Linux Introduction

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Slides courtesy of: Martin Dahlö
Linux Introduction

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

Practice makes perfect :)
The goal for you in this lecture is to:

1. See the basic Linux commands
2. Glimpse the underlying logic
3. Learn the Most Important Habit
UPPMAX

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

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- Uses Linux
Why Text?

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

- Scary at first, but wonderful to work with
  - Automation and scripts
  - Supercomputing not possible without it
Navigating the file system
Navigating the file system

- `ls` – list the content of a directory
Navigating the file system

- `ls` – list the content of a directory

[dahlo@kalkyl4 dir]$
Navigating the file system

- `ls` – list the content of a directory

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

- **ls** – list the content of a directory

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

- `cd` – change working directory
  - `cd <directory name>` = down
  - `cd ..` = up
Navigating the file system

- `cd` – change working directory
  - `cd <directory name>` = down
  - `cd ..` = up
Navigating the file system

- `cd` – change working directory
  - `cd <directory name>` = down
  - `cd ..` = up
Navigating the file system

- cd – change working directory
  - cd <directory name> = down
  - cd .. = up
  - cd - = back
Navigating the file system

- `pwd` – print working directory

```
[dahlo@kalkyl4 dir]$ pwd
/home/dahlo/glob/work/testarea/temp/dir
```
Navigating the file system

- `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
```
Navigating the file system

- Summary
  - `ls` – list content of directory
  - `cd` – change working directory
  - `pwd` – print working directory
Interacting with files

- Copy a file

  `cp <name of original> <name of copy>`
Interacting with files

• Copy a file

```
cp  myText.txt  copy_of_my_text.txt
```
Interacting with files

- Copy a file

```bash
cp /home/dahlo/test.txt ../../myDocs/
```
Interacting with files

• Move a file
  
  mv <name of original> <name of destination>
  mv myText.txt copy_of_my_text.txt
Interacting with files

● Move a file

\texttt{mv \ <name of original> \ <name of copy>}
\texttt{mv \ /home/dahlo/test.txt \ ../../myDocs/}
Interacting with files

- View content of a file
  less <file name>
  less readme.txt
Interacting with files

- View content of a file
  
  less `<file name>`

  less readme.txt
Interacting with files

- View content of a file
  
  less <file name>
  
  less readme.txt

This is the content of readme.txt

readme.txt (END)

(q to exit)
Interacting with files

• Using `less`
  - Search with `mysearchterm`
  - 'n' scan forward through hits
  - 'N' scan backwards through hits
  - 'q' to quit
Interacting with files

- View the first rows of a file
  - `head <filename>`
Interacting with files

• View the first rows of a file
  • `head <filename>`
Interacting with files

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

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

- 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 glok
drwxrwxrwx 1 root root  0 2012-08-22 17:06 myDoc
-rw-rwxrwx 1 root root  36 2012-09-13 15:16 other_stuff
-rwxrwxrwx 1 root root 53027 2012-09-12 10:31 readme.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

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

```bash
## ------ ##
## Platform. ##
[dahlo@dahlo dahlo]$
```
Interacting with files

- 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 ...
glob
myDocs
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]$```
Interacting with files

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

```bash
[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
-drwxrwxrwx 1 root root 0 2012-08-22 17:06
-drwxrwxrwx 1 root root 0 2012-01-29 01:10
-rw-rwxrwx 1 root root 36 2012-09-13 15:16
-rw-rwxrwx 1 root root 53027 2012-09-12 10:31
[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_STRING 1
#define HAVE_VASPRINTF 1

configure: exit 0
[dahlo@dahlo dahlo]$
```
Interacting with files

● 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 myDoc
-drwxrwxrwx 1 root root  0 2012-01-29 01:10 other_stuff
-drwxrwxrwx 1 root root  36 2012-09-13 15:16 readme.txt
-rw-rw-rw- 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]$
```
Interacting with files

- Edit content of a file
  
nano <file name>

  nano readme.txt
Interacting with files

- Other editors
  - gedit or nedit
    - Work like ”wordpad”
    - Require login with ”ssh -X”
    - Invoke with ”gedit &”
  - vim
    - A little different
    - Need a command reference to learn/use it
    - Very quick and friendly
  - emacs
    - A more powerful ”nano”
Interacting with files

- Remove a file
  
  \texttt{rm <file name>}
  
  Ex.
  
  \texttt{rm readme.txt}
  \texttt{rm ../../../file1.txt}
  \texttt{rm /home/dahlo/test.txt}

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

- *
- Works with most Linux commands
Wildcards

- *
- Works with most Linux commands
Wildcards

- *
- Works with most Linux commands

[dahlo@dahlo dir]$ ls -l
total 68
-rw-rw-rw- 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root 0 2012-01-17 08:28 Directory1
-rw-rw-rw- 1 root root 36458 2012-01-05 13:44 file1.txt
-rw-rw-rw- 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]$ ls -l *.txt
-rw-rw-rw- 1 root root 36458 2012-01-05 13:44 file1.txt

[dahlo@dahlo dir]$ ls -l file*
-rw-rw-rw- 1 root root 36458 2012-01-05 13:44 file1.txt
-rw-rw-rw- 1 root root 2273 2012-01-05 13:44 file2.old
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]$ ls -l *.txt
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
[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: `rm *.tmp`

```bash
[dahlo@dahlo dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
-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]$ ls -l *.txt
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
[dahlo@dahlo dir]$ ls -l file*
-rwxrwxrwx 1 root root 36458 2012-01-05 13:44 file1.txt
```
Useful Commands

TAB

COMPLETION

Never write a path or filename without it!
Useful 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
```
Useful Commands

TAB COMPLETION

Never write a path or filename without it!
Useful 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
```
Useful Commands

TAB COMPLETION

*Never* write a path or filename without it!
Useful 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
```
Useful Commands

- It's easy to forget syntax
  - Manual pages

```
man <program name>
```

Ex:
```
man ls
```

(q to quit)
Useful Commands

- Using **man** is a lot like **less**
- Search using **/mysearchterm**
  - 'n' to scan forward through hits
  - 'N' to scan back
  - 'q' to quit
Useful Commands

- How do I stop something that I regret starting?
  - Ctrl-C sends a signal that interrupts the current process
  - `top` has a 'k'ill command. Type 'k' and then the PID of the process you want
  - Logging out of the terminal kills all processes spawned from that terminal
Useful Commands

- How do I log out?
  - exit

- Exits only the current terminal
Useful Commands

• Summary
  • cp – copy a file
  • mv – move a file
  • less – view a file
  • Nano/gedit/vim/emacs – 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 current terminal
Connect to UPPMAX

- Secure SHell connection (ssh)
  - `ssh -X <username>@tintin.uppmax.uu.se`
    - Ex: `ssh -X dahlo@tintin.uppmax.uu.se`
- Terminal in Linux and OSX
  - Putty also alternative, but not as good..
Customising your startup

- Every time you log in, the file `~/.bashrc` is executed.
- The `.` in front of the name makes it hidden.
- You can put handy stuff there, e.g.:
  - `alias ll="ls -l"`
  - Load your standard modules
  - Start with a clean slate: `rm -r *`
  - (The above is a joke!!!)
• Laboratory time!
  - Instructions on course webpage
  - Have some fika and do chapter 1
  - If you have time, do chapter 2
  - Then have some lunch

• Tip for the lab: don't copy-and-paste from the PDF file. Write out each command (with tab completion) instead.