Linux Introduction

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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
  • Bianca
  • Rackham

• 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
The Bash Prompt

[username@computer directory]$ 

[marcus1@rackham1 ~]$ 

- Bash reads commands entered into the prompt and executes them.
- The first word is always a program to run. The following words are input given to the program.
- Words are separated by spaces.
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
```

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Type</th>
<th>Date Modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>dir</td>
<td></td>
<td>folder</td>
<td>2012-01-05 13:44:47</td>
</tr>
<tr>
<td>directory1</td>
<td></td>
<td>folder</td>
<td>2012-01-05 13:45:43</td>
</tr>
<tr>
<td>secondDirectory</td>
<td></td>
<td>folder</td>
<td>2012-01-05 13:46:21</td>
</tr>
<tr>
<td>anotherFile.doc</td>
<td>27.6 KB</td>
<td>Word document</td>
<td>2012-01-05 13:44:47</td>
</tr>
<tr>
<td>file1.txt</td>
<td>35.6 KB</td>
<td>plain text document</td>
<td>2012-01-05 13:44:15</td>
</tr>
<tr>
<td>file2.old</td>
<td>2.2 KB</td>
<td>backup file</td>
<td>2012-01-05 13:44:33</td>
</tr>
</tbody>
</table>
Navigating the file system

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

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

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<th>Date Modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>dir</td>
<td></td>
<td>-- folder</td>
<td>2012-01-05 13:44:47</td>
</tr>
<tr>
<td>directory1</td>
<td></td>
<td>-- folder</td>
<td>2012-01-05 13:45:43</td>
</tr>
<tr>
<td>secondDirectory</td>
<td></td>
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<td>backup file</td>
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</table>
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

```bash
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

```bash
mv <name of original> <name of destination>
mv myText.txt copy_of_my_text.txt
```
Interacting with files

• Move a file

```bash
mv <name of original> <name of copy>
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

This is the content of readme.txt
readme.txt (END)
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>

```
[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
drwxrwxrwx 1 root root 53027 2012-09-12 10:31 test.txt
[dahlo@dahlo dahlo]$ 
```
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 ...
-rwxrwxrwx 1 root root  0 2012-01-17 08:28 ...
-rwxrwxrwx 1 root root  0 2012-01-28 21:41 gitlog
-rwxrwxrwx 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
```
Interacting with files

- View the first rows of a file
  - `head <filename>`
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 ...
-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 ...
-rwxrwxrwx 1 root root  36 2012-09-13 15:16 ...
-rwxrwxrwx 1 root root 53027 2012-09-12 10:31 ...
[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>`
Interacting with files

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

```bash
[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: `cp *.txt directory1/`

```
[dahlo@dahlo dir]$ ls -l
total 68
-rwxrwxrwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
-rwxrwxrwx 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
```
Wildcards

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

```bash
[dahlo@dahlo dir]$ ls -l
total 68
-rw-rw-rwx 1 root root 28214 2012-01-05 13:44 anotherFile.doc
drwxrwxrwx 1 root root 0 2012-01-17 08:28 Directory1
-rw-rw-rwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rw-rw-rwx 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
-rw-rw-rwx 1 root root 36458 2012-01-05 13:44 file1.txt
[dahlo@dahlo dir]$
[dahlo@dahlo dir]$ ls -l file*
-rw-rw-rwx 1 root root 36458 2012-01-05 13:44 file1.txt
-rw-rw-rwx 1 root root 2273 2012-01-05 13:44 file2.old
[dahlo@dahlo dir]$ 
```
Useful Commands

**TAB COMPLETION**

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

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**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**

```bash
man <program name>
```

Ex:
```bash
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@rackham.uppmax.uu.se`
    - Ex: `ssh -X dahlo@rackham.uppmax.uu.se`

- Terminal in Linux and Mac
  - for some graphics on Mac, install Xquartz. Go to www.xquartz.org

- MobaXterm in Windows (http://mobaxterm.mobatek.net/)
  - 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.