

University of Central Arkansas

# Bruce HPC System Documentation

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# Bruce Documentation

## 1 Accessing Bruce

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### 1.1 Requesting an Account

To request a user account for the Bruce HPC system, click on the link below. Your default email handler will be launched. Provide your first and last names and UCA ID in the body of the email. You will receive your account credentials via email as soon as your account is ready.

[Bruce Account Request](#)

Alternatively, email your request with the following information.

*To:* `jcorkran@uca.edu`

*Subject:* `Bruce-Account-Request`

*Body:* Provide First name, Last name, and UCA ID.

### 1.2 Resetting Your Password

To reset your password, click on the link below. Your default email handler will be launched. Provide your first and last names and Bruce username in the body of the email. You will receive your account credentials via email as soon as your account is ready.

[Bruce Password Reset](#)

Alternatively, email your request with the following information.

*To:* `jcorkran@uca.edu`

*Subject:* `Bruce-Password-Reset`

*Body:* Provide First name, Last name, Bruce username.

### 1.3 First Time Login / Password Change

The first time you log in to Bruce, you must change your password. This can be done using the `passwd` command.

```
$ passwd
```

You will then be prompted to change your password.

## 1.4 SSH Command Line

Bruce is accessed through the secure protocol SSH. It provides a text-based interface by spawning a remote shell. After connecting, all commands you type in your local terminal are sent to the remote server and executed there.

```
ssh [username@]161.31.5.50
```

Example:

```
ssh jcorkran@161.31.5.50
```

## 1.5 SSH Utilities

The following are suggested SSH utilities, but there are many others available for free on the WWW.

### 1.5.1 Putty

Download: <https://www.chiark.greenend.org.uk/~sgtatham/putty/>

### 1.5.2 MobaXterm

Download: <https://mobaxterm.mobatek.net/download.html>

## 2.1 Home Directory

Once you SSH into the server, by default, you will be automatically taken to your home directory. This is your default directory in which you can save your files; no one can write to this directory but you.

## 2.2 Useful Commands

Command	Description
ls	List all the files and directories
ls -alhF	List files and directories with detailed information like permissions, size (human-readable format), owner, etc.
cd	Change directory
mkdir	Make a new directory
rmdir	Remove a directory
mv	Rename or move a directory
cp	Copy a file or directory
cat, less	Display contents of a file
rm	Remove a file or directory
pwd	Print the current working directory
Vim	Open a file for editing

A more comprehensive list of commands and examples can be found at: [101 Bash Commands and Tips for Beginners to Experts](#).

## 2.3 Transferring Files

### 2.3.1 SCP Syntax:

```
scp [local_file] [username@]server_IP:[remote_file] [destination]
```

Examples:

Copying a local file to my home directory on the remote server.

```
$ scp myfile.txt jcorkran@161.31.5.50: ~1
```

Copying a remote file from my home directory to my local current working directory.

```
$ scp jcorkran@161.31.5.50:~/documents/myfile.txt .2
```

---

<sup>1</sup> The tilde (~) represents a user's home directory.

<sup>2</sup> The dot (.) represents a user's current working directory (the directory you are currently in).

More information about **scp** can be found at: <https://www.geeksforgeeks.org/scp-command-in-linux-with-examples/>

## 2.3.2 FTP – Clients

The following are suggested FTP clients, but there are many other free clients on the WWW.

### 2.3.2.1 Filezilla

Download: <https://filezilla-project.org/>

### 2.3.2.2 WinSCP

Download: <https://winscp.net/eng/index.php>

### 2.3.2.3 MobaXterm

Download: <https://mobaxterm.mobatek.net/download.html>

## 2.4 Running Programs

### 2.4.1 Slurm

Slurm is a workload management system used for submitting, monitoring, modifying, and deleting jobs. It is normally used with job scripts to submit and execute jobs. Various settings can be included in the job script, such as the number of processors, resource usage, and application-specific variables. The steps for running a job through Slurm are outlined below.

### 2.4.2 Slurm Job Scripts

**NOTE: This is by no means an exhaustive overview of the capabilities and commands available in SBATCH. For more information, refer to the [Additional Resources](#) section.**

To run scripts with Slurm, we use the sbatch command acting on a job script. In a job script, the user can add and modify the Slurm options.

An sbatch script example is given below. There are many other options available, this is just a very small example of what is possible.

```
$ cat examplescript.sh
#!/bin/sh
#SBATCH -o my.stdout          # output file name
#SBATCH --time=303          # time limit to the batch job
#SBATCH --ntasks-per-node=4
srun hello
```

The structure is:

---

<sup>3</sup> Acceptable time formats include “minutes”, “minutes:seconds”, “hours:minutes:seconds”, “days-hours:minutes”, and “days-hours:minutes:seconds”.

**Shebang line:** shell definition line

**SBATCH lines:** optional job script directives

**shell commands:** optional shell commands, such as loading modules.

**Application execution line:** execution of the application using sbatch, the Slurm submission wrapper.

### Commenting vs. Commands

Line Starts With	Treated As
#	Comment in shell and Slurm
#SBATCH	Comment in shell, option in Slurm
# SBATCH	Comment in shell and Slurm

### 2.4.3 Slurm Script Options

#SBATCH {options} {parameter}

The following are some of the more useful options, a full list can be obtained by typing `sbatch --help` at the command line.

Directive Description	Specified As
Name the job <jobname>	#SBATCH -J <jobname>
Request at least <minnodes> nodes	#SBATCH -N <minnodes>
Request <minnodes> to <maxnodes> nodes	#SBATCH -N <minnodes>-<maxnodes>
Request at least <MB> amount of temporary disk space	#SBATCH --tmp <MB>
Run the job for a time of <walltime>	#SBATCH -t <walltime> <sup>4</sup>
Run the job at <time>	#SBATCH --begin <time>
Set the working directory to <directorypath>	#SBATCH -D <directorypath>
Set error log name to <jobname.err>*	#SBATCH -e <jobname.err>
Set output log name to <jobname.log>*	#SBATCH -o <jobname.log>
Mail <user@address>	#SBATCH --mail-user <user@address>
Mail on any event	#SBATCH --mail-type=ALL
Mail on job end	#SBATCH --mail-type=END
Run job in partition	#SBATCH -p <destination>

\*By default, both standard output and standard error are redirected to a file.

<sup>4</sup> Acceptable time formats include “minutes”, “minutes:seconds”, hours:minutes:seconds”, “days-hours:minutes” and “days-hours:minutes:seconds”.



## 2.4.4 Submitting Slurm Job Script

To submit a job to Slurm, use the *sbatch* command.

### Example:

```
[jcorkran@bruce ~]$ sbatch slurm.scr
Submitted batch job 17
[jcorkran@bruce ~]$
```

## 2.4.5 Checking and Changing Queued Job Status

After submitting a job, the status of the job can be viewed using the *squeue* command. The default queue used by Slurm is called *defq*. The job number can be specified with the *-j* option to avoid seeing other jobs. Other options can be found in the man page<sup>5</sup> for *squeue* (*man squeue*).

To cancel a job, use the *scancel <job number>* command.

To edit a job in the queue, use the *scontrol* command. This command allows a user to change several parameters of a job while in the queue such as changing the start time. For more information about *scontrol*, refer to the man page for *scontrol*.

**WARNING** - *sview* can only be used with an X-Server enabled SSH client, such as Moba-Xterm.

Just as with *scontrol* a user can edit a job in the queue using the *sview* tool. This is a GUI based application that allows the job to be viewed and edited with a right-click menu. *Sview* can also perform many other functions, including canceling jobs.

## 2.4.6 List of Commands used in this Chapter

```
$ sbatch <filename>
$ sinfo
$ squeue
$ sview
$ scancel
$ scontrol
```

---

<sup>5</sup> A man page (short for “manual page”) is a form of software documentation usually found on a Linux/Unix operating system

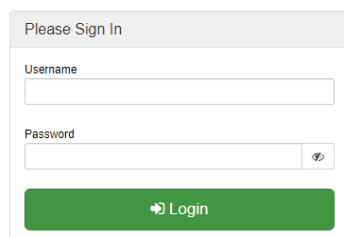
# 3

## User Web Portal

### 3.1 Web Portal URL

The user web portal is available at:

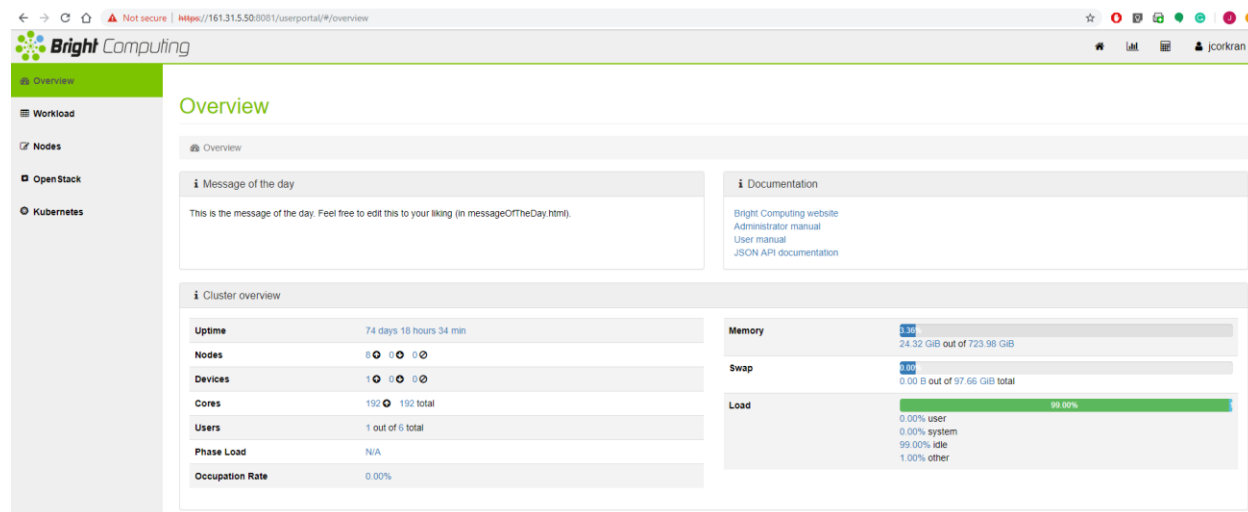
<https://161.31.5.50:8081/userportal/#/login>



A screenshot of a web portal login form. The form is titled "Please Sign In" and contains two input fields: "Username" and "Password". The "Password" field has a small eye icon to its right, indicating it is a password field. Below the input fields is a green button with a white arrow icon and the text "Login".

### 3.2 Web Portal Overview

The user portal allows users to log in via a web interface. It does not provide any administrative functions but allows the user to view the state of the cluster and general data about the system. The first time a browser is used to log into the portal, a warning message will appear about the site certificate being untrusted. This can be safely accepted.



A screenshot of the User Web Portal Overview page. The page is titled "Overview" and features a sidebar on the left with navigation options: Overview, Workload, Nodes, OpenStack, and Kubernetes. The main content area is divided into several sections:

- Message of the day:** A message box with the text "This is the message of the day. Feel free to edit this to your liking (in messageOfTheDay.html)." and a small edit icon.
- Documentation:** A list of links: "Bright Computing website", "Administrator manual", "User manual", and "JSON API documentation".
- Cluster overview:** A table of system metrics:

Uptime	74 days 16 hours 34 min
Nodes	1 0 0 0
Devices	1 0 0 0
Cores	192 192 total
Users	1 out of 6 total
Phase Load	N/A
Occupation Rate	0.00%
- Memory:** A progress bar showing "24.32 GiB out of 723.98 GiB".
- Swap:** A progress bar showing "0.00 B out of 97.66 GiB total".
- Load:** A progress bar showing "99.00%" with a breakdown: "0.00% user", "0.00% system", "99.00% idle", and "1.00% other".

## 4.1 Quick Start Guide

This is a simple step-by-step guide to get you started as quickly as possible.

Request a user account: [Chapter 2 Request an Account](#)

## 4.2 Logging in to Bruce

If this is the first time you are logging into Bruce, be sure to reset your password. See [Accounts and Passwords](#) for more information.

Access to Bruce is possible by using SSH. Open your preferred SSH client and:

**NOTE: Windows 10 now supports SSH by default through the Command Prompt.**

- Enter:
  - For Terminals:
    - `ssh yourusername@161.31.5.50`
  - For Applications:
    - Host = 161.31.5.50
    - Connection = SSH
    - Port = 22
- Input password

## 4.3 Submitting a job using #SBATCH

It is recommended to use a script when submitting jobs to Bruce. This allows for easier troubleshooting and tracking of batch system parameters used.

Bruce uses a batch system called Slurm. To create a new job script you need to:

- open a new file in the text editor of your choice (e.g., nano or vim)
- compose a job script including batch system directives
- save the file and submit it to the batch system queue using the *sbatch* command

The following is a simple example of submitting a job using vim as the text editor and sbatch for job submission.

## 4.4 SRUN job with two tasks

```
$ vim submit.sh
```

```

#!/bin/bash
#SBATCH --job-name=testjob           # The name you want the job to have
#SBATCH --output=sample-%j.out      # The filename for the jobs output (stdout)
#SBATCH --error=sample-%j.err       # The filename for the jobs error output (stderr)
#SBATCH --nodes=2                   # The number of compute nodes to use
#SBATCH --time=10:00                # The maximum time allowed for the job in minutes
#SBATCH --partition=defq            # The name of the default queue is defq

srun hello                          # srun used to run the executable in your current
srun hostname                        # working directory
srun sleep 60                       # srun used to run the hostname command in parallel
~
~

```

**NOTE:** Short-hand options exist, e.g., “--job-name” is equivalent to the “-j” option from [Slurm Script Options](#).

Save the file in the current working directory and then run your job script.

```

$ sbatch submit.sh
Submitted batch job 29
$ ls
hello  hello.c  sample-29.err  sample-29.out  submit.sh

```

## 4.5 Batch system commands

The following is a list of commands useful to end-users for submitting and managing their jobs.

- ***sbatch*** *<script\_file>* submits a job to the batch system which is then inserted into the job queue
- ***squeue*** shows the current job queue
- ***scontrol show job*** *<job\_id>* shows detailed information about the specific job
- ***scancel*** *<job\_id>* deletes a job from the queue

## 5.1 Bright Computing Documentation

<https://www.brightcomputing.com/documentation>

## 5.2 Other Resources (e.g., Slurm scripts)

<https://www.hpc2n.umu.se/documentation/guides>

<https://www.hpc2n.umu.se/>

<http://www.arc.ox.ac.uk/content/slurm-job-scheduler>