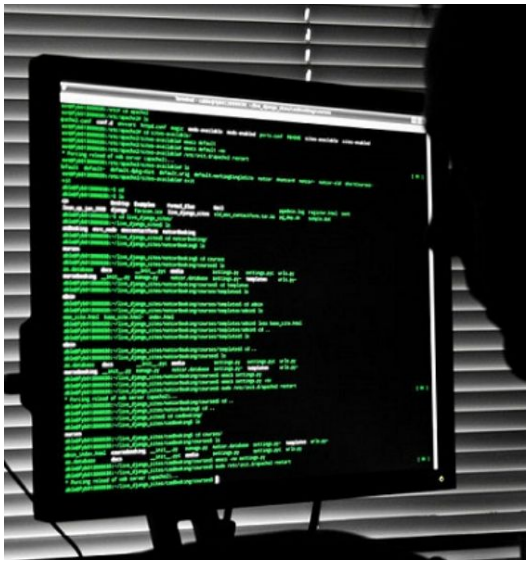
Introduction to UNIX command-line



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Introduction to UNIX command-line

- **Day 1**
  - Unix - Learning the essentials
  - Unix fundamentals , syntax and usage
- **Day 2**
  - Unix commands
  - Useful tools for processing text files
- **Day 3**
  - Useful shell commands
  - UNIX Shell Scripting

Learning Objectives

By the end of this module, students will be able to:

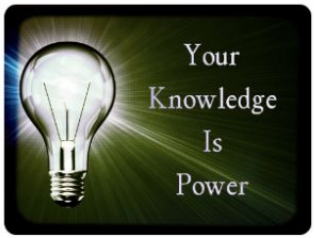
- List the attributes of Unix that make it ideal for addressing complicated biological questions using computers
- Compare and contrast the Command Line Interface (**CLI**) vs the Graphical User Interface (**GUI**)
- Identify the uses of the multiple UNIX commands
  - pwd, mkdir, and cd and use them to navigate within the UNIX file system

Introduction to UNIX Command Line: Learning Objectives

By the end of this module, students will be able to:

- Perform the following tasks within the UNIX environment:
  - Create a text file
  - List and reorder files
  - Display, copy, move, and delete directories and files
  - Use grep command to search text in the txt files
  - Use awk to process tab delimited files
  - Use sed to edit text in the txt files

Do biomedical researchers have to become programmers?



+

Google

stackoverflow

SEQanswers
the next generation sequencing community

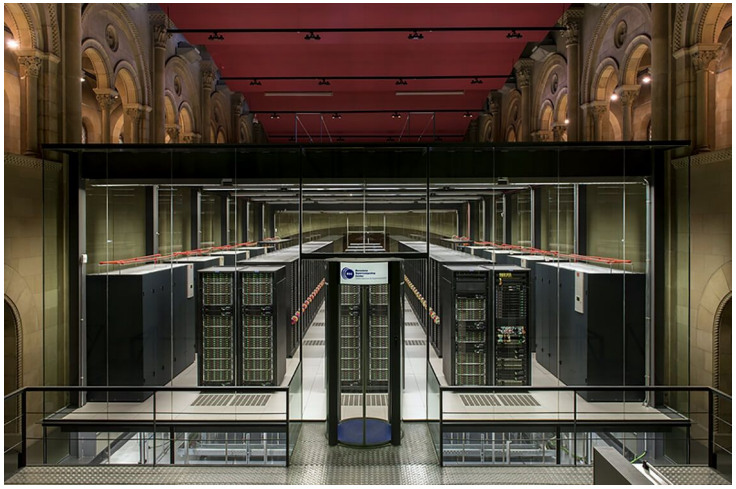
=

*provided in the class

*free and easy to use

Why Learn Unix?

- As biological data sets have grown **larger** and biological problems have become more complex, the requirements for computing power have also grown.
- Computers that can provide this power generally use the Unix operating system



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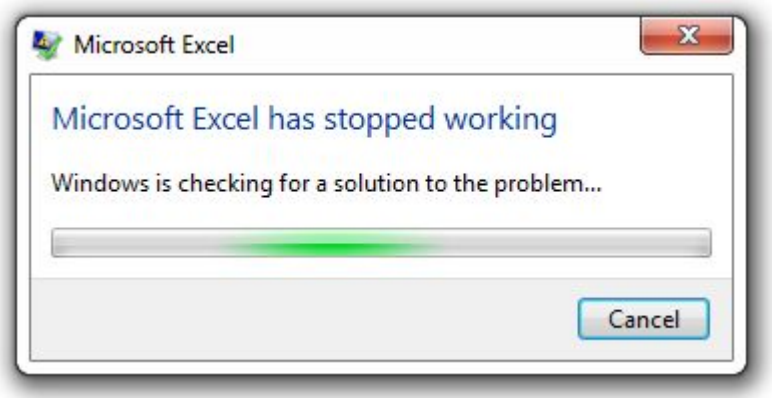
Why Learn Unix?

- Most new bioinformatics software is created for Unix
- Unix is very **efficient**
  - manage extremely **huge amounts of data**
- It is **very popular**, so it is easy to find information and get help
- Unix is very **stable** - computers running Unix almost never crash

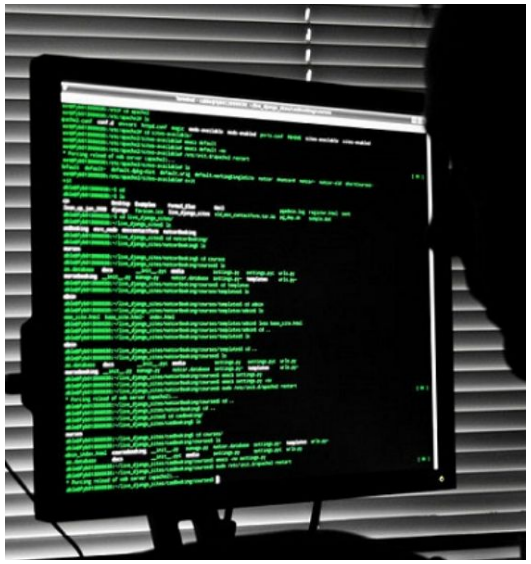
Why not MS Excel?

- Excel is good for **simple tasks and small datasets**
- Excel is not eble to handle **large datasets** above 1,048,576 rows and 16,384 columns
- Excel is not suitable for large number of datasets.
  - Excel cannot be automated and can process one file at the time



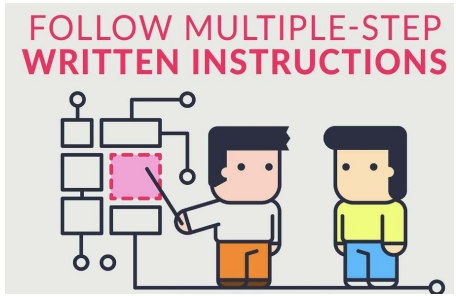
What is Unix?

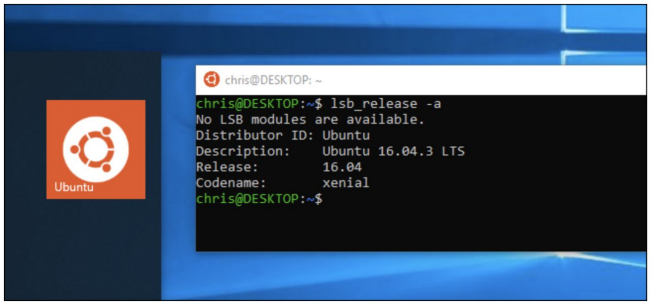
- UNIX-like system (e..g Linux, Ubuntu) is a type of operating system that lack a **graphical interface** and require inputting code.
- UNIX environment is often is referred as command line interface opposed to graphical interface, which is common for Windows and MacOS.



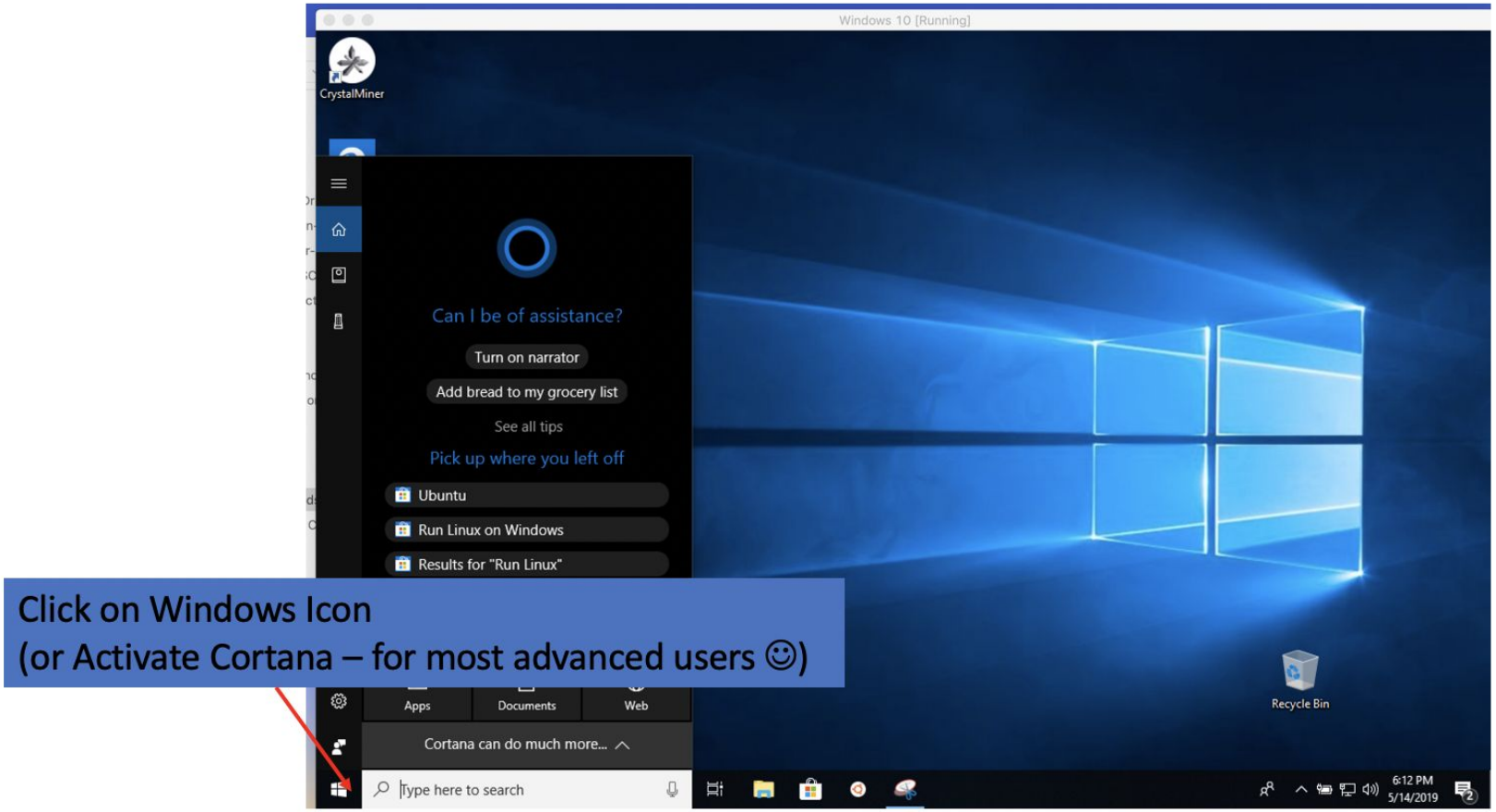
How to run UNIX

Terminal

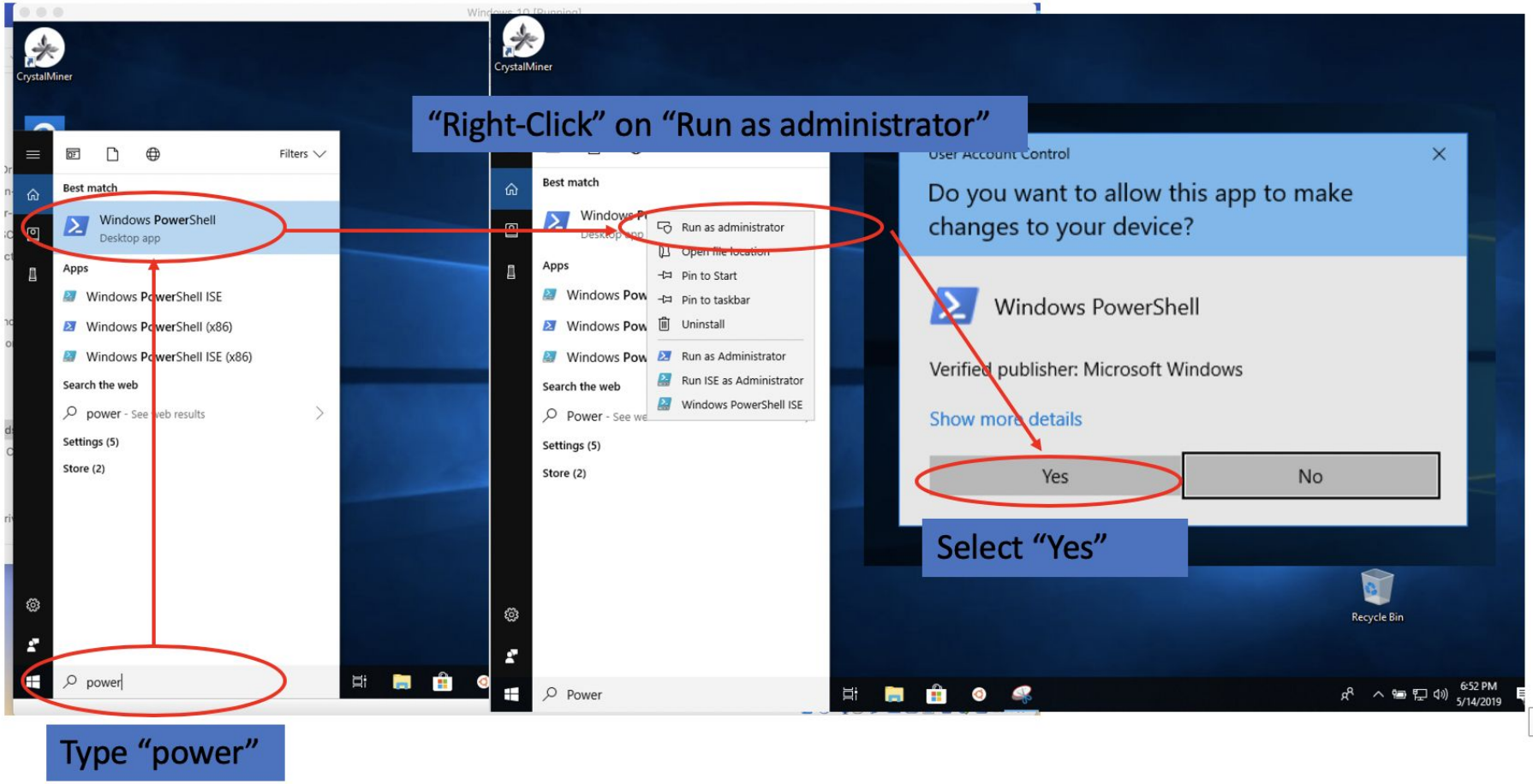


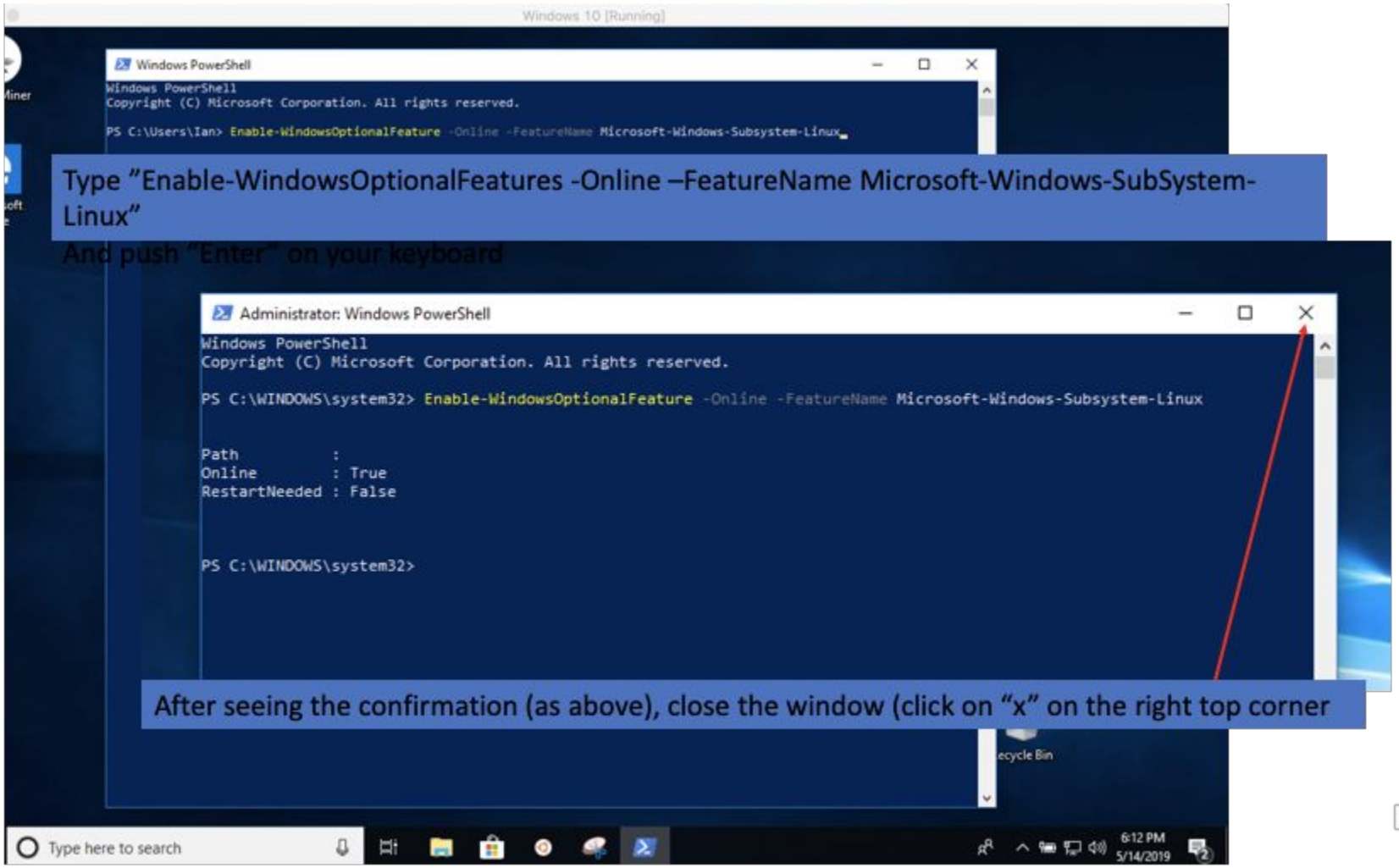


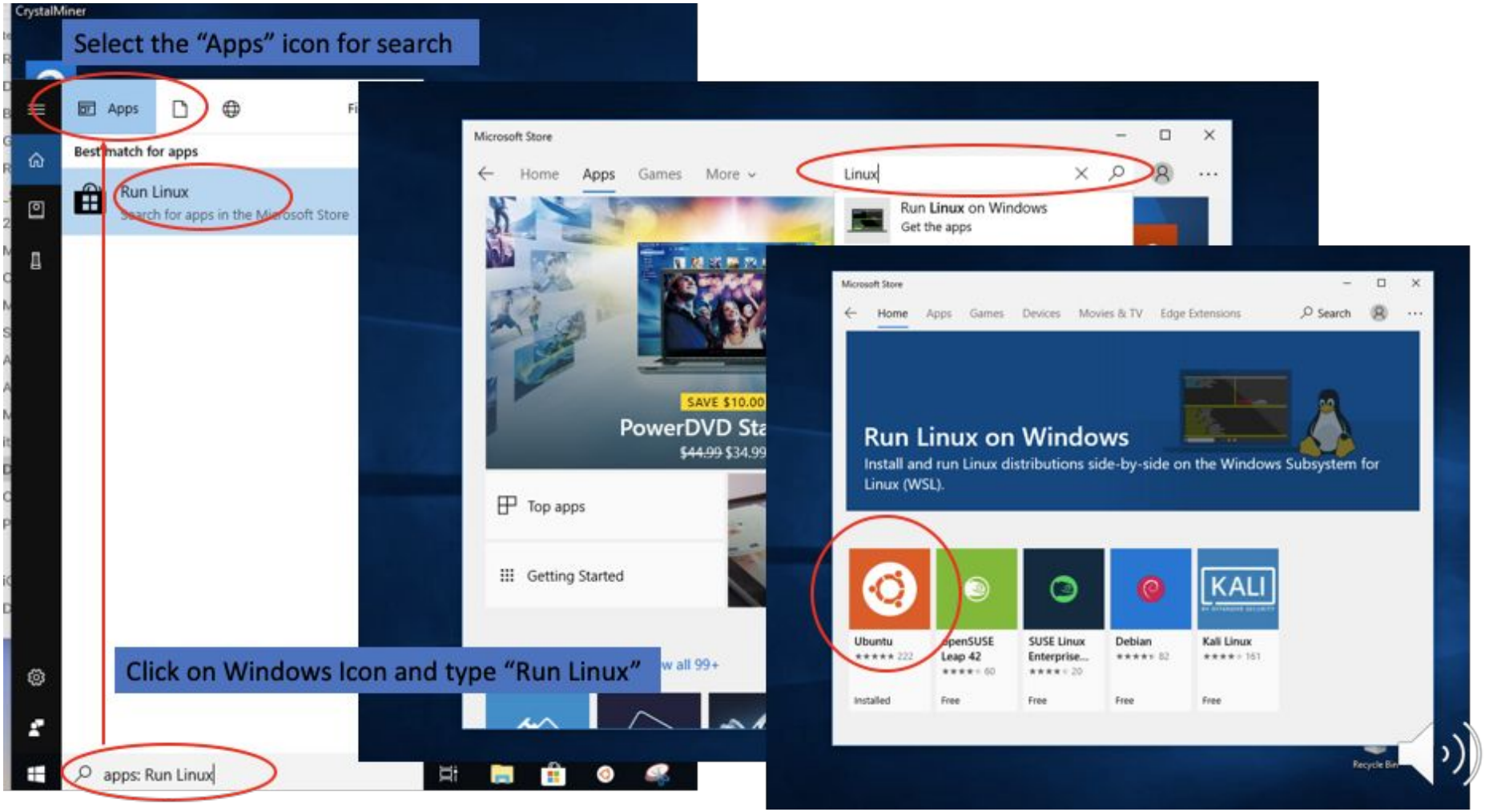
Run UNIX (Ubuntu) on Windows

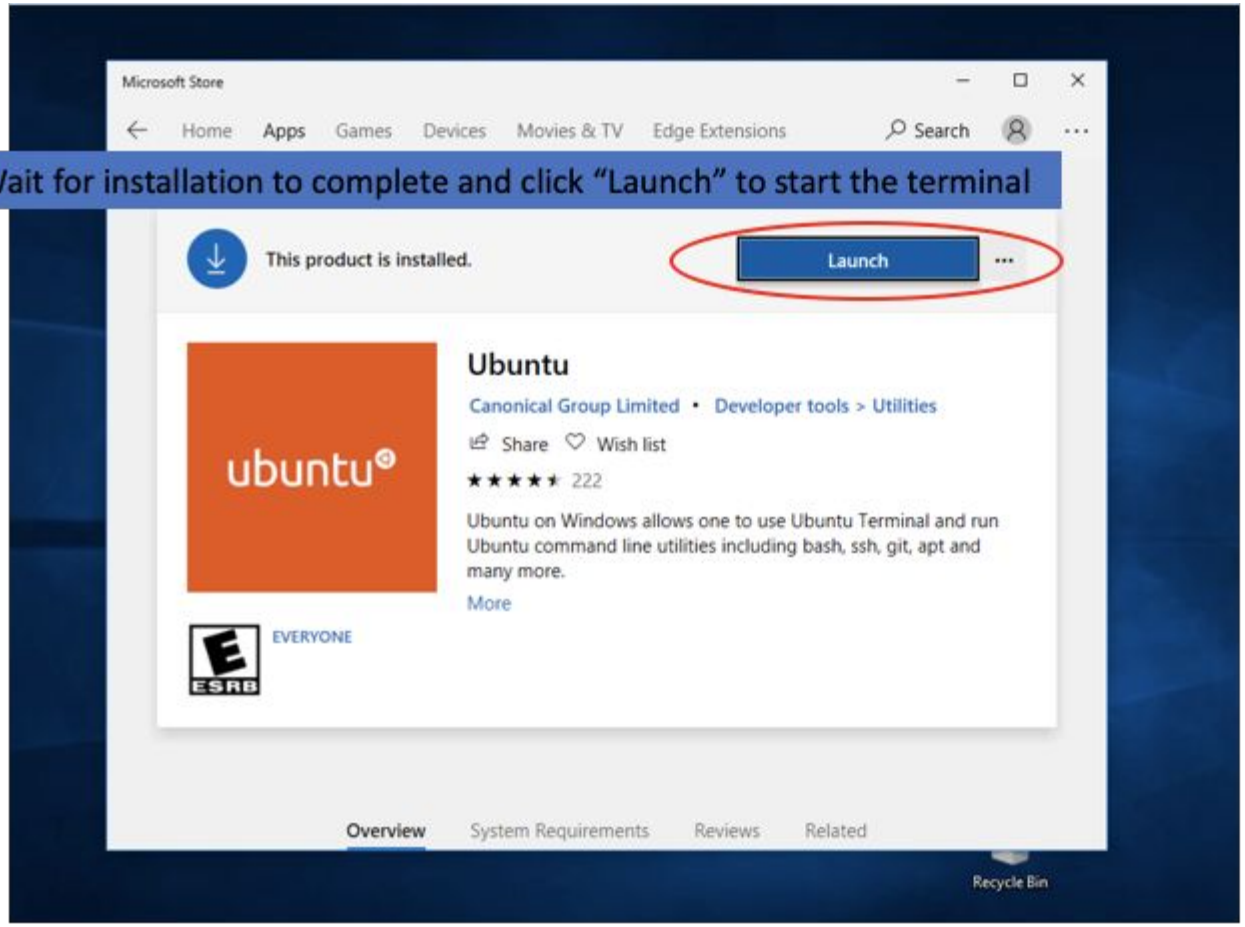


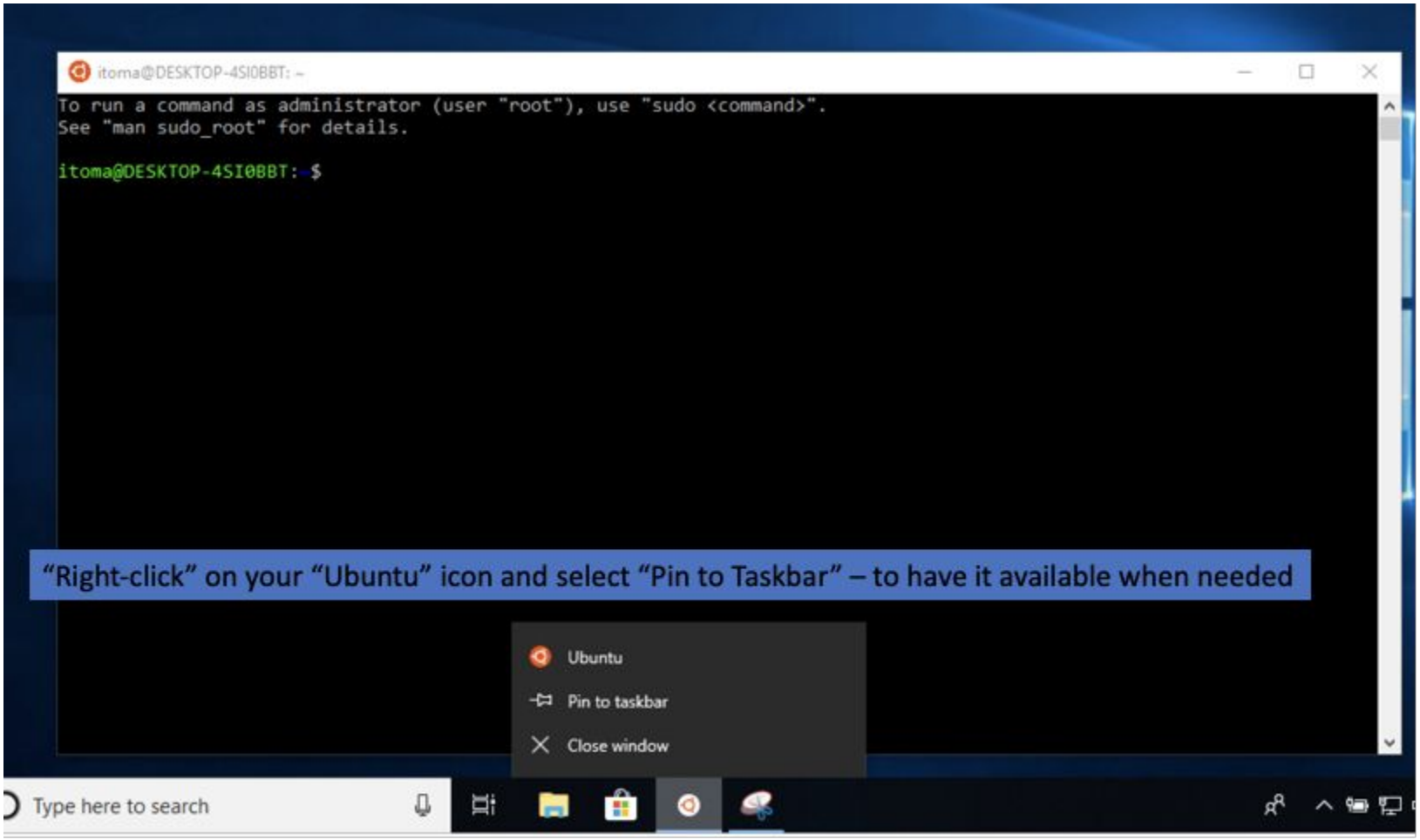
Open powershell application




Windows 10 [Running]
Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
PS C:\Users\Ian> Enable-WindowsOptionalFeature -Online -FeatureName Microsoft-Windows-Subsystem-Linux
Type ”Enable-WindowsOptionalFeatures -Online –FeatureName Microsoft-Windows-SubSystem-Linux”
And push “Enter” on your keyboard
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
PS C:\WINDOWS\system32> Enable-WindowsOptionalFeature -Online -FeatureName Microsoft-Windows-Subsystem-Linux
Path :
Online : True
RestartNeeded : False
PS C:\WINDOWS\system32>
After seeing the confirmation (as above), close the window (click on “x” on the right top corner
Type here to search
6:12 PM
5/14/2019


Select the “Apps” icon for search
Apps
Best match for apps
Run Linux
Search for apps in the Microsoft Store
apps: Run Linux
Click on Windows Icon and type “Run Linux”
Microsoft Store
Home
Apps
Games
More
Linux
Run Linux on Windows
Get the apps
SAVE $10.00
PowerDVD Sta
$44.99 $34.99
Top apps
Getting Started
Microsoft Store
Home
Apps
Games
Devices
Movies & TV
Edge Extensions
Search
Run Linux on Windows
Install and run Linux distributions side-by-side on the Windows Subsystem for Linux (WSL).
Ubuntu
openSUSE Leap 42
SUSE Linux Enterprise...
Debian
Kali Linux
Installed
Free
Free
Free
Free


Wait for installation to complete and click “Launch” to start the terminal
Microsoft Store
Home
Apps
Games
Devices
Movies & TV
Edge Extensions
Search
This product is installed.
Launch
ubuntu
Ubuntu
Canonical Group Limited • Developer tools > Utilities
Share
Wish list
222
Ubuntu on Windows allows one to use Ubuntu Terminal and run Ubuntu command line utilities including bash, ssh, git, apt and many more.
More
EVERYONE
ESRB
Overview
System Requirements
Reviews
Related
Recycle Bin

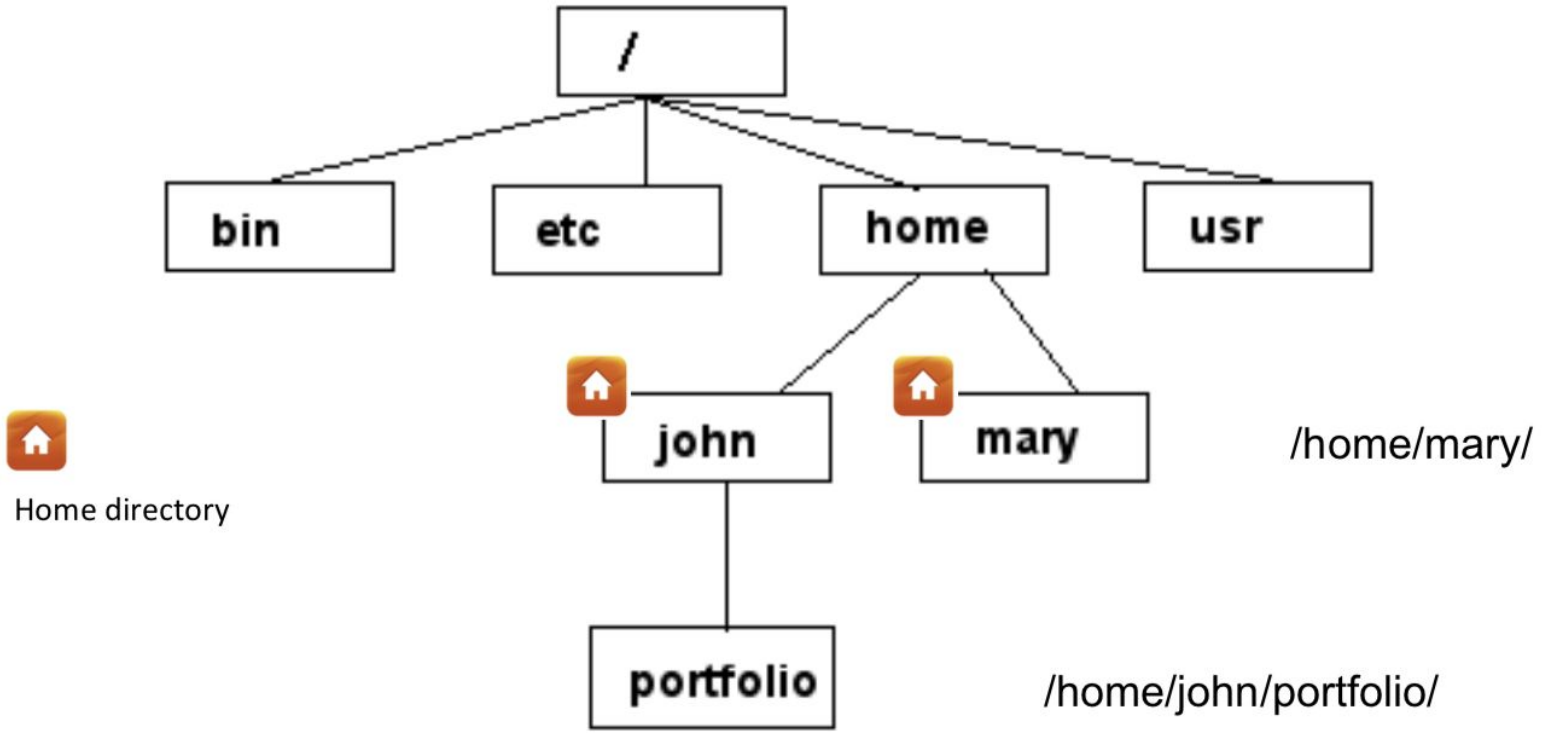

itoma@DESKTOP-4SI0BBT: ~
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
itoma@DESKTOP-4SI0BBT: $
"Right-click" on your "Ubuntu" icon and select "Pin to Taskbar" – to have it available when needed
Ubuntu
Pin to taskbar
Close window
Type here to search

The Unix Shell

- A shell is a program that waits for you to type a command and then executes it.
  - type the command, then “return”

Unix File System

Unix is cAsE sEnsItiVe !



/home/mary/

/home/john/portfolio/

my home directory

path

My laptop : /Users/serghei

Home directory

- When you open terminal, you always start in your **Home** directory.
- Create sub-directories in your home or other directory to store specific projects or groups of information

Do **not** accumulate thousands of files with cryptic names in your Home directory

Command: pwd

- To display current directory

```
[serghei@login3 ~]$ pwd
/u/home/s/serghei
```

Command: mkdir

- To create a new directory use “mkdir”

```
[serghei@login3 ~]$ mkdir test
```

If no error message is displayed means the command was run successfully

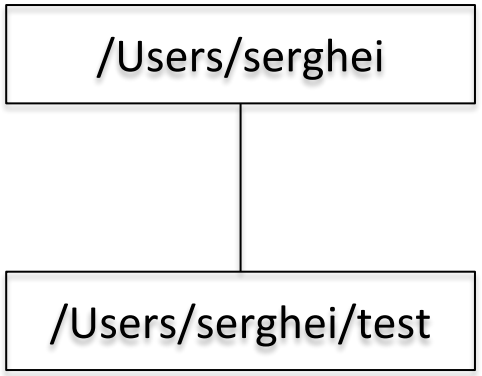
Command: cd

- cd changes your current working directory

```
[serghei@login3 ~]$ cd test
[serghei@login3 test]$ pwd
/u/home/s/serghei/test
```

Command: cd

- "**~**" is the location of your home directory
- "**..**" is the location of the directory above the current one



Let's practice

```
[serghei@login3 test]$ cd ~
[serghei@login3 ~]$ pwd
/u/home/s/serghei
[serghei@login3 ~]$ cd ..
[serghei@login3 s]$ pwd
/u/home/s
[serghei@login3 s]$ cd
/u/home/s/serghei
```

Tips

- to go back to previously entered commands, use the **up** and **down** arrows

- to auto-complete file names, use the **tab** key

- if you are stuck within a command/process/program, try **ctrl-z** to terminate it

Let’s practice

mkdir jdkhfkjdsfhkjsdhfkjsdhfkjhs

cd jdkhfkjdsfhkjsdhfkjsdhfkjhs

Create a text file

1. `[serghei@login3 ~]$ vi test.txt`

   On-screen, you will see blank lines, each with a tilde (~) at the left, and a line at the bottom giving the name and status of the new file:

2. P

```
~
"test.txt" [New File]
```

3. P

```
~
-- INSERT --
```

   - "ESC" (insert mode is gone)
   - "SHIFT" + ";" (you should see on the screen **:wq**)
   - **"wq"** (w – save file, q- quit) OR **"q!"** (discard changes and quit file)
   - "ENTER"

```
~
:wq
```

```
~
:q!
```

Command : ls

- to list the files in the current directory

```
ls

Applications    Movies          ichorCNA
Desktop         Music       libtinfow.so.5
Documents       Pictures    read.aligment.review
Downloads       Public          seaborn-data
GeneImp.sh      anaconda3       test
Google Drive       code
Library         db_human
```

Command : ls

- **ls** has many options
  - -l long list (displays lots of info)
  - -t sort by modification time
  - -S sort by size
  - -h list file sizes in human readable format
  - -r reverse the order
- Options can be combined: “ls -lh”

Let's practice!

```
[serghei@login3 test]$ ls
jdkhfkjdsfhkjsdhfkjsdhfkjhsdjfk  test.txt

[serghei@login3 test]$ ls -l
total 8
drwxr-xr-x 2 serghei eeskin 4096 Sep  8 09:35
jdkhfkjdsfhkjsdhfkjsdhfkjhsdjfk
-rw-r--r-- 1 serghei eeskin   80 Sep  8 09:50 test.txt

[serghei@login3 test]$ ls -lh
total 8.0K
drwxr-xr-x 2 serghei eeskin 4.0K Sep  8 09:35
jdkhfkjdsfhkjsdhfkjsdhfkjhsdjfk
-rw-r--r-- 1 serghei eeskin   80 Sep  8 09:50 test.txt
```

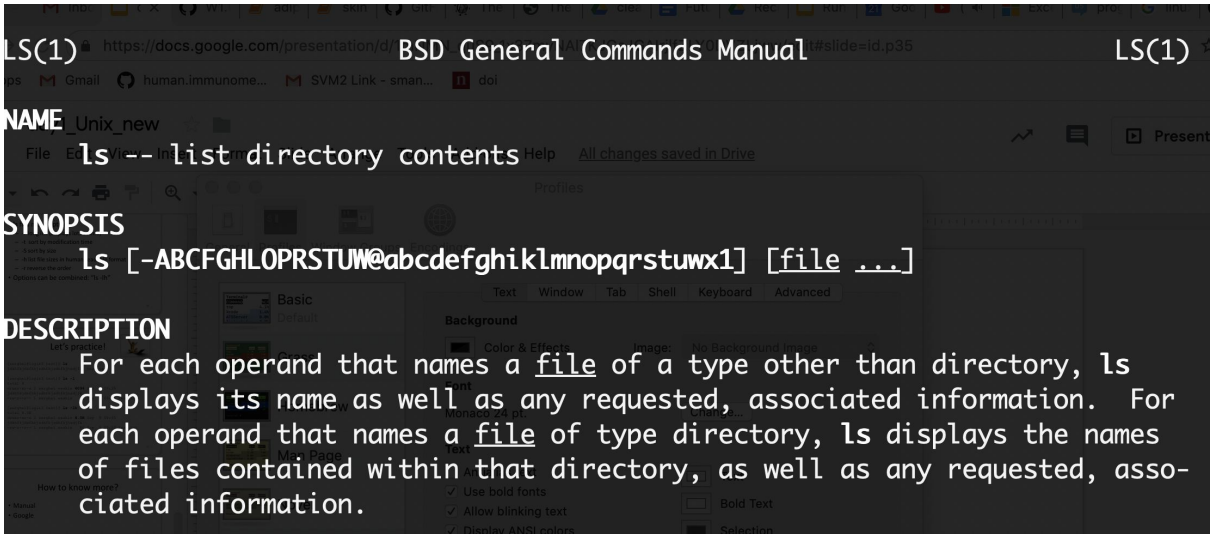
How to know more?

- Manual
- Google

Command : man

- displays manual pages

```
[serghei@login3 project]$ man ls
```



q to exit

Google

Google ls sort by data

Web Images Shopping Videos News More Search tools

About 33,700,000 results (0.77 seconds)

linux - How can I sort the output of 'ls' by last modified date ...
superuser.com/.../how-can-i-sort-the-output-of-ls-by-last-modified-date
Apr 9, 2009 - The ls man page describes this in more details, and lists other options ... ls -halt is for human readable , show hidden , print details , sort by date ...

Linux / Unix: Sort ls Command Output By Last Modified Date ...
www.cyberciti.biz/.../ls-command-sort-the-output-by-last-modified-time-...
Aug 25, 2013 - Explains how to sort the output of ls command by last modified date in ... 1 vivek staff 301746331 Aug 25 01:25 data-db2-sample.rar -rw-r--r--@ ...

linux - How to sort results from ls command by modification ...
unix.stackexchange.com/.../how-to-sort-results-from-ls-c... Stack Exchange
Aug 11, 2013 - ls -lrt. to get files and folders sorted by modification date, but this does not .... Sort data in descending order of first column, for equal values, use ...

7 Answers

active oldest votes

477

```
ls -t
```

or (for reverse, most recent at bottom):

```
ls -tr
```

The `ls` man page describes this in more details, and lists other options.

General Syntax: *

- “*” can be used as a wildcard in Unix

```
[serghei@login3 test]$ ls *txt
test.txt

[serghei@login3 test]$ ls t*g
test.log

[serghei@login3 test]$ ls t*
test.log
test.txt
```

Displaying a file

- Various ways to display a file in Unix
  - cat
  - less
  - head
  - tail

Command: cat

- dumps an entire file to standard output
- good for displaying short, simple files

```
[serghei@login3 test]$ cat test.txt
My first txt file!
```

Command: less

- Scrolling through a file without a mouse

Up and down keys
Scroll one line

space-b
Scroll one page

press **q** to exit

Let’s practice!

```
[serghei@login3 test]$ less large.txt

1
2
3
4
5
6
7
…
30
```

Try to scroll forward/back one line/page!

Command: head

- displays the top part of a file

by default it shows the first 10 lines

  - **-n** option allows you to change that

Command: tail

- Same as head, but shows the last lines

Let’s practice!

```
[serghei@login3 test]$ head large.txt
1
2
…
9
10
[serghei@login3 test]$ tail large.txt
21
22
…
30
[serghei@login3 test]$ tail -n 3 large.txt
28
29
30
```

File Commands

- Copying a file: **cp**

-
- Move or rename a file: **mv**

-
- Remove a file: **rm**

Copy

`cp <source> <destination>`

- to copy a file use **cp**
- to copy a directory use **cp -r**

Let's practice

```
[serghei@login3 test]$ cp test.txt test1.txt
[serghei@login3 test]$ ls
large.txt test1.txt  test.log  test.txt
[serghei@login3 test]$ mkdir new
[serghei@login3 test]$ cp -r new new2
[serghei@login3 test]$ ls
large.txt  new  new2  test1.txt  test.log  test.txt
[serghei@login3 test]$ cp test.txt new/
[serghei@login3 test]$ cp test.txt new/test_new.txt
[serghei@login3 test]$ cd new
[serghei@login3 new]$ ls
test_new.txt  test.txt
```

Command: mv

`mv <source> <destination>`

- moves a file/directory to a different location
- renames a file/directory

```
[serghei@login3 new]$ cd ..
[serghei@login3 test]$ pwd
/u/home/s/serghei/test
[serghei@login3 test]$ mv test1.txt new/
[serghei@login3 test]$ mv test.txt test_rename.txt
[serghei@login3 test]$ ls
large.txt  new  new2  test.log  test_rename.txt
[serghei@login3 test]$ mv test.txt new/test2.txt
```

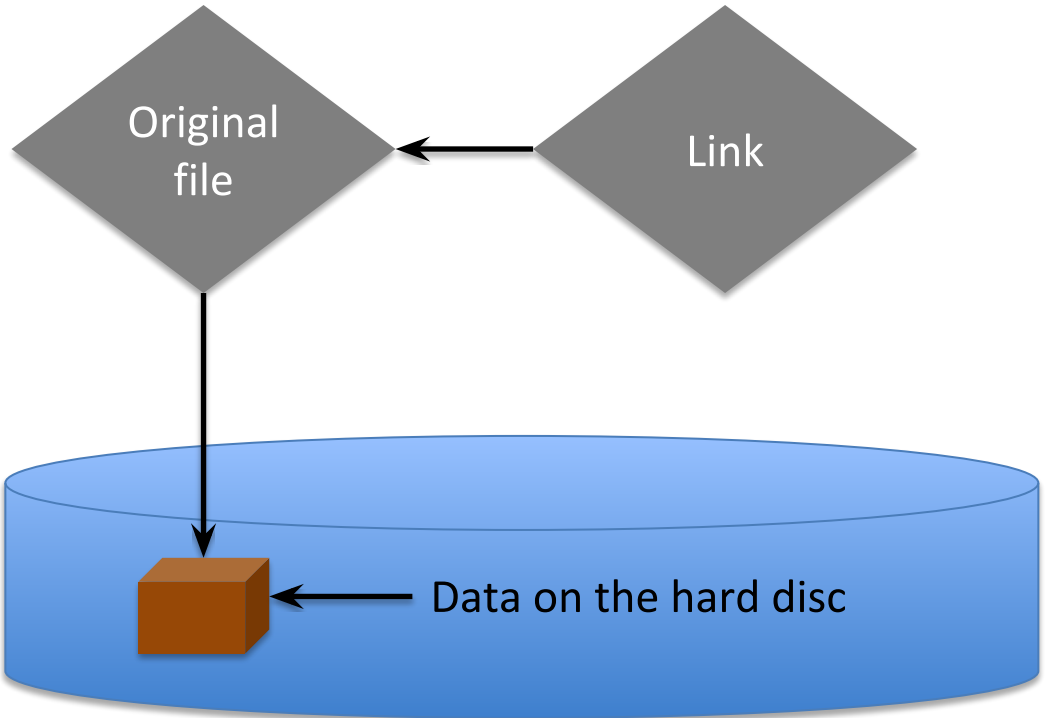
Symbolic Links

- is a special kind of file that points to another file

existing file for which you want to create the symbolic link

name of the symbolic link

```
ln -s <ORIGINAL_FILE> <LINK_NAME>
```



Good to know

- You can perform an operation on *LINK_NAME*, just as you could with the *ORIGINAL_FILE*
- You can use normal file management commands (e.g., cp, rm) on the symbolic link.

Don’t modify the original file through the link

Command: rm

- to remove a file use **rm**
- to remove a directory use **rm -r**

```
[serghei@login3 test]$ rm test.log
[serghei@login3 test]$ rm -r new2
[serghei@login3 test]$ ls
large.txt  new  test_rename.txt
```

Files and directories deleted with **rm** are gone forever and cannot be recovered!!!

Good to know

- **cp/mv/rm** can work on many files at once:

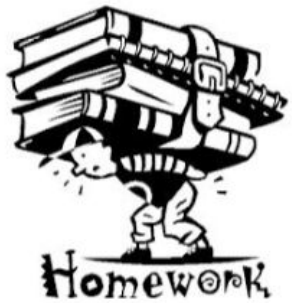
```
cp file1 file2 new/
rm file1 file2 file27
```

- **cp/mv/rm** can work with *:

```
mv f* new/
rm f*
rm l*s
rm *txt
```

Summary

Directory commandline	
pwd	display current directory
mkdir	create a new directory
cd	change current working directory
cp-r	copy a directory
File commandline	
ls	list files in the current directory
cat	display the entire file
less	display part of the file
tail	display the end of the file
head	display the head of the file
cp	copy a file
mv	move a file
rm	remove a file
file and password	
vi test.text	create a text file
passwd	change password



1. Create directory “practice” in your home directory
2. Inside directory “practice” create files p.a and p.b
3. Create a copy of file p.a(p_copy.a) and rename file p.b (new name : practice.b)
4. Delete all files ending with b