

Introduction to Linux

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Command Line Interface (CLI)





Help

- Slides download

github.com/tsaiweiwu/arch

- User Guide

arch.jhu.edu/guide

arch.jhu.edu/support/faq/

- Tickets

help@rockfish.jhu.edu

- User ID at Rockfish.
- Detailed explanation of the problem/issue.
- Add snapshots if possible.
- Path to the working directory, scripts and (slurm) output files.



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Outline

- Linux Architecture
- Linux File System
- Connection and File Transfer
- Basic Commands
- More Commands
- Demo
- Terminology

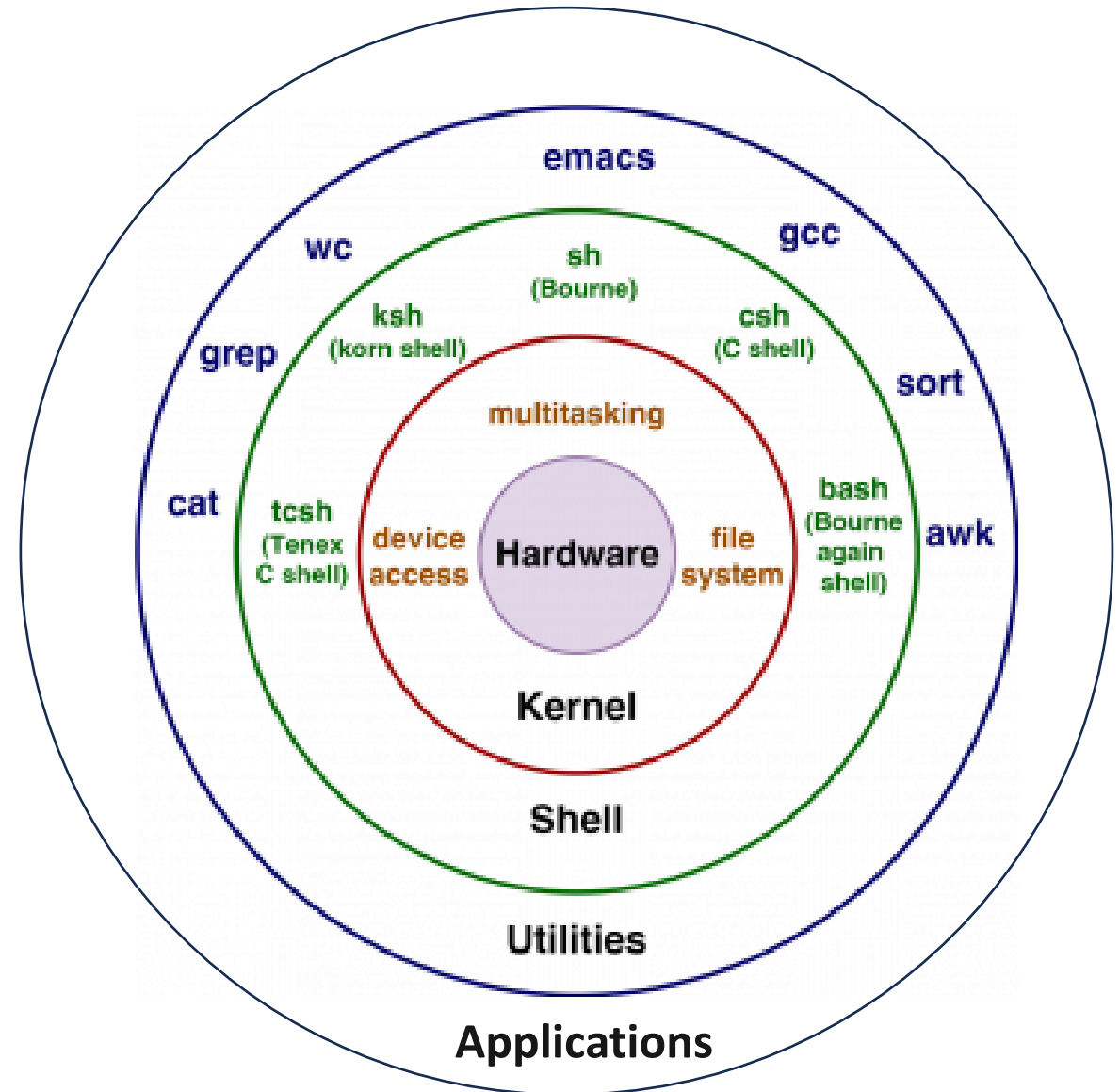


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Linux Architecture

- Hardware: CPU, RAM, IO, GPU
- Kernel: core of OS
- Shell: bash
- Utilities:
 - basic commands
 - text editor - vi, emacs, nano
 - compilers - gcc, intel, aocc, nvcc



<https://puneetpanwar.com/introduction-to-linux-command-line/>

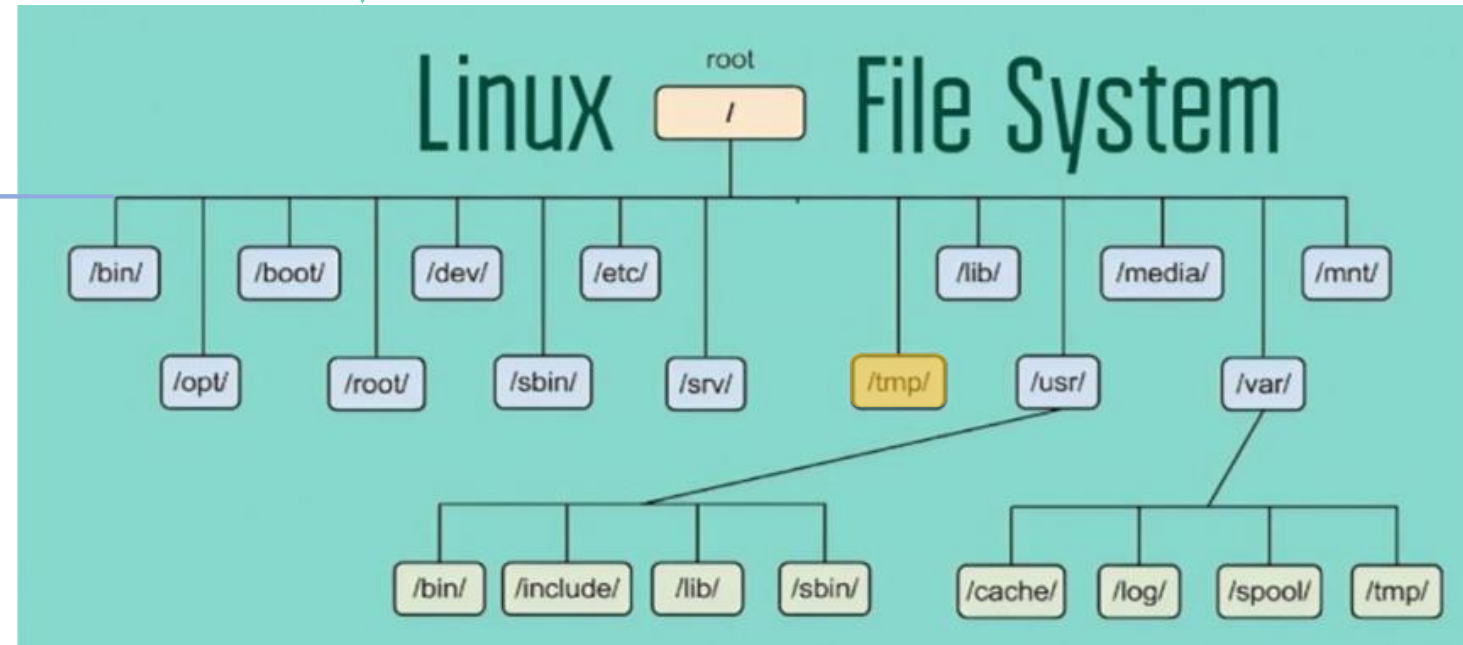
Linux File System (Folder Structure)



- /scratch16/<PI-userid>/<userid>
- /scratch4/<PI-userid>/<userid>
- /data/<PI-userid>/<userid>
- /home/<userid>

node

login (01-03)
compute
dtn (data transfer node)
management



<https://english.newstracklive.com/news/exploring-linux-file-system-hierarchical-structure--permissions-emc-sc71-nu384-ta384-1287279-1.html>

Linux File System (Storage Quota)

quota commands

```
$ du -shc /home/userid/
```

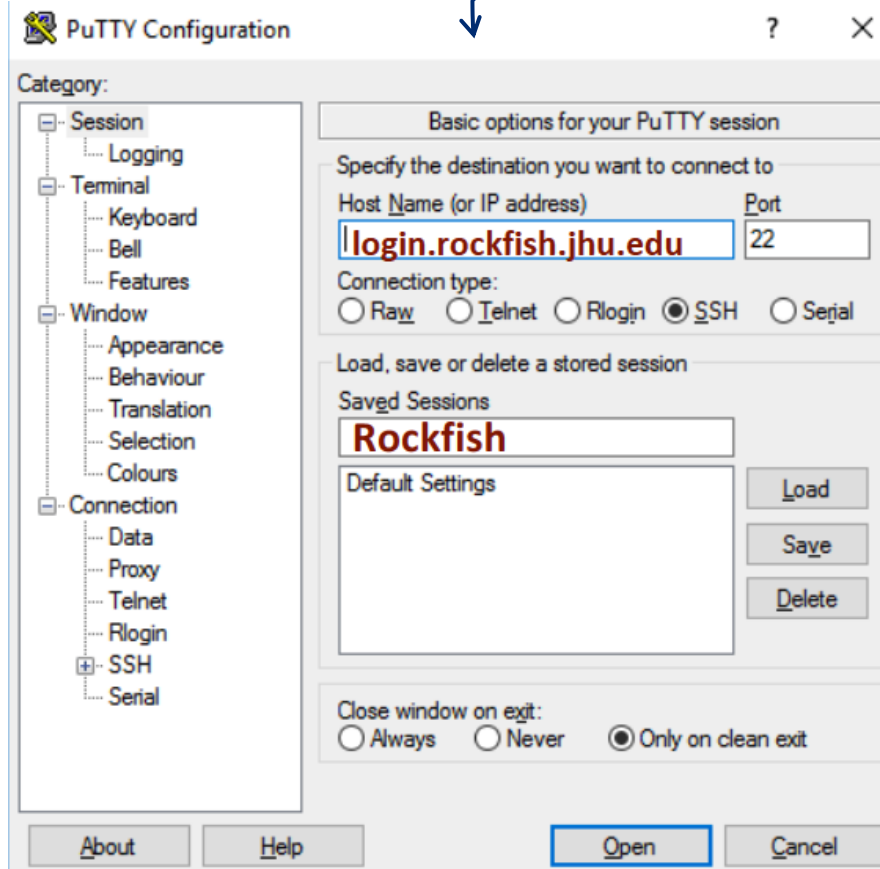
```
$ du -hc --max-depth=1
```

```
$ quotas.py
```

```
$ quotas.py [-group PI-userid]
```

File System	link/path	Capacity	quota	Comment
HOME	/home/userid		50GB	backed up
data	/data/PI- <u>userid</u>	6 PB	1TB	long term files
scratch4	/scratch4/PI- <u>userid</u>	2 PB	1TB	designed for small files, scratch/temporary files
scratch16	/scratch16/PI- <u>userid</u>	2 PB		designed for large files, scratch/temporary files
tmp	/tmp		1TB	

Connection



Windows

- Putty
- MobaXterm
- SecureCRT

gui

- Open OnDemand (OOD)
(requires VPN)

web

- portal.rockfish.jhu.edu

- PowerShell

cli

- Windows Sub-Linux System

Connection and File Transfer with CLI

globus.org is for large data transfer



Secure Shell

\$ ssh **(-l)** userid login.rockfish.jhu.edu

small l

\$ ssh userid@login.rockfish.jhu.edu

\$ ssh -X or ssh -Y

Secure Copy for scripts or small data

\$ scp local_file userid@login.rockfosh.jhu.edu:**(~)**

\$ scp **(-r)** local_dir userid@login.rockfosh.jhu.edu: \$HOME

\$ scp user id@login.rockfosh.jhu.edu:/path/to/file **(.)**

environment variables

- \$HOME
- ~
- /home/\$(id -un)
- /home/\$USER

.bashrc

.ssh

File Transfer from google drive

Rockfish OnDemand

AppsFilesJobsClustersInteractive AppsMy Interactive Sessions

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OnDemand provides an integrated, single access point for all of your HPC resources.

Pinned Apps

A featured subset of all available apps

Job Composer

System Installed App

Home Directory

System Installed App

TotalView

System Installed App

Mathematica

System Installed App

Jupyter Server

System Installed App

Abaqus/CAE

System Installed App

VSCoDe Server IDE/Editor

System Installed App

Matlab

System Installed App

Rockfish HPC Cluster Shell Access

System Installed App

Active Jobs

System Installed App

Desktop

System Installed App

ParaView

System Installed App

IGV Desktop

System Installed App

Lumerical

System Installed App

RStudio Server

System Installed App

JBrowse Desktop

System Installed App

Desktop (11764647)1 node | 1 core | Running

Host: >_c002

Delete

Created at: 2024-04-23 19:40:48 EDT

Time Remaining: 29 hours and 58 minutes

Session ID: f3b55076-ff2c-42ac-9a85-8f17425c575f

noVNC Connection

Native Instructions

Compression

0 (low) to 9 (high)

Image Quality

0 (low) to 9 (high)

Launch Desktop

View Only (Share-able Link)

A screenshot of a desktop environment with a dark background. A taskbar is visible at the bottom, containing several application icons including a terminal, a file explorer, and a web browser. A large red arrow points downwards towards the taskbar area.

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navigation commands

\$ cd

\$ PWD

account commands

\$ whoami

\$ id

- \$USER

environment variables

```
[twu73@login02 ~]$
```

whoami

hostname

```
[twu73@login02 Desktop]$
```

```
tsaiwei@DESKTOP-UCTGA49:~$ ssh -Y twu73@login.rockfish.jhu.edu
twu73@login.rockfish.jhu.edu's password:
Warning: No xauth data; using fake authentication data for X11 forwarding.
Last login: Fri Apr 19 11:03:59 2024 from 73.103.78.70
```

```
[STATUS] loading software modules
[STATUS] modules are Lmod (https://lmod.readthedocs.io/en/latest/)
[STATUS] software is Spack (https://spack.readthedocs.io/en/latest/)
[STATUS] the default modules ("module restore") use GCC 9 and OpenMPI 3.1
[STATUS] you can search available modules with: module spider <name>
[STATUS] you can list available modules with: module avail
[STATUS] loading a compiler, MPI, Python, or R will reveal new packages
[STATUS] and you can check your loaded modules with: module list --terse
[STATUS] to hide this message in the future: touch ~/.no_rf_banner
[STATUS] restoring your default module collection now
[STATUS] quota information listed below, you can view by invoking "quotas.py"
```

MOTD

Home Usage for user twu73 as of Mon Apr 22 18:00:08 2024

Used	Quota	Percent	Files
13.88 GB	0.00 KB	N/A	273,244

GPFS Usage for Group rfsadmin: as of Mon Apr 22 18:30:13 2024

FS	Used	Quota	Used %	Files	Files Quota	Files %
data	50.51 TB	150.00 TB	33.00%	29,756,870	61,440,000	48.00%
scratch4	7.40 TB	10.00 TB	74.00%	7,035,797	20,480,000	34.00%
scratch16	2.43 TB	10.00 TB	24.00%	3,035,106	10,240,000	29.00%

GPFS Usage for Group jaimecomb: as of Mon Apr 22 18:30:13 2024

FS	Used	Quota	Used %	Files	Files Quota	Files %
data	34.47 GB	1.00 TB	3.00%	28,613	409,600	6.00%
scratch4	695.76 GB	10.00 TB	6.00%	41,988	1,048,576	4.00%
scratch16	67.92 GB	5.00 TB	1.00%	71,203	5,120,000	1.00%

```
[twu73@login02 ~]$
```


More commands

ls	shows files
mv	move or rename files/dir
touch	create a file
mkdir	create a folder
cp [-r]	copy files or folder
rm [-r]	remove files or folder
wget	download from a link
curl	download file
scp [-r]	secure copy files from/to another host

hostname	shows the name of the node
who	list users on the node
top -u \$USER	displays a user's processes
htop	
history	shows the history of your commands
cat	view files
more / less	
head / tail	
cal [month] [year]	
date	

More commands

```
$ ls -l
```

```
drwxr-xr-x. 4 root root   68 Jun 13 20:25 tuned
-rw-r--r--. 1 root root 4017 Feb 24  2022 vimrc
```

list files

\$ ls -l long format

\$ ls -a hidden files

\$ ls -h human-readable

\$ ls -d folders

\$ ls -r reverse order

\$ ls -t modification time

\$ ls -alrt combination

find files

\$ find . -name file_name

\$ find . -type d -name dir_name

\$ find . -size +500M file_name

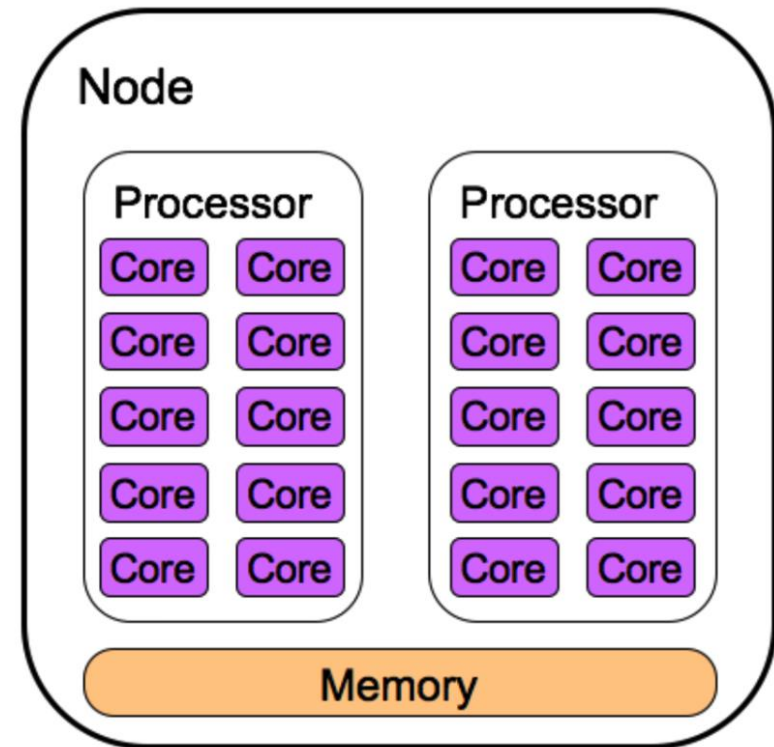
\$ find . -iname file_name

Demo

- list folders
- storage quota with du
- file permissions
- find files
- text editor nano
- calculate folder space
- history
- tmux

Terminology

- **NODE** on a cluster is a single computing unit.
- A node is comprised of many logical processors (=cpus=cores).
- A SLURM **JOB** can contains several **TASKS**. And each task can use one or more of cores.



The background of the slide is a photograph of a large, multi-story brick building with a series of prominent arches. The building is constructed of red brick with white mortar. To the left of the building, there are lush green trees and a clear blue sky with some light clouds. A person is visible standing on a balcony or walkway of the building, looking out. The overall scene is bright and sunny.

Questions?

THANK YOU.

help@rockfish.jhu.edu