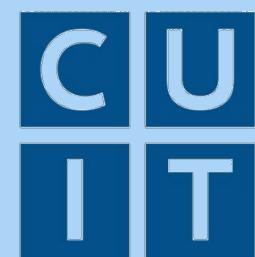


A large, abstract graphic in the upper left corner consists of several overlapping rectangles of varying shades of blue and white, creating a layered effect.

# Introduction to Linux Workshop

September 30 2014



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# Introduction

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# Introduction

## Linux Basics for Beginners



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# Introduction

Linux Basics for Beginners

(No HPC Yet)



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# Introduction

1<sup>st</sup> Hour: Slides + Hands-on

2<sup>nd</sup> Hour: Hands-on



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# Introduction

## First Workshop



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# History

This will be quick



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# History

Linux is old

1991



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# History

For our purposes

Linux = Unix



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# History

Unix is very old

1969



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# History

Unix created by engineers for engineers



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# History

Unix was designed to be simple and powerful



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# Access

Did everyone get a user ID?



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# Access

## Windows Instructions

1. Search for putty on Columbia home page
2. Select first result
3. Follow link to Putty download page
4. Download putty.exe
5. Run putty.exe



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# Access

## Mac Instructions

1. Run terminal



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# Access

## Mac (Terminal)

```
$ ssh userNN@didius.cc.columbia.edu
```

## Windows (Putty)

Host Name: didius.cc.columbia.edu



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# Access

Aside

System: cunix.columbia.edu

User: Your UNI



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# Prompt

[user1@didius ~] \$

- User name
- System name
- Name of current directory
  - ~ is special



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**pwd**

\$ pwd

“Print working directory”



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# Directory Path

```
$ pwd
```

```
/workshop/home/user1
```



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**ls**

\$ ls

“List directory”

Not very interesting.



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**cd**

\$ cd /

“Change directory”

\$ pwd



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**ls**

\$ ls

\$ ls -l

Long listing.



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**cd**

\$ cd

\$ pwd

cd with no arguments takes you back home



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..

\$ pwd

\$ cd ..

\$ pwd

“..” means “the directory above this one”



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\$ pwd

\$ cd .

\$ pwd

“.” means “this directory”



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# ls -a

```
$ cd
```

```
$ ls -a
```

Can combine options

```
$ ls -la
```



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```
$ pwd  
$ cd ~  
$ pwd
```

“~” means “home directory”



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# Paths

```
$ cd tmp
```

```
$ cd /tmp
```

Absolute: starts with “/”

Relative: doesn’t



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**cp**

```
$ cd  
$ cp /tmp/keets .  
$ ls
```



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**rm**

```
$ cp keets junk
```

```
$ ls
```

```
$ rm junk
```

```
$ ls
```



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**cat**

\$ cat keets



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**mv**

\$ mv keets keats

\$ ls



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# **mkdir**

```
$ mkdir tmp  
$ mv keats tmp  
$ cd tmp  
$ ls
```



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# rmdir

```
$ pwd  
$ mv keats ..  
$ cd ..  
$ rmdir tmp  
$ ls
```



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# who am i

```
$ whoami
```

```
$ who am i
```

```
$ id
```

```
$ groups
```



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# id, groups

```
$ id rl2226
```

```
$ groups rl2226
```



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**who**

\$ who



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W

\$ W



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# bash

- bash is a “shell”
- It prints the prompt and interprets what you enter
- It has many keyboard shortcuts that can really speed up your work



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# bash

```
$ ls jeats
```

```
ls: jeats: No such file or directory
```

- Up arrow to retrieve the command
- Left and right arrows to navigate on line
- Change the “j” to a “k” and rerun



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# bash

“^” means “hold down control”

`^a` : go to beginning of line

`^e` : go to end of line

`^k`: delete to end of line

Many more useful bash commands



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# bash

```
$ ls k[tab]  
$ ls keats
```

- Tab completion
- Works for commands as well



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**man**

\$ man ls

Display manual for “ls” command



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# ls -l

```
$ ls -l  
total 4  
-rw----- 1 user1 workshop 573 Sep 29 22:00 keats
```

- File type and permissions
- Link count
- User
- Group
- Date last changed
- File name



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# File Type

```
$ ls -l  
total 4  
-rw----- 1 user1 workshop 573 Sep 29 22:00 keats
```

- Normal File

d Directory

l Link

Others Various Special Files



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# Permissions

```
$ ls -l  
total 4  
-rw----- 1 user1 workshop 573 Sep 29 22:00 keats
```

r      read

w      write

x      execute

others    various special settings



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# Links

```
$ ls -l  
total 4  
-rw----- [1] user1 workshop 573 Sep 29 22:00 keats
```

We'll ignore links for now.



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# User

```
$ ls -l  
total 4  
-rw------- 1 user1 workshop 573 Sep 29 22:00 keats
```

The user that owns this file.



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# Group

```
$ ls -l  
total 4  
-rw----- 1 user1 workshop 573 Sep 29 22:00 keats
```

The group that owns this file.



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# Size

```
$ ls -l  
total 4  
-rw------- 1 user1 workshop 573 Sep 29 22:00 keats
```

The size of this file.

Here listed in bytes.



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# Last Change Date

```
$ ls -l  
total 4  
-rw------- 1 user1 workshop 573 Sep 29 22:00 keats
```

The last time the file was changed.



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# Name

```
$ ls -l  
total 4  
-rw------- 1 user1 workshop 573 Sep 29 22:00 keats
```

The file name.



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# Permissions

```
$ ls -l /bin/bash
-rwxr-xr-x 1 root wheel 768952 Sep 25 15:31 /bin/bash
```



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# Permissions

```
$ ls -l /bin/bash
-rwxr-xr-x 1 root wheel 768952 Sep 25 15:31 /bin/bash
```

r      read

w      write

x      execute

others    various special settings



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# Permissions

```
$ ls -l /bin/bash
-rwxr-xr-x 1 root wheel 768952 Sep 25 15:31 /bin/bash
```

Nine permission settings



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# Permissions

```
$ ls -l /bin/bash
-rwxr-xr-x 1 root wheel 768952 Sep 25 15:31 /bin/bash
```

Three groups of three



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# Permissions

```
$ ls -l /bin/bash
-rwxr-xr-x 1 root wheel 768952 Sep 25 15:31 /bin/bash
```

First group: owner

read	yes
write	yes
execute	yes



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# Permissions

```
$ ls -l /bin/bash  
-rwxr-xr-x 1 root wheel 768952 Sep 25 15:31 /bin/bash
```

## Second group: group

read	yes
write	no
execute	yes



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# Permissions

```
$ ls -l /bin/bash  
-rwxr-xr-x 1 root wheel 768952 Sep 25 15:31 /bin/bash
```

Third group: everyone else

read	yes
write	no
execute	yes



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# date

```
$ date
```

```
Tue Sep 30 13:27:29 EDT 2014
```



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# Output Redirection

```
$ cd  
$ date > thedate  
$ cat thedate
```



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# Output Redirection

```
$ cd  
$ ls -l > myhome  
$ cat myhome
```



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# sort

```
$ sort keats
```



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# Input Redirection

```
$ sort < keats
```



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# Input/Output Redirection

```
$ sort < keats > sorted  
$ cat sorted
```



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# Appending

```
$ date >> thedate  
$ cat thedate
```

Useful for log files



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# grep

```
$ grep planet keats
```

```
When a new planet swims into his ken;
```

Find all lines containing “planet” in “keats”



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# Pipes

```
$ cat keats
```

```
$ cat keats | grep planet
```

When a new planet swims into his ken;

Pipes connect output from one command to the input of another command



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# Editing

No single obvious choice for editor

- vi – simple but difficult at first
- emacs – powerful but complex
- nano – simple but not really standard



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# nano

```
$ nano keats
```

“^” means “hold down control”

**^a** : go to beginning of line

**^e** : go to end of line

**^k**: delete line

**^o**: save file

**^x**: exit



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# less

```
$ less /var/log/messages
```

- Used to read (not edit) files
- Very useful command



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# less

[space] : next page

b : previous page

g : go to end of file

^g : display location in file

/ : search

n: repeat search



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# sleep

```
$ sleep 5
```

- More useful than it seems



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# echo

```
$ echo hi  
hi
```

- More useful than it seems



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# Multiple Commands

```
$ sleep 5; echo hi  
hi
```

- Use ; to separate commands



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# Job Control

```
$ sleep 60
```

```
^C
```

```
$
```

- Use control-c to stop a running command



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# Job Control

```
$ sleep 60; echo hi  
^C
```

What happened? Why?



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# exit

```
$ exit
```

- Logs out
- There are other ways of logging out

```
$ logout
```

```
$ ^d
```



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**ps**

\$ ps

- Lists the processes you have running in this session



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**ps**

\$ ps -e

- List every process



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# ps

```
$ ps -aux
```

- List every process with a lot more information
- Flags for ps are numerous and inconsistent



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# top

```
$ top
```

- Lists running processes
- Updates every 3 seconds
- Many options to change display
- Many other top-like commands exist.



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# Questions?

Any questions?



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# Other Topics

- This is the end of the slides proper
- Many other commands and concepts that could be covered
- Following slides just list possibilities



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# Other Topics

- Environment variables
- \$PATH
- which
- type



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# Other Topics

- More process control
- ^Z
- bg, fg
- jobs (command)



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# Other Topics

- Standard directories
- bin
- dev
- etc
- tmp
- usr
- var



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# Other Topics

- File systems
- df
- Space usage
- du



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# Other Topics

- Processes
- fork()
- exec()
- kill



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# Other Topics

- Shell scripts
- Programming



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