GNU/Linux 101
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Research Computing Center
Fall Workshop Series 2016
rccworkshop / linuxrocks!
bash-2.1~# man workshop

Linux101    RCC Workshop    L101

OBJECTIVES

- Operating system concepts
- Linux concepts
- Linux CLI
- Basic systems administration
- HPC, Spear, other RCC resources
bash-2.1~# whoami

# cat ~/casey.yml

name: Casey McLaughlin

- 12+ years at FSU
- Support, SysAdmin, Web Dev
- 11 years using Linux
Basic Commands

$ whoami
$ hostname
$ date
$ cal
$ df
$ free
$ exit
Anatomy of a Command

```
# ls -l -a /home/bob
```

- **Executable**: `ls`
- **Options**: `-l`, `-a`
- **Arguments**: `/home/bob`
Example Arguments

$ cal -j
$ date -R
$ df -h
$ df -h --total
$ ls -1 /etc
$ ls -1A /etc
Getting Help With Commands

$ whatis
$ man
$ info
$ type
$ which
Command Tidbits

Up Arrow

TAB

$ history

$ history | grep [command]

$ !!

$ !number

$ !?string

CTRL+R
What is a Shell?
Linux is Multi-User!

[CTRL+ALT+F2] ← Escape the GUI

F1 - F6 are TTYs

[CTRL+ALT+F1] ← Return to the GUI
Connecting Remotely

128.186.1.32 144.174.80.67

$ ssh [USER]@hpc-login.rcc.fsu.edu
PW: linuxRocks#1
Connecting Remotely

$ ip addr show
$ ifconfig
$ ping
$ hostname
Linux vs BSD vs tons of others

POSIX: "Portable Operating System Interface"

IEEE spec for maintaining compatibility between OSes

POSIX systems have similar shells.
Linux Distributions

http://futurist.se/gldt/wp-content/uploads/12.09/gldt1209.png
Windows
Re-Education
Windows Disk Drives

C: First Hard Drive
D: Second Hard Drive
E: CD-ROM Drive
G: USB Drive
I: Network Mapped Drive
Linux File System

/                  ← Primary mount
/mnt/myserver     ← Network mount
/media/cdrom      ← CD-ROM mount
/foobar           ← Second HDD
/my/happy/usb     ← USB Drive
Linux Filesystem

$ cd
$ pwd
$ ls

Relative vs absolute paths
‘..’ syntax
<table>
<thead>
<tr>
<th>Linux Filesystem</th>
<th>Directories</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>/</code></td>
<td>Filesys Root</td>
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<td><code>/bin</code></td>
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<td><code>/boot</code></td>
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<tr>
<td><code>/media</code></td>
<td>CDROM, USB</td>
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<tr>
<td><code>/mnt</code></td>
<td>Other mounts</td>
</tr>
<tr>
<td><code>/opt</code></td>
<td>Miscellaneous</td>
</tr>
<tr>
<td><code>/proc</code></td>
<td>Internal Stuff</td>
</tr>
<tr>
<td><code>/root</code></td>
<td>Root user home</td>
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<tr>
<td><code>/sbin</code></td>
<td>Sys Binaries</td>
</tr>
<tr>
<td><code>/srv</code></td>
<td>Services</td>
</tr>
<tr>
<td><code>/tmp</code></td>
<td>Temp Directory</td>
</tr>
<tr>
<td><code>/usr</code></td>
<td>User Programs</td>
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<tr>
<td><code>/var</code></td>
<td>Variable libs*</td>
</tr>
<tr>
<td><code>/lost+found</code></td>
<td>Trash</td>
</tr>
</tbody>
</table>
Some Important Things

~ = My Home Directory
cler = Clear the terminal
echo = Print something on the screen

[TAB] = Auto-complete commands
The Environment

$ printenv

$ echo $PATH
$ echo $PWD
$ sh
/bin and /usr/bin (and *)

$ ls /bin
$ ls /usr/bin

$ ls /usr/bin/c*
$ ls /usr/bin/c?9
$ ls /usr/bin/c?9*
Manipulating Files

$ file
$ touch
$ echo "..." > file.txt
$ cat
$ more
$ less
Manipulating Files

$ mkdir
$ cp
$ mv
$ rmdir
$ rm (-r)
Searching for Files

$ locate [filename]
$ find [location] --name [filename]

Ex:
$ locate passwd
$ find /etc --name passwd
Text Editors

$ nano somenewfile.txt

$ vi somenewfile.txt
Getting files from the Internet

$ whatis wget
$ type wget

$ cd ~ (go home)
Chaining Commands

$ ls /etc && ls ~ && ls /

$ whatis grep && type grep
grep

$ grep philosopher tw.txt
$ grep workshop /etc/passwd

$ grep -n philosopher tw.txt
Piping and Redirection

Default Behavior:

$ some command → Terminal Screen

Piping (substitute | for →):

$ some-cmd → another-cmd → etc → Terminal
$ some-cmd → another-cmd >> a-file
Piping and Redirection

$ ls -l | wc -l
$ cat tw.txt | wc -l
$ cat /etc/passwd | wc -l
$ cat /etc/passwd | sort
$ cat /etc/passwd | sort | less
Piping and Redirection


$ cat cr.txt

$ cat cr.txt | wc -l

$ cat cr.txt | sort

$ cat cr.txt | sort > cr-sorted.txt

$ less cr-sorted.txt
Piping to `grep` is the shizzle

```bash
$ cat cr.txt | grep -n "Luxembourg"
$ history | grep "wget"
$ history | grep "wget" > ~/wgcmds.txt

$ man ls | grep recursive
$ man grep | grep case
$ ls -1 /bin/c* | grep ch | wc -l
```
Manipulating Data from the Net

$ man curl | grep location

Piping Summary

<table>
<thead>
<tr>
<th>Pipe output to another command</th>
</tr>
</thead>
</table>
> Pipe output to file (overwrite) |
>> Pipe output to file (append) |
< Pipe file contents to command |

```
$ echo -e "\nNarnia" >> cr.txt && \
sort cr.txt > cr.txt
```
Users and Permissions

Users can be in multiple groups.

Root user is special.
Linux File Permissions

# ls -l /bin
-rwxr-xr-x root root 1779 Jan 10 05:05:05 uname

# ls -l /etc/host.conf
-rw-r--r-- root root 1779 Jan 10 05:05:05 uname
Linux File Permissions

- rwx rws r--

Read, write and execute permissions for all other users

Read, write and execute permissions for members of the group owning the file

Read, write and execute permissions for the owner of the file

File type: “-” means a file. “d” means a directory.
Octal File Permissions

0 000  ---
1 001  --x
2 010  -w-
3 011  -wx
4 100  r--
5 101  r-x
6 110  rw-
7 111  rwx
User File Commands

$ id  or  $ whoami
$ groups
$ file [somefile]
$ chmod [perms] [file]
$ chown [user] [file]
$ passwd
$ su
SUDO: Running Commands as root

$ sudo [command]

$ sudo su

# whoami
Copying files across a network

# scp user@[server]:/path/to/file /localpath
BASH Scripts

#!/bin/bash

HNAME=`hostname`
UNAME=`whoami`
echo -e "Hello World\nI am running on $HNAME"
echo -e "\nMy name is $UNAME\n"
Compiling Software

# whatis gcc
# type gcc
Compiling Software

# gcc -o gimmenums primescprog

# mv primescprog primes.c
# gcc -o gimmenums primes.c
Compiling Software Part Duex

# wget -0 d.tgz http://bit.ly/gnudiction
# tar -zvf d.tgz
# ls .
# cd diction-1.11
# ./configure
# make
Submitting Jobs to MOAB

Test Connection and then Move Code to HPC

```bash
# ssh [user]@hpc-login.rcc.fsu.edu
# exit
# scp ~/primes.c [user]@submit.hpc.fsu.edu
```

Login to HPC and compile it

```bash
# ssh [user]@hpc-login.rcc.fsu.edu
# gcc -o primes.sh primes.c
```
Submit Job to HPC Queue

$ nano ~/submit.sh

#!/bin/bash
#SBATCH --job-name="myjob"
#SBATCH -n 1
#SBATCH -p quicktest
#SBATCH -t 00:00:05
primes.sh

$ sbatch submit.sh
Hidden Files

Anything beginning in a dot (".") in Linux** is hidden.

Why hide files?

# ls -a
Aliases

# alias lm="ls -l | less"
# alias countfi="ls -1|wc -l"

# unalias lm
.bash_aliases

# nano ~/.bash_aliases

lm="ls -l | less"
countfi="ls -1 | wc -l"

# source ~/.bash_aliases
CRON Jobs

# * * * * * command to execute
# T T T T T
# | | | | |
# | | | | |
# | | | | | day of week (0 - 6) (0 to 6 are Sun to Sat, or use names;
# | | | | 7 is Sunday, the same as 0)
# | | | | month (1 - 12)
# | | | day of month (1 - 31)
# | | hour (0 - 23)
# | min (0 - 59)
CRON Jobs

# crontab -e

# Runs every minute
01 * * * * echo "Hello from Cron"

# Runs every day at 1:01am
01 01 * * * /usr/bin/runbackup

# Runs on May 4 every year @ 4:30pm
30 16 04 05 * echo "Happy Birthday, Casey"
System Administration

- Process Management (what is running?)
- Installing Software (package management)
- User Management
- Configuring Services
These Slides: http://bit.ly/1j27VUu

Book: http://linuxcommand.org/t1cl.php

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