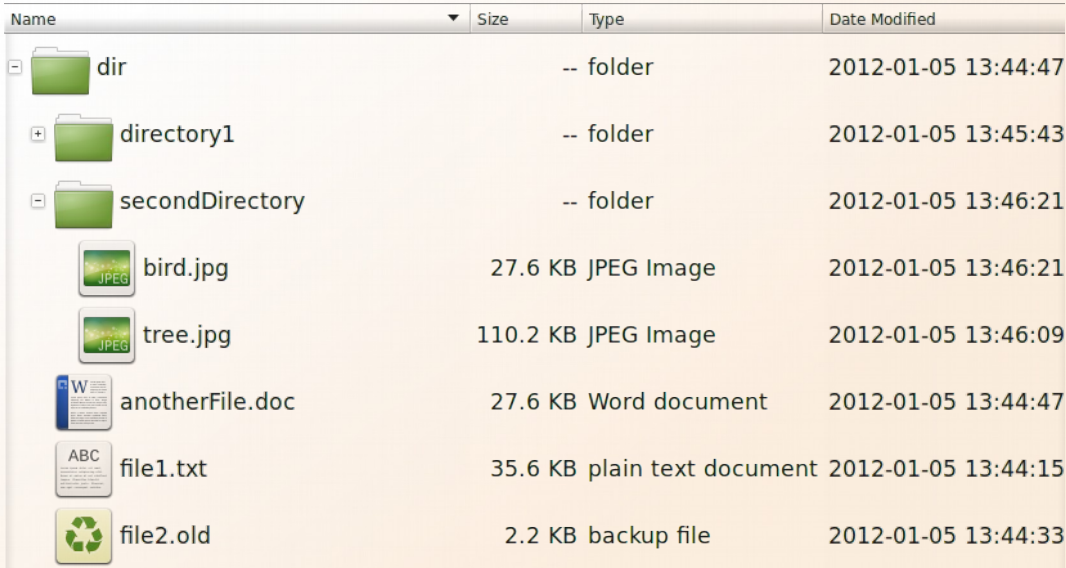
```
[dahlo@kalkyl4 dir]$ cd directory1
[dahlo@kalkyl4 directory1]$ ls -l
total 184
-rw-r--r-- 1 dahlo uppmax 56427 Jan  5 13:45 notes
-rw-r--r-- 1 dahlo uppmax 25301 Jan  5 13:45 test.txt
```



Navigation Commands

- cd – change working directory
  - cd <directory name> = down
  - cd .. = up

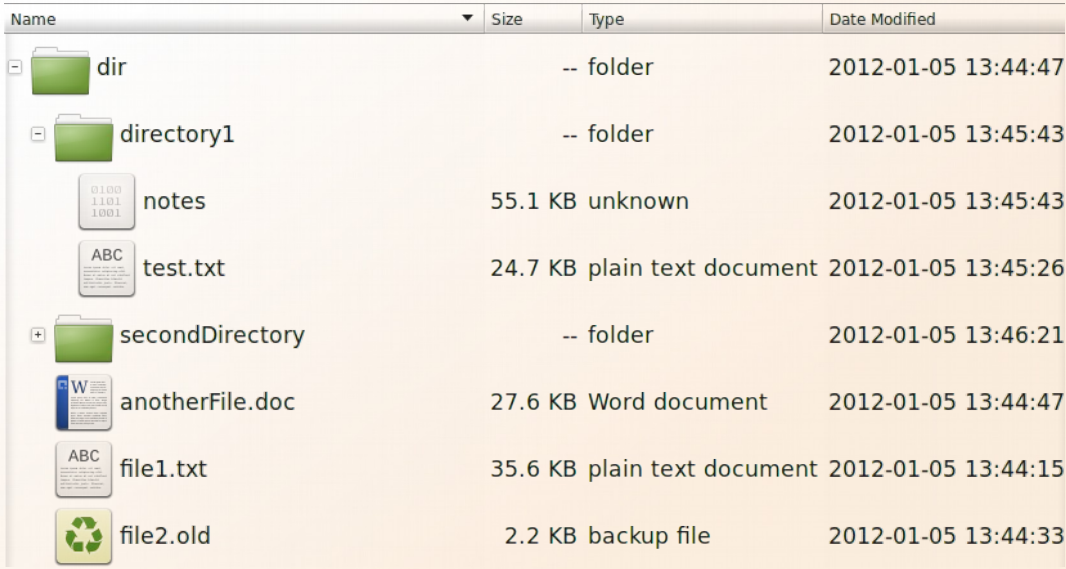
```
[dahlo@kalkyl4 directory1]$ cd ../secondDirectory
[dahlo@kalkyl4 secondDirectory]$ ls -l
total 252
-rw-r--r-- 1 dahlo uppmax  28214 Jan  5 13:46 bird.jpg
-rw-r--r-- 1 dahlo uppmax 112853 Jan  5 13:46 tree.jpg
```



Navigation Commands

- cd – change working directory
  - cd <directory name> = down
  - cd .. = up

```
[dahlo@kalkyl4 secondDirectory]$ ls -l ../directory1/
total 184
-rw-r--r-- 1 dahlo uppmax 56427 Jan  5 13:45 notes
-rw-r--r-- 1 dahlo uppmax 25301 Jan  5 13:45 test.txt
```



Navigation Commands

- pwd – print working directory

```
[dahlo@kalkyl4 dir]$ pwd
/home/dahlo/glob/work/testarea/temp/dir
```

Navigation Commands

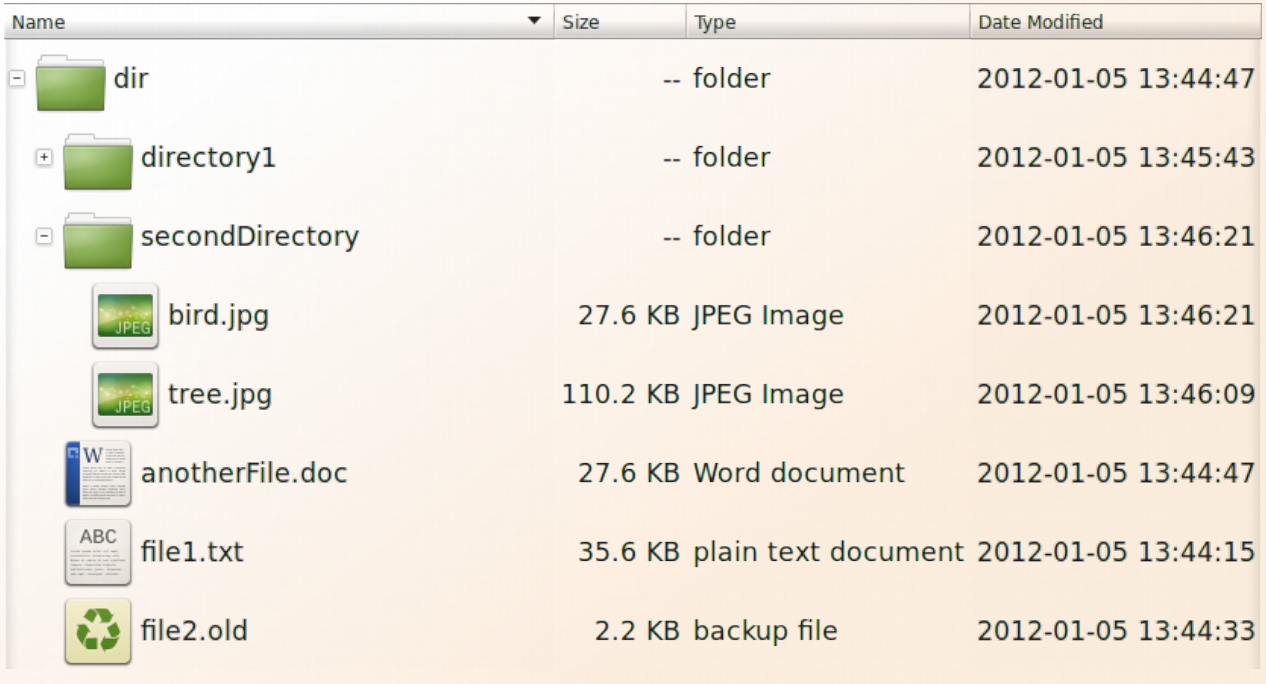
- pwd – print working directory

```
[dahlo@kalkyl4 dir]$ pwd
/home/dahlo/glob/work/testarea/temp/dir

[dahlo@kalkyl4 dir]$ cd directory1/
[dahlo@kalkyl4 directory1]$ pwd
/home/dahlo/glob/work/testarea/temp/dir/directory1
```

Navigation Commands

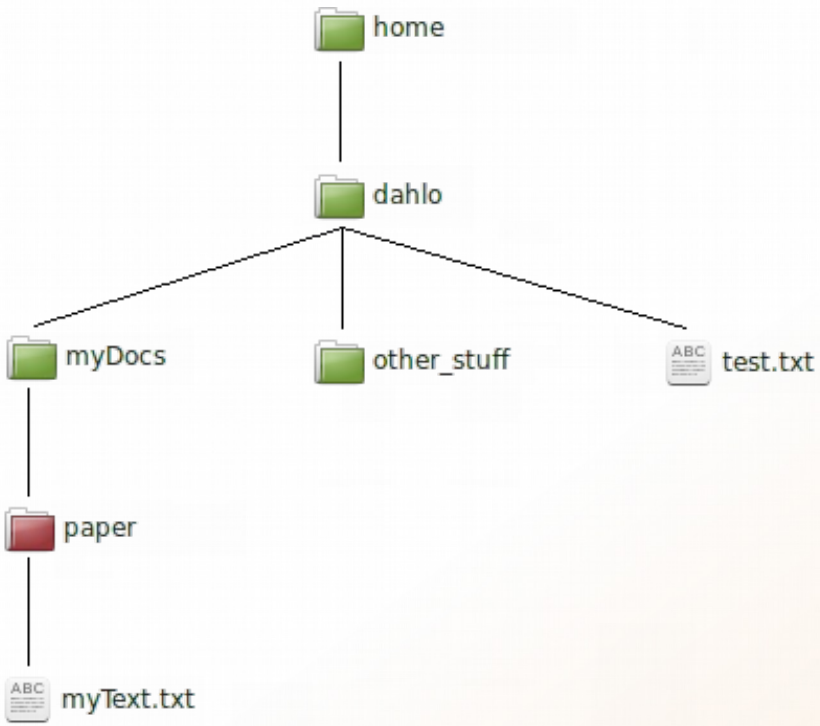
- Summary
  - ls – list content of directroy
  - cd – change working directory
  - pwd – print working directory



Interaction Commands

- Copy a file

  cp <name of original> <name of copy>

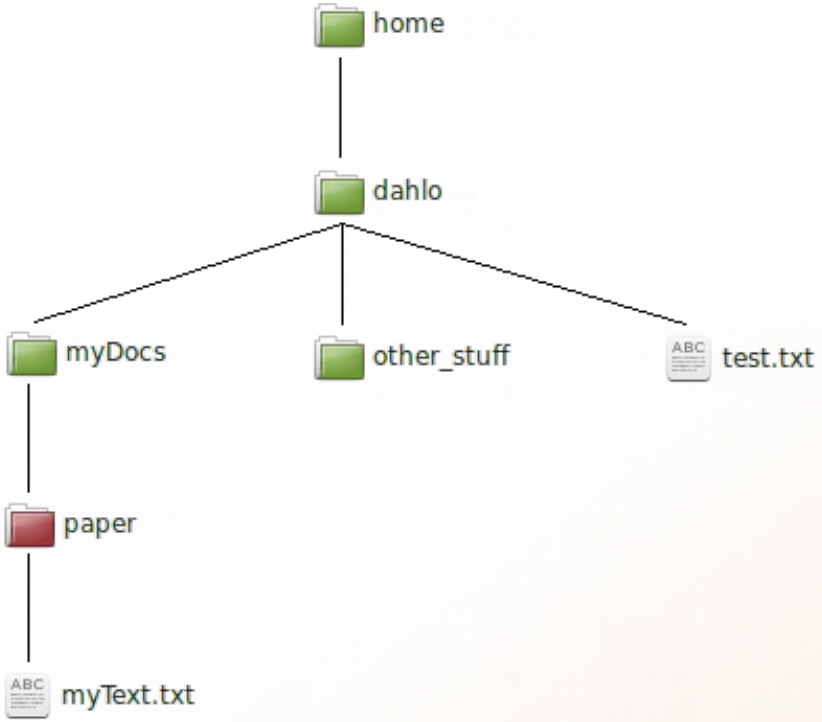


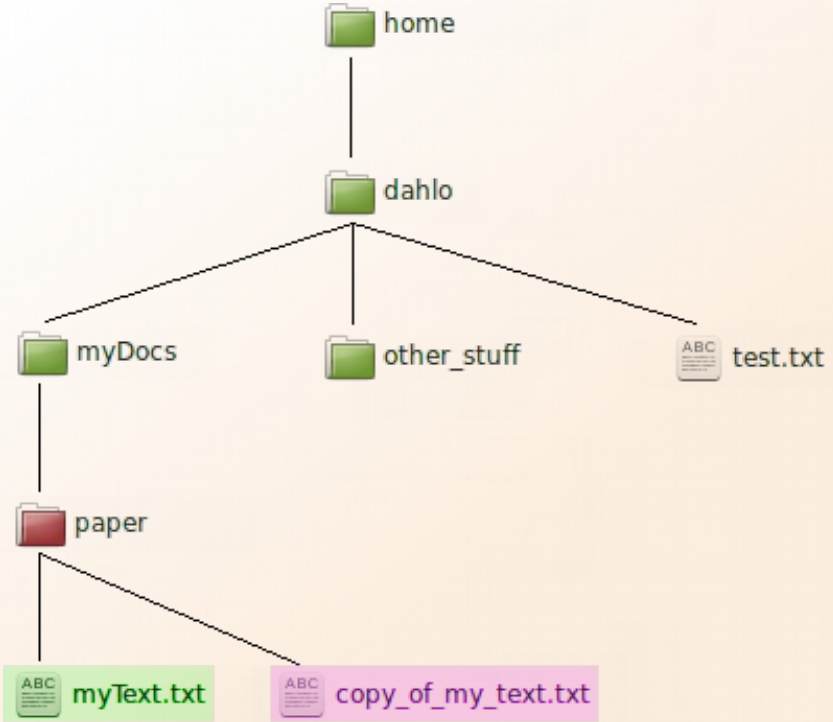
Interaction Commands

- Copy a file

  cp <name of original> <name of copy>

  cp myText.txt copy_of_my_text.txt



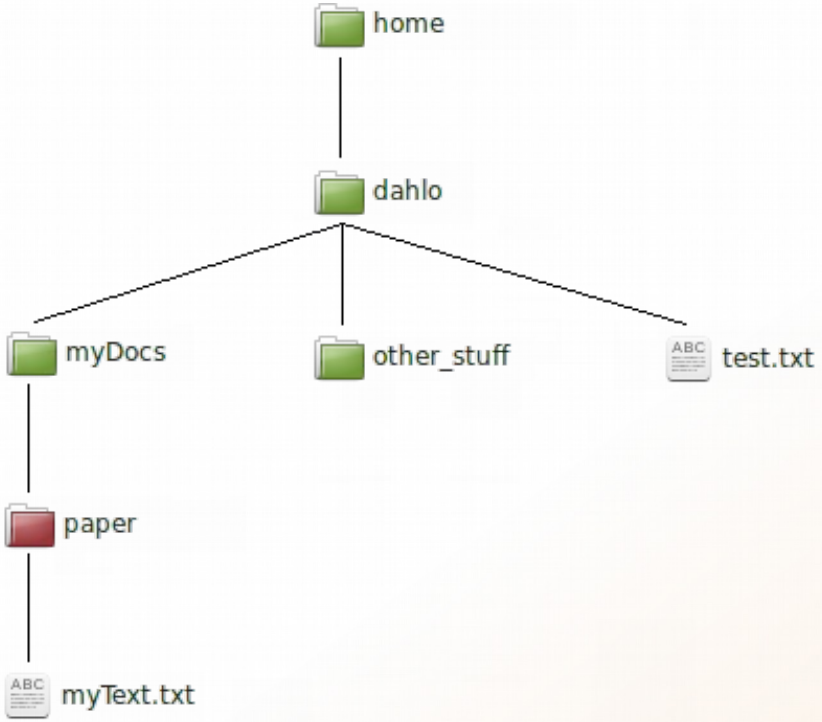


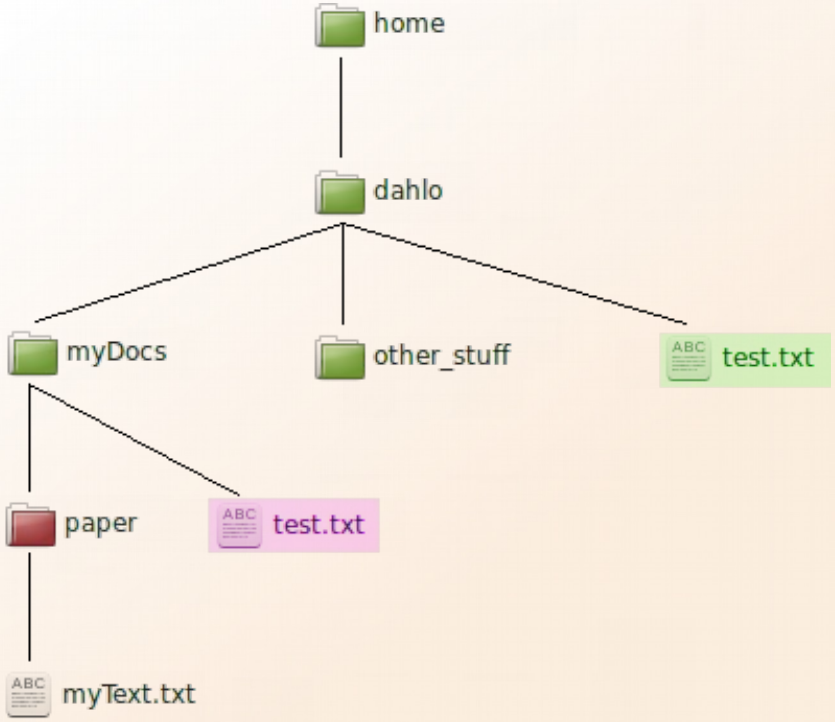
Interaction Commands

- Copy a file

  cp <name of original> <name of copy>

  cp /home/dahlo/test.txt ../../myDocs/



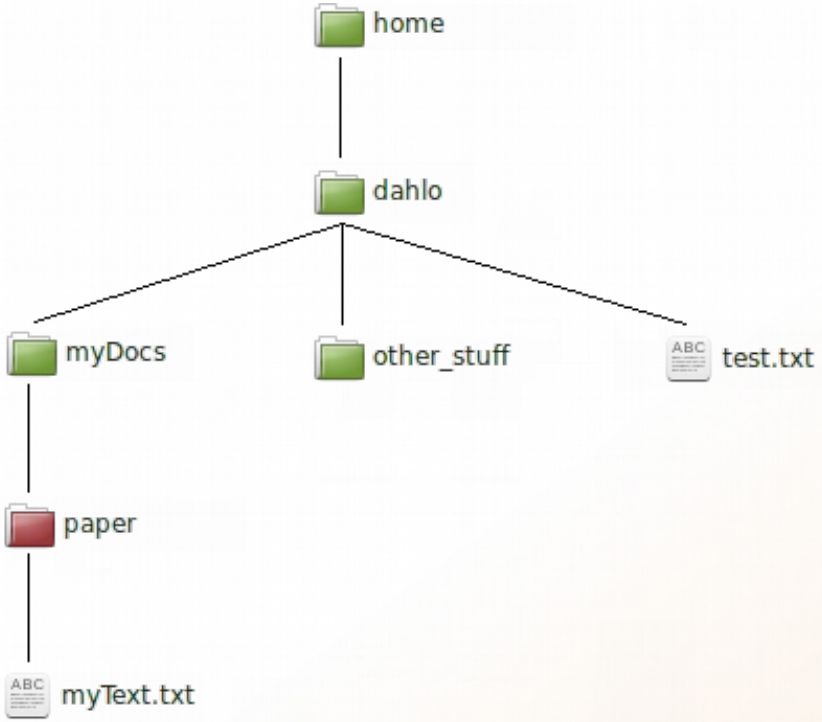


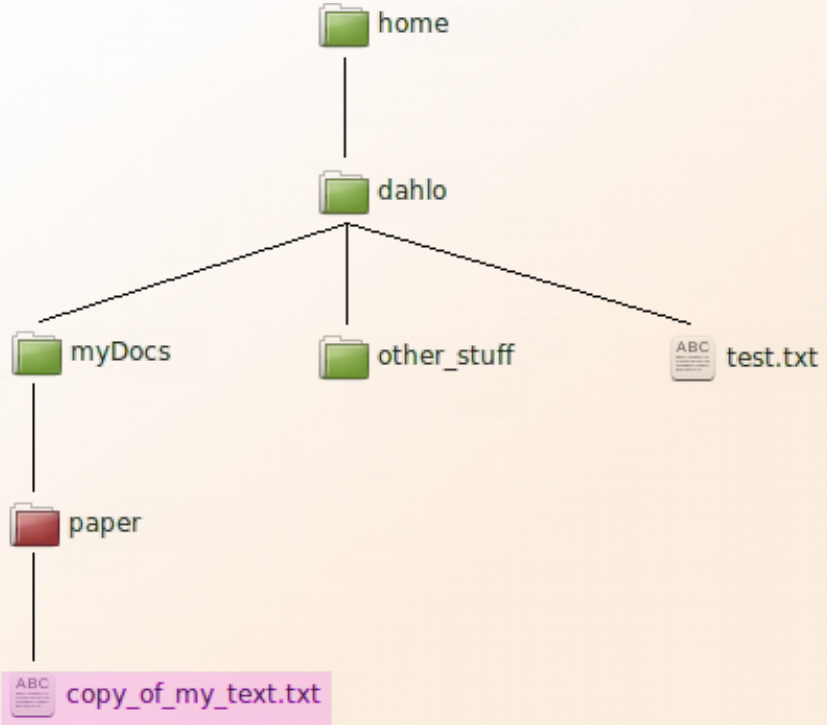
Interaction Commands

- Move a file

  mv <name of original> <name of copy>

  mv myText.txt copy_of_my_text.txt



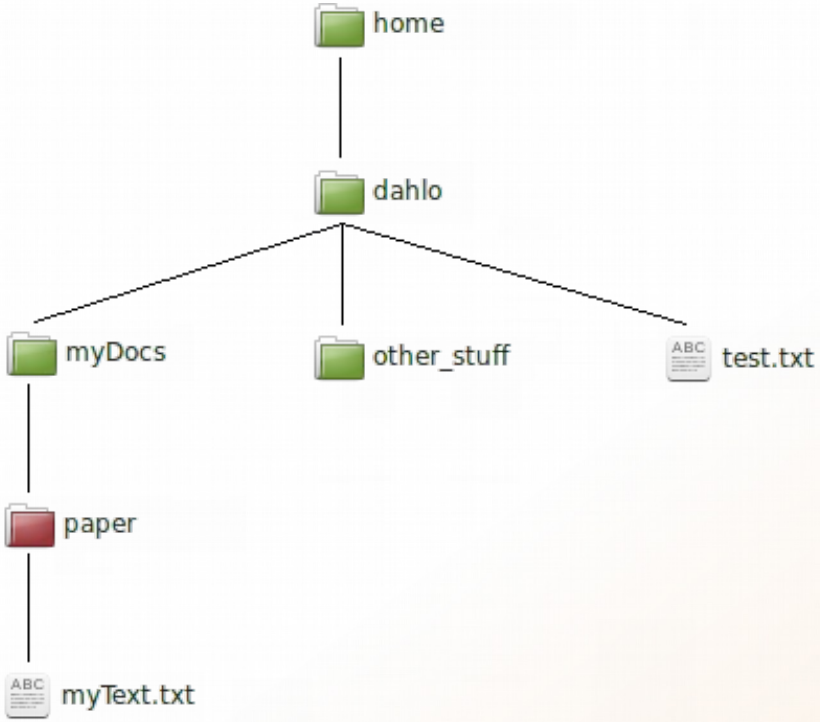


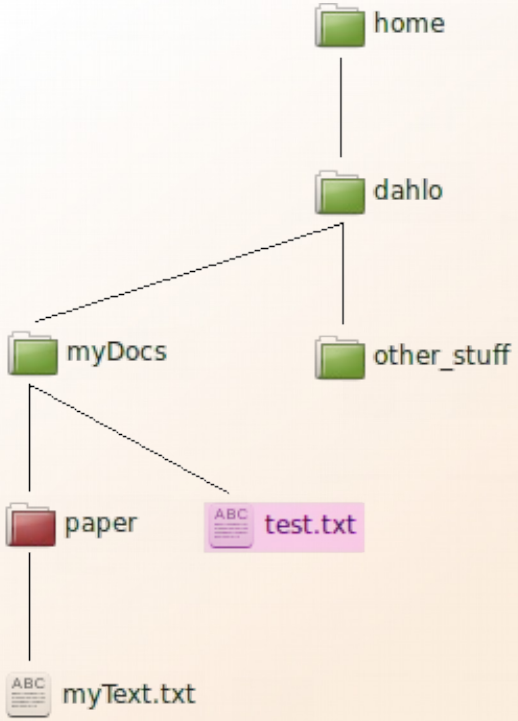
Interaction Commands

- Move a file

  mv <name of original> <name of copy>

  mv /home/dahlo/test.txt ../../myDocs/



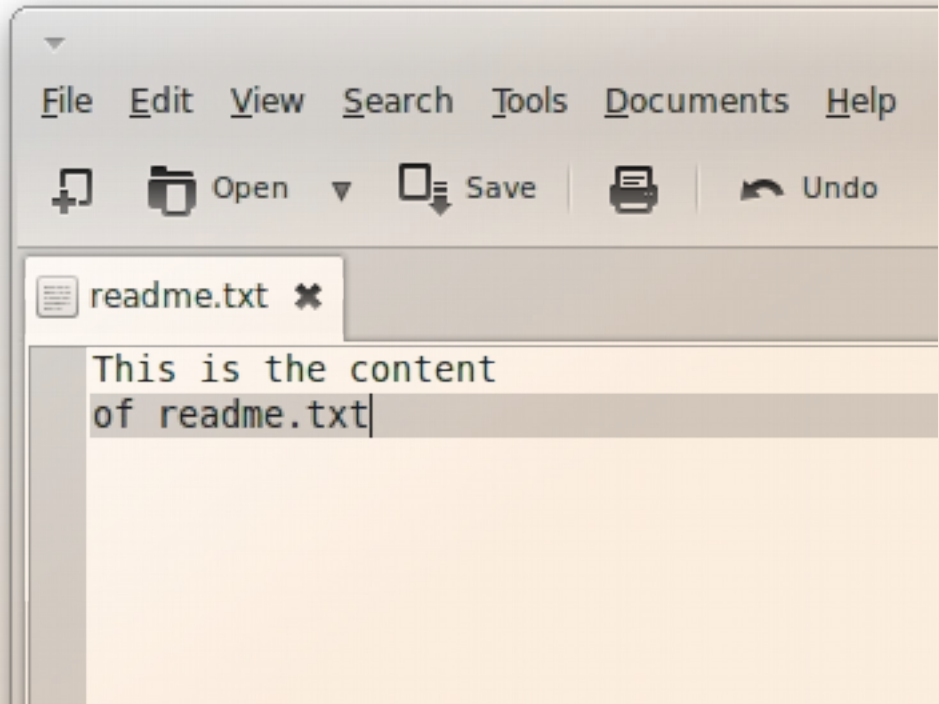


Interaction Commands

- View content of a file

  less <file name>

  less readme.txt



Interaction Commands

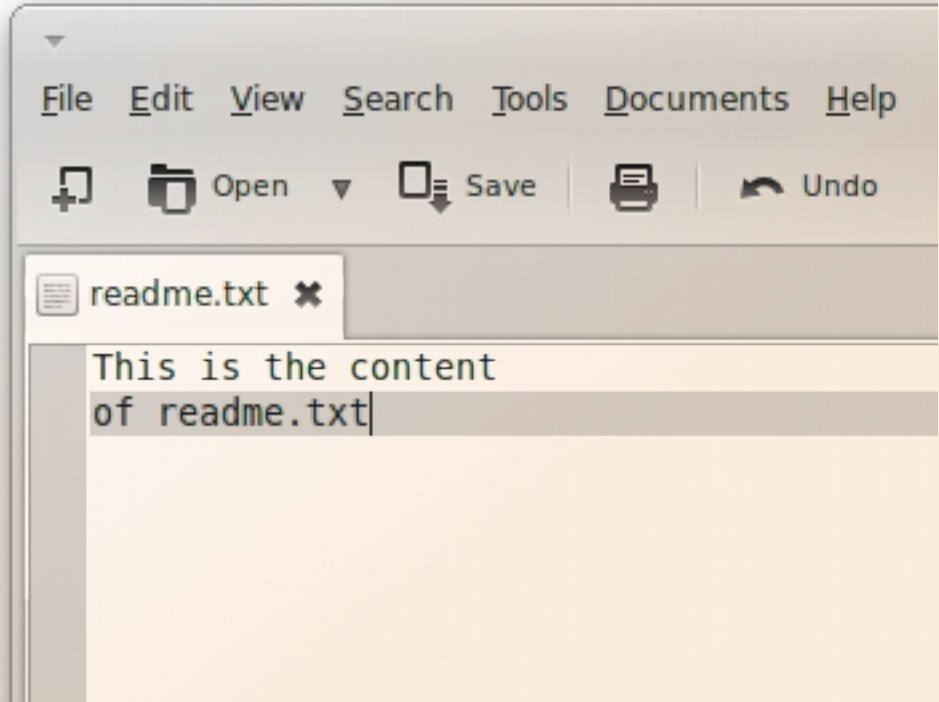
- View content of a file

  less <file name>

  less readme.txt

```
This is the content
of readme.txt

readme.txt (END)
```



Interaction Commands

- View content of a file

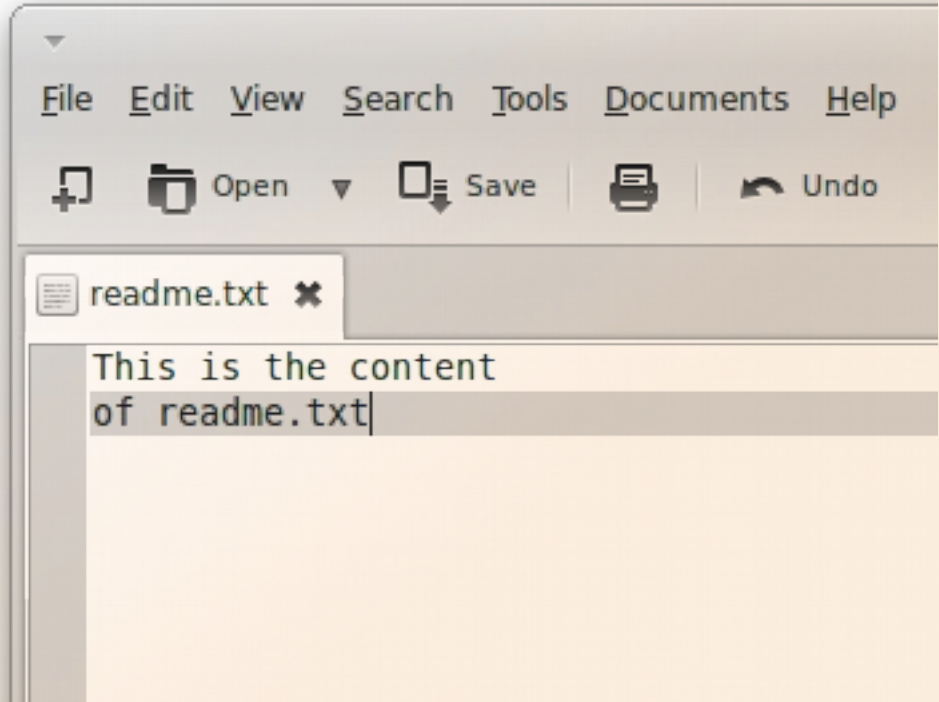
  less <file name>

  less readme.txt

```
This is the content
of readme.txt

readme.txt (END)
```

  (q to exit)



Head

- View the first rows of a file
  - head <filename>

```
[dahlo@dahlo dahlo]$
```

Head

- View the first rows of a file
  - head <filename>

```
[dahlo@dahlo dahlo]$ ls -l
total 57
drwxrwxrwx 1 root root  4096 2012-09-14 10:16 .
drwxrwxrwx 1 root root     0 2012-01-17 08:28 ..
drwxrwxrwx 1 root root     0 2012-01-28 21:41 glob
drwxrwxrwx 1 root root     0 2012-08-22 17:06 myDocs
drwxrwxrwx 1 root root     0 2012-01-29 01:10 other_stuff
-rwxrwxrwx 1 root root    36 2012-09-13 15:16 readme.txt
-rwxrwxrwx 1 root root 53027 2012-09-12 10:31 test.txt
[dahlo@dahlo dahlo]$
```

Head

- View the first rows of a file
  - head <filename>

```
[dahlo@dahlo dahlo]$ ls -l
total 57
drwxrwxrwx 1 root root  4096 2012-09-14 10:16 .
drwxrwxrwx 1 root root     0 2012-01-17 08:28 ..
drwxrwxrwx 1 root root     0 2012-01-28 21:41 glob
drwxrwxrwx 1 root root     0 2012-08-22 17:06 myDocs
drwxrwxrwx 1 root root     0 2012-01-29 01:10 other_stuff
-rwxrwxrwx 1 root root    36 2012-09-13 15:16 readme.txt
-rwxrwxrwx 1 root root 53027 2012-09-12 10:31 test.txt
[dahlo@dahlo dahlo]$
[dahlo@dahlo dahlo]$ head test.txt
```

Head

- View the first rows of a file
  - head <filename>

```
[dahlo@dahlo dahlo]$ ls -l
total 57
drwxrwxrwx 1 root root  4096 2012-09-14 10:16 .
drwxrwxrwx 1 root root     0 2012-01-17 08:28 ..
drwxrwxrwx 1 root root     0 2012-01-28 21:41 glob
drwxrwxrwx 1 root root     0 2012-08-22 17:06 myDocs
drwxrwxrwx 1 root root     0 2012-01-29 01:10 other_stuff
-rwxrwxrwx 1 root root    36 2012-09-13 15:16 readme.txt
-rwxrwxrwx 1 root root 53027 2012-09-12 10:31 test.txt
[dahlo@dahlo dahlo]$
[dahlo@dahlo dahlo]$ head test.txt
This file contains any messages produced by compilers while
running configure, to aid debugging if configure makes a mistake.

It was created by PSNC DRMAA for SLURM configure 1.0.5, which was
generated by GNU Autoconf 2.67.  Invocation command line was

  $ ./configure --with-slurm-inc=/usr/include/slurm --with-slurm-lib=/usr/lib64/slurm --prefix=/bubo/sw/apps/build/slurm
-drmaa/1.0.5

## --------- ##
## Platform. ##
[dahlo@dahlo dahlo]$
```

Head

- View the first n rows of a file
  - head -n <nr of lines> <filename>

```
[dahlo@dahlo dahlo]$ ls -l
total 57
drwxrwxrwx 1 root root  4096 2012-09-14 10:16 .
drwxrwxrwx 1 root root     0 2012-01-17 08:28 ..
drwxrwxrwx 1 root root     0 2012-01-28 21:41 glob
drwxrwxrwx 1 root root     0 2012-08-22 17:06 myDocs
drwxrwxrwx 1 root root     0 2012-01-29 01:10 other_stuff
-rwxrwxrwx 1 root root    36 2012-09-13 15:16 readme.txt
-rwxrwxrwx 1 root root 53027 2012-09-12 10:31 test.txt
[dahlo@dahlo dahlo]$
[dahlo@dahlo dahlo]$ head -n 3 test.txt
This file contains any messages produced by compilers while
running configure, to aid debugging if configure makes a mistake.

[dahlo@dahlo dahlo]$
```

Tail

- View the last rows of a file
  - tail <filename>

```
[dahlo@dahlo dahlo]$ ls -l
total 57
drwxrwxrwx 1 root root  4096 2012-09-14 10:16 .
drwxrwxrwx 1 root root     0 2012-01-17 08:28 ..
drwxrwxrwx 1 root root     0 2012-01-28 21:41 glob
drwxrwxrwx 1 root root     0 2012-08-22 17:06 myDocs
drwxrwxrwx 1 root root     0 2012-01-29 01:10 other_stuff
-rwxrwxrwx 1 root root    36 2012-09-13 15:16 readme.txt
-rwxrwxrwx 1 root root 53027 2012-09-12 10:31 test.txt
[dahlo@dahlo dahlo]$
[dahlo@dahlo dahlo]$ tail test.txt
#define HAVE_STRCASECMP 1
#define HAVE_STRCHR 1
#define HAVE_STRDUP 1
#define HAVE_STRERROR 1
#define HAVE_STRNDUP 1
#define HAVE_STRSTR 1
#define HAVE_STRTOL 1
#define HAVE_VASPRINTF 1

configure: exit 0
[dahlo@dahlo dahlo]$
```

Tail

- View the last n rows of a file
  - tail -n <nr of lines> <filename>

```
[dahlo@dahlo dahlo]$ ls -l
total 57
drwxrwxrwx 1 root root  4096 2012-09-14 10:16 .
drwxrwxrwx 1 root root     0 2012-01-17 08:28 ..
drwxrwxrwx 1 root root     0 2012-01-28 21:41 glob
drwxrwxrwx 1 root root     0 2012-08-22 17:06 myDocs
drwxrwxrwx 1 root root     0 2012-01-29 01:10 other_stuff
-rwxrwxrwx 1 root root    36 2012-09-13 15:16 readme.txt
-rwxrwxrwx 1 root root 53027 2012-09-12 10:31 test.txt
[dahlo@dahlo dahlo]$
[dahlo@dahlo dahlo]$ tail -n 3 test.txt
#define HAVE_VASPRINTF 1

configure: exit 0
[dahlo@dahlo dahlo]$
```

Interaction Commands

- Edit content of a file

  nano <file name>

  nano readme.txt

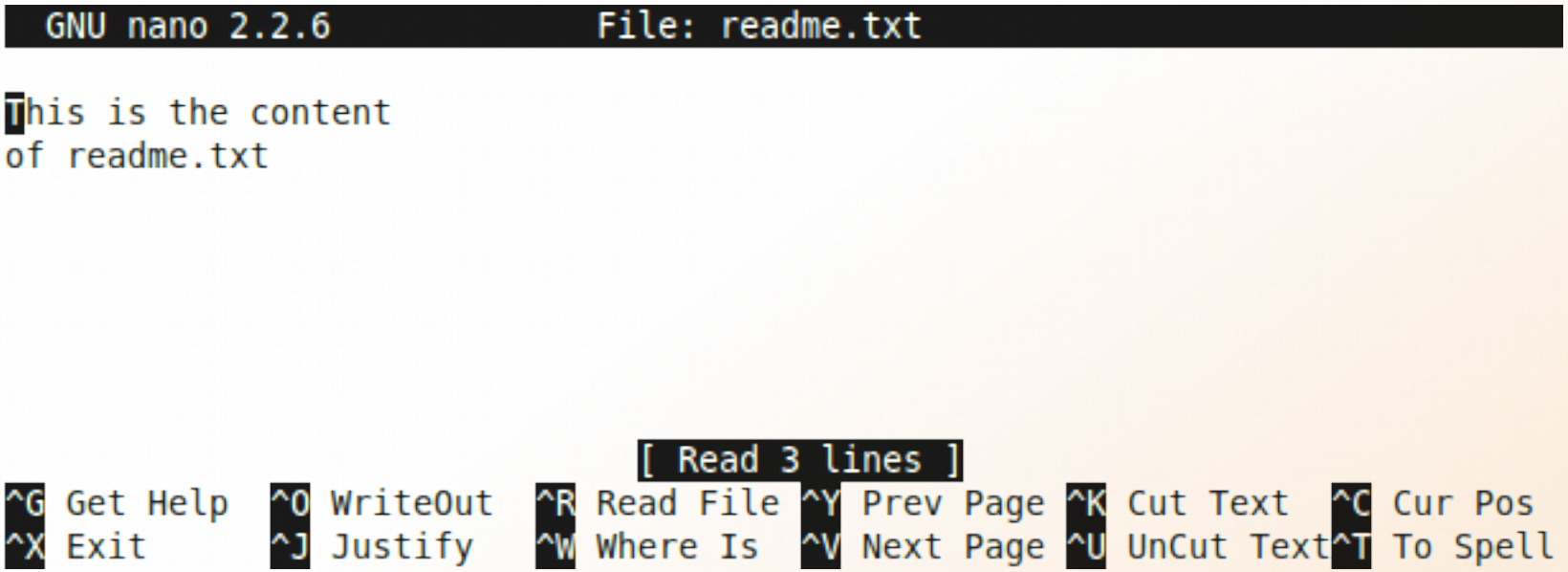
Interaction Commands

- Edit content of a file

  nano <file name>

  nano readme.txt

^ = ctrl



Interaction Commands

- Remove a file

  rm <file name>

  Ex.

  rm readme.txt

  rm ../../../file1.txt

  rm /home/dahlo/test.txt

  - There is no trash bin in Linux! Gone is gone..

Wildcards

- *
- Works with most Linux commands

```
[dahlo@dahlo dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root     0 2012-01-17 08:28 directory1
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo dir]$
```

Wildcards

- *
- Works with most Linux commands

```
[dahlo@dahlo dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root     0 2012-01-17 08:28 directory1
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo dir]$
[dahlo@dahlo dir]$ ls -l *.txt
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
[dahlo@dahlo dir]$
```

Wildcards

- *
- Works with most Linux commands

```
[dahlo@dahlo dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root     0 2012-01-17 08:28 directory1
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo dir]$
[dahlo@dahlo dir]$ ls -l *.txt
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
[dahlo@dahlo dir]$
[dahlo@dahlo dir]$ ls -l file*
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
[dahlo@dahlo dir]$
```

Wildcards

- *
- Works with most Linux commands
- Ex: cp *.txt directory1/

```
[dahlo@dahlo dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root     0 2012-01-17 08:28 directory1
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo dir]$
[dahlo@dahlo dir]$ ls -l *.txt
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
[dahlo@dahlo dir]$
[dahlo@dahlo dir]$ ls -l file*
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
[dahlo@dahlo dir]$
```

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Wildcards

- *
- Works with most Linux commands
- Ex: rm *.tmp

```
[dahlo@dahlo dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root     0 2012-01-17 08:28 directory1
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo dir]$
[dahlo@dahlo dir]$ ls -l *.txt
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
[dahlo@dahlo dir]$
[dahlo@dahlo dir]$ ls -l file*
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
[dahlo@dahlo dir]$
```

TAB COMPLETION

Never write a path or filename without it!

Good to Know Commands

TAB COMPLETION

Never write a path or filename without it!

```
[dahlo@dahlo-linux dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root     0 2012-01-17 08:28 directory1
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo-linux dir]$ nano fi
```

Good to Know Commands

TAB COMPLETION

Never write a path or filename without it!

```
[dahlo@dahlo-linux dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root     0 2012-01-17 08:28 directory1
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo-linux dir]$ nano file
```

Good to Know Commands

TAB COMPLETION

Never write a path or filename without it!

```
[dahlo@dahlo-linux dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root     0 2012-01-17 08:28 directory1
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rwxrwxrwx 1 root root  2273 2012-01-05 13:44 file2.old
drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo-linux dir]$ nano file
file1.txt  file2.old
[dahlo@dahlo-linux dir]$ nano file
```

Good to Know Commands

TAB COMPLETION

Never write a path or filename without it!

```
[dahlo@dahlo-linux dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
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drwxrwxrwx 1 root root     0 2012-01-17 08:28 secondDirectory
[dahlo@dahlo-linux dir]$ nano file
file1.txt  file2.old
[dahlo@dahlo-linux dir]$ nano file1.txt
```

Good to Know Commands

- How much is the computer working?

  top

```
top - 21:27:48 up 37 days,  7:34,  2 users,  load average: 6.38, 6.09, 6.03
Tasks: 278 total,   4 running, 274 sleeping,   0 stopped,   0 zombie
Cpu(s): 73.5%us,  1.5%sy,  0.0%ni, 24.3%id,  0.6%wa,  0.0%hi,  0.0%si,  0.0%st
Mem:  24598372k total, 17703556k used,  6894816k free,    83596k buffers
Swap: 25165816k total,    29704k used, 25136112k free, 15403636k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
 5751 zhibing   20   0 1531m  45m 9492 S 100.0  0.2 679:58.20 invaperco
 5755 zhibing   20   0 1531m  43m 9492 S 100.0  0.2 679:49.38 invaperco
 5759 zhibing   20   0 1531m  43m 9480 S 100.0  0.2 679:56.71 invaperco
 5779 zhibing   20   0 1531m  44m 9492 S 100.0  0.2 679:21.84 invaperco
 6212 nicusor   20   0  451m 377m 3356 R 100.0  1.6 668:47.67 cretin
28221 roca      20   0 3114m  88m 4188 R 99.7  0.4   8:26.15 seward.exe
16870 root      20   0     0    0    0 S  0.7  0.0   0:13.69 flush-8:0
 1781 root      39  19     0    0    0 S  0.3  0.0  17:26.31 kipmi0
 1903 root      20   0     0    0    0 S  0.3  0.0   1:24.46 kpanfs_dispatch
28483 dahlo     20   0 13384 1292  884 R  0.3  0.0   0:00.03 top
    1 root      20   0 21416  652  448 S  0.0  0.0   0:01.70 init
    2 root      20   0     0    0    0 S  0.0  0.0   0:00.03 kthreadd
    3 root      RT   0     0    0    0 S  0.0  0.0   0:00.14 migration/0
    4 root      20   0     0    0    0 S  0.0  0.0   0:01.40 ksoftirqd/0
    5 root      RT   0     0    0    0 S  0.0  0.0   0:00.00 migration/0
```

Good to Know Commands

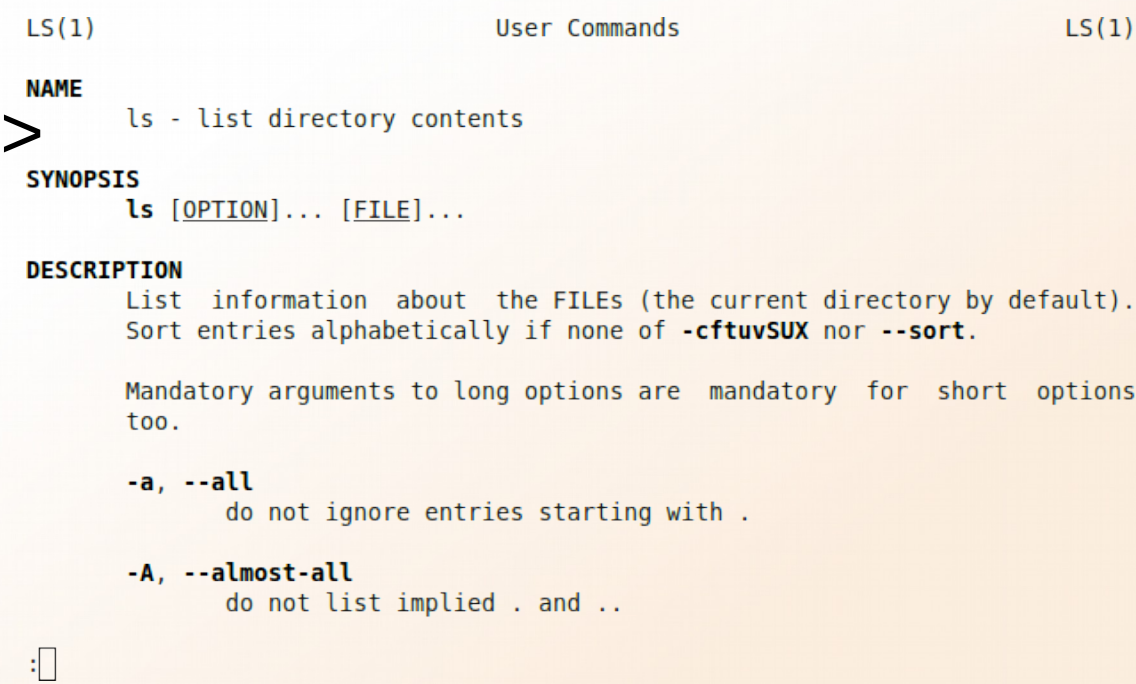
- Instructions how to use programs
  - Easy to forget syntax
  - Manual pages

man <program name>

Ex.

man ls

(q to quit)



```
LS(1)                          User Commands                          LS(1)

NAME
       ls - list directory contents

SYNOPSIS
       ls [OPTION]... [FILE]...

DESCRIPTION
       List  information  about  the FILEs (the current directory by default).
       Sort entries alphabetically if none of -cftuvSUX nor --sort.

       Mandatory arguments to long options are  mandatory  for  short  options
       too.

       -a, --all
              do not ignore entries starting with .

       -A, --almost-all
              do not list implied . and ..

:
```

Good to Know Commands

- How do I log out?
  - exit

- Exits only the current terminal

Good to Know Commands

- Summary
  - cp – copy a file
  - mv – move a file
  - less – view a file
  - nano – view and edit a file
  - rm – remove a file
  - head / tail
  - wildcards
  - tab completion – use it
  - top – see active processes
  - man – manual pages
  - exit – Log out curren terminal

Connect to UPPMAX

- Secure SHell connection (ssh)

- ssh -X <username>@milou.uppmax.uu.se
  - Ex: ssh -X dahlo@milou.uppmax.uu.se
- Terminal in Linux and OSX
- MobaXterm in Windows (http://mobaxterm.mobatek.net/)
  - Putty also alternative, but not as good..

Reservations

- Special for this course
- salloc -A g2015045 -t 07:00:00 -p core -n 1 --no-shell --reservation=g2015045_20151116 &
  - --reservation will be proj id and date
  - Will start a node which you have access to
    - Check which node with *squeue -u username*
    - ssh to given node, from within UPPMAX

```
[dahlo@kalkyl1 work]$ salloc -A g2012205 -t 08:00:00 -p node --no-shell --reservation=sunday
salloc: Granted job allocation 1745256
[dahlo@kalkyl1 work]$ squeue -u dahlo
  JOBID PARTITION     NAME     USER  ST       TIME  NODES NODELIST(REASON)
1745256     devel   (null)    dahlo   R       0:13      1 q36
[dahlo@kalkyl1 work]$
[dahlo@kalkyl1 work]$ ssh -X q36
```

- Laboratory time!