



# Getting Started with AHPCC

Dr. Recep Erol  
HPC Admin & AI Facilitator  
October 3, 2024

# About Me



HPC Admin and AI Facilitator



AI/ML | Optimization | Inference Acceleration | Model Deployment



Parallel Computing | Distributed Computing | Hardware Acceleration



[rerol@uark.edu](mailto:rerol@uark.edu)




[erolrecep.github.io](https://erolrecep.github.io)




[@erolrecep](https://twitter.com/erolrecep)

# Agenda for Day 1


**GettingStartedwithAHPCC**
Private
Unwatch 1


main
1 Branch
0 Tags

Add file
Code

 <b>erolrecep</b>	final version of the repository is ready	e012e78 · 3 hours ago	14 Commits
Linux101	initial draft of day1	yesterday	
SLURM_Hands-on	final version of the repository is ready	3 hours ago	
SLURM_and_Module	final version of the repository is ready	3 hours ago	
images	media were added	yesterday	
.gitignore	mac cache files are removed	yesterday	
README.md	schedule and plan is getting more and more available	8 hours ago	

**README**

## Getting Started with AHPCC



Arkansas High Performance Computing Center

## Linux 101: Hands-On Training

In this training, we are going to learn the basics of how to use a linux based operating system (OS) operations using command environment, terminal in an HPC system. We will learn from creating a file to moving a folder to another folder, downloading a file from internet and more. Alright, let's get started.

In this hands-on session, you will learn what is terminal, why do we need it, and different from other operating systems, terminal is very important for the Linux-based OS. You can think of, terminal is a kind of interface between the user and the operating system's brain.

Many HPC users like to develop projects in HPC environment. To help new users to get used to this habit, we will build a project template together to help you how you can organize files/folder for your project in the HPC system.

If everyone is ready to start, let's get started!

Make sure to open the interactive GUI desktop application and then open a terminal session from the toolbar. Then follow the instructions below.

Since terminal shows us where we are, we like to see the full path with;

```
$ pwd
```

Change directory to where you want to create your project template

```
$ cd /home/erol/Desktop
```

Create the project folder

```
$ mkdir python-project-template
```

List the directory to see if we actually created the folder ???

```
$ ls
```

# Day 1 Learning Goals

- Introduce HPC Portal
- Login system
- Login & Compute terminal contexts
- Hands-on Linux 101 training
- Clone a repository from GitHub and run in the terminal

# Check First

- You have a laptop?
- You are connected to ***UARK WIFI***, not ~~UARK Guest!~~
- Your browser is working?



UNIVERSITY OF  
ARKANSAS

# Snapshot from Data Center





<https://hpc-portal2.hpc.uark.edu/>



# OnDemand Portal - Login

🌐 hpc-portal2.hpc.uark.edu

This site is asking you to sign in.

Username

Password





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

# Let's Create Instances

- Pinnacle Desktop
- Jupyter Notebook



# Portal Terminal

Clusters ▼

Interactive Apps ▼

>\_Grace Shell Access

>\_Karpinski Shell Access

>\_Pinnacle Shell Access

Pinnacle Shell Access



# Portal Terminal

```
INFO: this login node has **no access to external network**  
      for wget, git, operations please use any one of pinnacle-l[3-5,8-10]  
      or cloud compute nodes.
```

Login nodes are for file operations and job submission.

All login nodes run a different kernel than compute nodes, so:

- Don't compile on login nodes. Resulting code won't work on compute nodes.
- Don't run R or Python on login nodes.

For a shared cloud compute node:

```
srun -N1 -n1 -c1 -p cloud72 -q cloud -t 72:00:00 --pty /bin/bash
```

```
Last login: Wed Sep 25 11:30:33 2024 from 172.16.15.63
```

	Quota	kilobytes	files
/scrfs	10,000,000,000		2,000,000
rerol	4,467,140		56,737

Currently Loaded Modules:

- 1) null

```
pinnacle-l2:rerol:~$
```



First attempt:

ssh [rerol@portal2.hpc.uark.edu](https://rerol@portal2.hpc.uark.edu) -p 2022

1. Login to the AHPCC via link:
  - ssh hpc-portal2.hpc.uark.edu
2. Login via IP address:
  - ssh 130.184.31.10

Web portal access link is also given here!

```
(rerol@hpc-portal2.hpc.uark.edu) Password:
Last login: Tue Sep 10 10:01:10 2024 from 104.241.14.65

Arkansas High Performance Computing Center
off-campus access portal (DMZ)

=====
https://hpc-portal2.hpc.uark.edu    <- Open Ondemand Web Portal
ssh hpc-portal2.hpc.uark.edu        <- Standard AHPCC login
ssh 130.184.31.10                   <- Standard AHPCC login

Access allowed from 104.241.14.65 until Mon Sep 16 23:39:07 CDT 2024
=====

Connection to hpc-portal2.hpc.uark.edu closed.
-> ~
```

Your IP address

You're allowed to login to the system for the next 12 hours.



Now, we're in a "Login Node"

Create a shared cloud compute job

```
[rerol@hpc-portal2.hpc.uark.edu's password:
```

```
Login nodes are for file operations and job submission.  
All login nodes run a different kernel than compute nodes, so:  
- Don't compile on login nodes. Resulting code won't work on compute nodes.  
- Don't run R or Python on login nodes.
```

```
For a shared cloud compute node:  
srun -N1 -n1 -c1 -p cloud72 -q cloud -t 72:00:00 --pty /bin/bash
```

```
Last login: Fri Sep 13 11:01:48 2024 from 104.241.14.65
```

Quota	kilobytes	files
/scrfs	10,000,000,000	2,000,000
rerol	4,074,752	43,216

```
Currently Loaded Modules:  
1) null
```

```
pinnacle-18:rerol:~$ |
```

You can submit  
a job from a  
login node!



sbatch job.sh  
or  
Sbatch job.slurm

Account storage information

The system assigned me to the "pinnacle-18  
login node"



SLURM assigned me to this  
compute node

Create a compute node job

```
[pinnacle-l8:rerol ~]$ srun -N1 -n1 -c1 -p cloud72 -q cloud -t 72:00:00 --pty /bin/bash  
srun: job 500935 queued and waiting for resources  
srun: job 500935 has been allocated resources
```

Currently Loaded Modules:  
1) null 2) os/el7

c1331:rerol:~\$ |

Which software/packages  
are loaded?





Command	Explanation
Srun	Submit job or allocate resources in SLURM
-N1	Number of nodes in the HPC system
-n1	Number of tasks
-c1	Number of CPU core
-p	Partition name from SLURM resources
cloud72	Name of the partition in the SLURM
-q	Job queue type. In this case "cloud" type
cloud	Job queue type.
-t	Time parameter for "Maximum runtime"
72:00:00	72 hours
--pty	"psuedo-terminal" for interactive terminal session
/bin/bash	Type of shell where the job will be submitted

```
[pinnacle-l8:rerol:~$ srun -N1 -n1 -c1 -p cloud72 -q cloud -t 72:00:00 --pty /bin/bash
```

# Linux 101 – Hands-on Demo

- Create Python Project Template
  - Instructions are given in the GitHub repository
  - You can use browser-based terminal
  - Or Visual Studio Code --> Shown on the next slide
- ❖ Please ask any questions you may have

[Version 1.93](#) is now available! Read about the new features and fixes from August.

X

Overview

SETUP

GET STARTED

USER GUIDE

SOURCE CONTROL

TERMINAL

GITHUB COPILOT

LANGUAGES

NODE.JS /  
JAVASCRIPT

TYPESCRIPT

PYTHON

JAVA

C++

C#

DOCKER

DATA SCIENCE

AZURE

REMOTE

Overview

SSH

Dev Containers

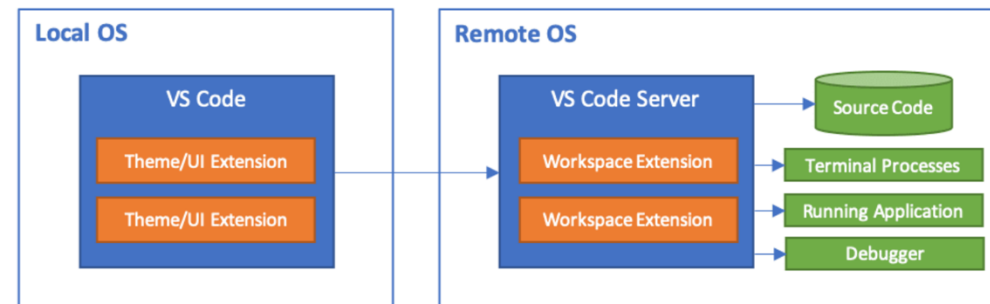
## VS Code Remote Development

Edit

Visual Studio Code Remote Development allows you to use a container, remote machine, or the [Windows Subsystem for Linux](#) (WSL) as a full-featured development environment. You can:

- Develop on the **same operating system** you deploy to or use **larger or more specialized hardware**.
- **Separate** your development environment to avoid impacting your local **machine configuration**.
- Make it easy for new contributors to **get started** and keep everyone on a **consistent environment**.
- Use tools or runtimes **not available** on your local OS or manage **multiple versions** of them.
- Develop your Linux-deployed applications using the **Windows Subsystem for Linux**.
- Access an **existing** development environment from **multiple machines or locations**.
- Debug an **application running somewhere else** such as a customer site or in the cloud.

No source code needs to be on your local machine to get these benefits. Each extension in the [Remote Development extension pack](#) can run commands and other extensions directly inside a container, in WSL, or on a remote machine so that everything feels like it does when you run locally.



### IN THIS ARTICLE

Getting started

Remote tutorials

GitHub Codespaces

Questions or feedback

 [Subscribe](#)

 [Ask questions](#)

 [Follow @code](#)

 [Request features](#)

 [Report issues](#)

 [Watch videos](#)

# List of commands we use in the hands-on session

- pwd
- cd
- mkdir
- ls
- ls -al (for a detailed view of list)
- touch
- rm <filename>
- rm -r <foldername>
- man <softwarename>
- cat <filename>
- head <filename>
- tail <filename>



# Getting Started with AHPCC

Dr. Recep Erol  
HPC Admin & AI Facilitator  
October 4, 2024



# Day 2

# Welcome Back!

# What We Learned Yesterday

- Interactive Portal
  - Created a remote desktop environment
  - Login to the system through terminal
  - Learned about file system and other information
- Hands-on experience on Linux 101
- Cloned GitHub repository and run the project



# Agenda for Day 2

## SLURM and Module

---

In this part of the workshop, we will introduce SLURM and Module software to you.

[SLURM](#) and [Module](#) are the two very important software we use every day to manage our compute environment and jobs to submit in an HPC system. Once you grasp these software, the rest of the workflow will be a lot easier for you in an HPC systems.

This README file is a kind of guideline for the hands-on exercises for this part of the workshop.

### What is Module? and Why we use it?

---

High Performance Computing (HPC) or Supercomputing systems are shared environments. In other words, multiple users use these systems together. Everybody has their own setup to work on different tasks. To be able to manage these demands, there should be a mechanism where user should be able to manage their software requirements and dynamic modifications. Module allows these changes and modifications on the software.

There are number of software and almost each software has multiple versions. It's almost impossible to install all these software at the same time to a computer or compute environment. Very possible to have conflicts between software and some will prevent others to run. These and a lot more issues would easily be solved if we use **Module** for our software management.

### What is SLURM? and Why we use it?

---

Simple Linux Resource Management or Slurm Workload Management is a software that is designed and provided to schedule your jobs, to manage your resources including CPU's, GPU's, RAM, or storage, or monitor submitted jobs to an HPC system. As we can guess from the name of the software, SLURM is a very useful software for multiple purposes. There are many commands that you can use and these commands are introduced in the hands-on exercises.

By completing the hands-on exercises in this part of the workshop, you're going to have a solid understanding of how you can manage your compute environment and manage your jobs in an HPC.

### Hands-on Exercises

---

- [Module Hands-on Exercise](#)
- [SLURM Hands-on Exercise](#)

Good Luck!

# Day 2 Learning Goals

- Introduce HPC Software
  - SLURM & Module
- Resource management and job submission with SLURM
- Software management with Module
- Hands-on training with,
  - Module
  - SLURM

# Check First

- You have a laptop?
- You are connected to ***UARK WIFI***, not ~~UARK Guest!~~
- Your browser is working?

# SLURM & Module



ENVIRONMENT  
**MODULES**

# What is Module?

- HPC is a shared environment
- There are a lot of software and difficult to manage all at once

# Hands-on Module Training

- Follow instructions in GitHub repository!

# What is SLURM?

- The Slurm Workload Management or Simple Linux Utility Resource Management (SLURM)
- Job scheduler
- Create interactive compute job with “srun”
- Job monitoring



# SLURM Hands-on Training

- Follow instructions in GitHub repository!

# Recap for Today

- Introduce HPC Software
  - SLURM & Module
- Resource management and job submission with SLURM
- Software management with Module
- Hands-on training with,
  - Module
  - SLURM



# Getting Started with AHPCC

Dr. Recep Erol  
HPC Admin & AI Facilitator  
October 3 & 4, 2024