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.

$ touch /proj/g2019010/completed/xxx
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

```
[marcusl@rackham1 dir]$ ls
```

<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>
</tbody>
</table>
Navigating the file system

- `ls` – list the content of a directory

[marcusl@rackham1 dir]$ ls
anotherFile.doc directory1 file1.txt file2.old secondDirectory
Navigating the file system

- `ls` – list the content of a directory

```
[marcusl@rackham1 dir]$ ls -l
总 192
-rw-r--r-- 1 marcusl uppmax 28214 Jan 5 13:44 anotherFile.doc
drwxr-xr-x 2 marcusl uppmax  4096 Jan 5 13:45 directory1
-rw-r--r-- 1 marcusl uppmax 36458 Jan 5 13:44 file1.txt
-rw-r--r-- 1 marcusl uppmax  2273 Jan 5 13:44 file2.old
drwxr-xr-x 2 marcusl uppmax  4096 Jan 5 13:45 secondDirectory
[marcusl@rackham1 dir]$
```
Navigating the file system

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

[marcusl@rackham1 dir]$ cd directory1
[marcusl@rackham1 directory1]$
Navigating the file system

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

```
[marcusl@rackham1 dir]$ cd directory1
[marcusl@rackham1 directory1]$ ls -l
-rw-r–r-- 1 marcusl uppmax 56427 Jan 5 13:45 notes
-rw-r–r-- 1 marcusl uppmax 56427 Jan 5 13:45 test.txt
```
Navigating the file system

- **cd** – change working directory
  - **cd** <path> = go there

```
[marcusl@rackham1 directory1]$ cd ../secondDirectory
[marcusl@rackham1 directory1]$ ls -l
```
```
total 252
-rw-r--r-- 1 marcusl uppmax 28214 Jan 5 13:45 bird.jpg
-rw-r--r-- 1 marcusl uppmax 112853 Jan 5 13:45 tree.jpg
```
Navigating the file system

• You can use paths anywhere you specify a file or directory

[marcusl@rackham1 secondDirectory]$ ls -1 ..directory1
  total 184
  -rw-r--r-- 1 marcusl uppmax  56427 Jan 5 13:45 notes
  -rw-r--r-- 1 marcusl uppmax  25301 Jan 5 13:45 test.txt
Navigating the file system

- `pwd` – print working directory

[marcusl@rackham1 dir]$ pwd
/home/marcusl/uppmaxintro/dir
Navigating the file system

- `pwd` – print working directory

```
[marcusl@rackham1 dir]$ pwd
/home/marcusl/uppmaxintro/dir
[marcusl@rackham1 dir]$ cd directory1/
[marcusl@rackham1 directory1]$ pwd
/home/marcusl/uppmaxintro/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 <original> <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 or rename a file

```
mv <original> <destination>
```

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

- Move a file

   mv <original> <destination>

   mv /home/dahlo/test.txt ../../myDocs/
Interacting with files

- Uploading/downloading a file to/from Rackham

`scp <original> <destination>`

**Upload:**
`scp myfile marcusl@rackham.uppmax.uu.se:~/`

**Download:**
`scp marcusl@rackham.uppmax.uu.se:~/myfile .`

Alternatively:
FileZilla, MobaXterm, sftp, any other program that works through SSH or SFTP protocol.
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>`

```
[marcusl@r1 test]$ head slurm-123.out
Starting test script
1%
2%
3%
4%
5%
6%
7%
8%
9%
[marcusl@r1 test]$
```
Interacting with files

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

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

```
[marcusl@r1 test]$$ head -n 3 slurm-123.out
Starting test script
1%
2%
[marcusl@r1 test]$$
```
Interacting with files

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

```
[marcusl@r1 test]$ tail slurm-123.out
91%
92%
93%
94%
95%
96%
97%
98%
99%
ERROR 42: something went wrong, process aborted
[marcusl@r1 test]$
```
Interacting with files

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

[marcusl@r1 test]$ tail -n 2 slurm-123.out
99%
ERROR 42: something went wrong, process aborted.
[marcusl@r1 test]$
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 X-forwarding ("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/marcusl/test.txt}

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

- *
  - Works with most Linux commands

```
[marcus1@rackham1 dir]$ ls
anotherFile.doc directory1 file1.txt file2.old secondDirectory
```
Wildcards

- *

- Works with most Linux commands

[marcusl@rackham1 dir]$ ls
anotherFile.doc directory1 file1.txt file2.old
secondDirectory

[marcusl@rackham1 dir]$ ls *.txt
[marcusl@rackham1 dir]$ ls *.txt
file1.txt
Wildcards

- *

- Works with most Linux commands

```
[marcusl@rackham1 dir]$ ls
anotherFile.doc directory1 file1.txt file2.old
secondDirectory
[marcusl@rackham1 dir]$
[marcusl@rackham1 dir]$ ls *.txt
file1.txt
[marcusl@rackham1 dir]$
[marcusl@rackham1 dir]$ ls *.*.txt
file1.txt
[marcusl@rackham1 dir]$
[marcusl@rackham1 dir]$ ls file*
file1.txt file2.old
```
Wildcards

- *
- Works with most Linux commands
- Examples:
  - `cp *.txt directory1/`
  - `rm *.tmp`
  - `eog *.png`
Useful Commands

- How much is the computer working?

```
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

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

- Exits only the current terminal
Useful Commands

• Summary
  • `cp` – copy a file
  • `mv` – move or rename a file
  • `less` – view a file
  • `Nano/gedit/vim/emacs` – view and edit a file
  • `rm` – remove a file
  • `head` / `tail`
  • `Wildcard` *
  • `Tab completion` – use it
  • `top` – see active processes
  • `man` – manual pages
  • `exit` – Log out current terminal
Useful Commands

TAB COMPLETION

Never write a path or filename without it!
Useful Commands

TAB COMPLETION

Never write a path or filename without it!

[marcusl@rackham1 dir]$ ls
anotherFile.doc directory1 file1.txt file2.old
secondDirectory

[marcusl@rackham1 dir]$ less fi
Useful Commands

**TAB COMPLETION**

*Never* write a path or filename without it!

```
[marcusl@rackham1 dir]$ ls
anotherFile.doc directory1 file1.txt file2.old secondDirectory
[marcusl@rackham1 dir]$ less file
file1.txt file2.old
[marcusl@rackham1 dir]$ less file
```
Useful Commands

TAB COMPLETION

Never write a path or filename without it!

[marcusl@rackham1 dir]$ ls
anotherFile.doc directory1 file1.txt file2.old secondDirectory

[marcusl@rackham1 dir]$ less file
file1.txt file2.old

[marcusl@rackham1 dir]$ less file1
Useful Commands

TAB COMPLETION

Never write a path or filename without it!

[marcusl@rackham1 dir]$ ls
anotherFile.doc directory1 file1.txt file2.old
secondDirectory
[marcusl@rackham1 dir]$ less file
file1.txt file2.old
[marcusl@rackham1 dir]$ less file1.txt
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 (X11) 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.