

A scenic view of the University of Colorado Boulder campus. In the foreground, a large, historic red brick building with a prominent tower and an American flag on top is visible. The building is surrounded by lush green trees with some autumn-colored foliage. In the background, a large, rugged mountain with rocky peaks and green slopes rises under a blue sky with light clouds.

**Alpine in your Browser: The Open  
OnDemand Gateway**

**Be Boulder.**



University of Colorado **Boulder**



# Alpine in your Browser! The Open OnDemand Gateway

Instructors: Trevor Hall, Brandon Reyes

- Website: [www.rc.colorado.edu](http://www.rc.colorado.edu)
- Helpdesk: [rc-help@colorado.edu](mailto:rc-help@colorado.edu)
- Slides: <https://github.com/ResearchComputing/OpenOnDemand>
- Survey: <http://tinyurl.com/curc-survey18>

# RMACC Cyber Infrastructure



- <https://ask.cyberinfrastructure.org/c/rmacc/65>
- This forum provides an opportunity for RMACC members to converse amongst themselves and with the larger global research computing community.
- The “go to” general Q&A platform for the global research computing community - researchers, facilitators, research software engineers, CI engineers, sys admins and others.

# Agenda

- About Open OnDemand
  - What is ACCESS-CI?
- How to log in to Open OnDemand
- Features of Open OnDemand
  - Using the Shell
  - File Transfer
  - Job Monitoring and Composer
- Interactive Applications
  - Demos!

# Open OnDemand



- Open OnDemand is an NSF-funded open-source HPC portal based on the Ohio Supercomputing Center's original OnDemand portal
- Enables web access to HPC resources, including:
  - Easy file management
  - Command-line shell access
  - Job management and monitoring across different batch servers and resource managers
  - Graphical desktop environments and desktop applications

# Open OnDemand (at CURC)



- Open OnDemand provides a browser-based interface to interact with Alpine and Blanca!
- All CURC users can access Open OnDemand
  - CU Users: <https://ondemand.rc.colorado.edu/>
  - CSU, AMC, RMACC users: <https://ondemand-rmacc.rc.colorado.edu>
- Notable Features:
  - SSH-free terminal access
  - Remote desktop
  - Jupyter Notebooks
  - RStudio
  - MATLAB

# ACCESS-CI (RMACC Users Only)

- ACCESS-CI provides:
  - Allocations
  - Support
  - Operations
  - Metrics
- Supports CURC by managing RMACC users
- Get an ACCESS-CI Account:  
<https://identity.access-ci.org/new-user.html>



Advanced Cyberinfrastructure Coordination Ecosystem:  
Services & Support

# ACCESS-CI (RMACC Users Only)

- Once you have an ACCESS-CI Account, reach out to us with the following information:
  - Your ACCESS-CI username
  - Your institutional affiliation
  - Your role
  - Your department
  - Your first and last name
  - Your preferred email address
- We will provision you an account!



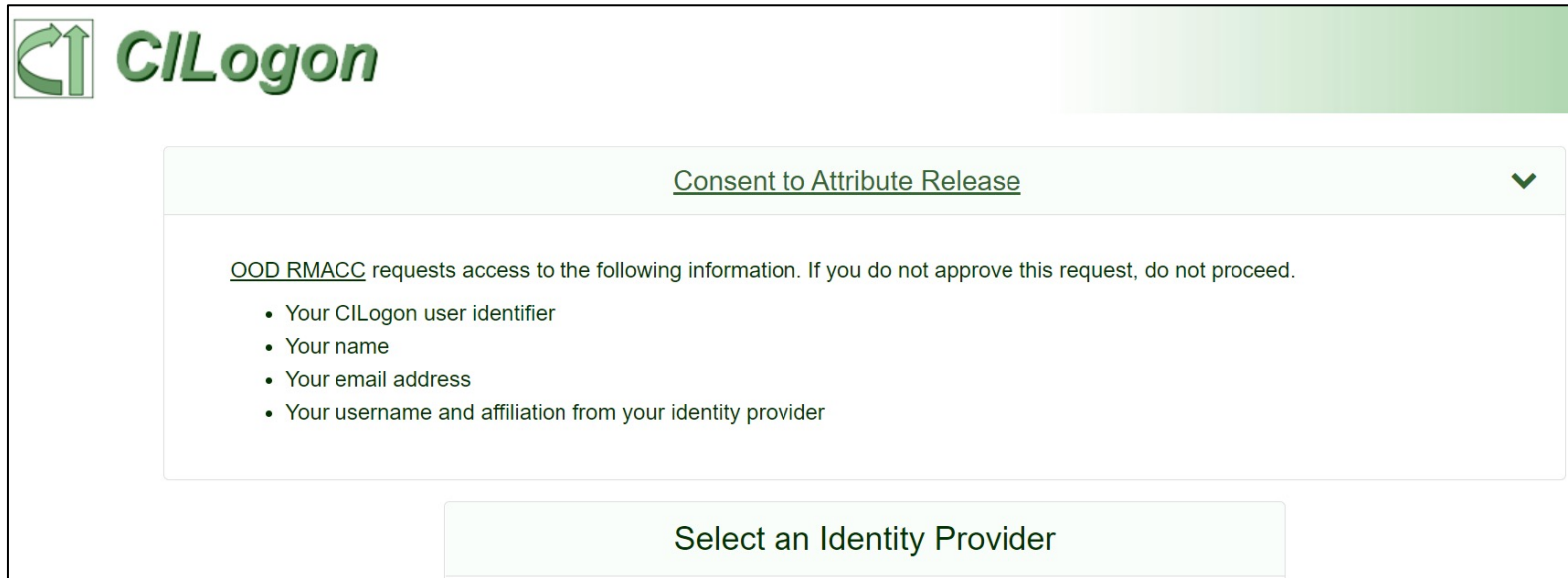
Advanced Cyberinfrastructure Coordination Ecosystem:  
Services & Support




# Logging in to Open OnDemand

# Logging In

- CU Boulder: <https://ondemand.rc.colorado.edu/>
- RMACC: <https://ondemand-rmacc.rc.colorado.edu>
  - You will be re-directed to the CILogon sign-in page:



 **CILogon**

[Consent to Attribute Release](#) ▼

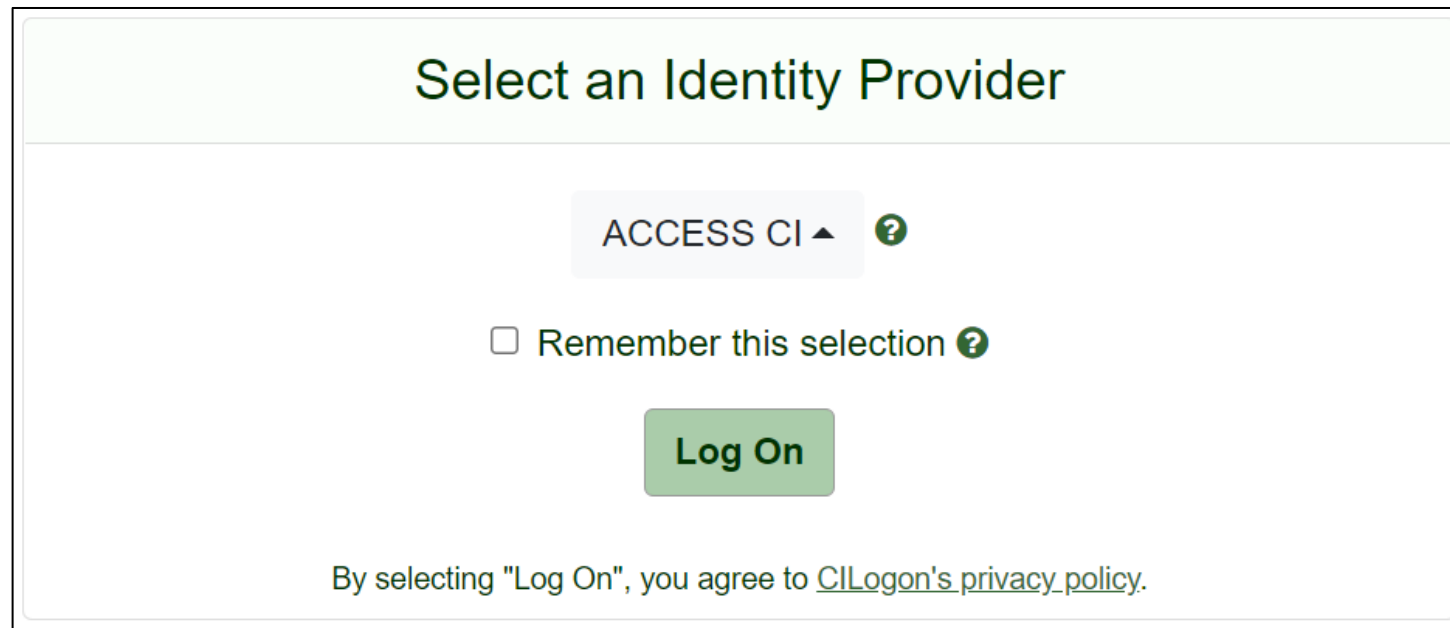
OOD RMACC requests access to the following information. If you do not approve this request, do not proceed.

- Your CILogon user identifier
- Your name
- Your email address
- Your username and affiliation from your identity provider

Select an Identity Provider

# Logging In (RMAACC Users Only)

- Select your identity provider.
  - If you are a CSU user, select 'Colorado State University'
  - If you are from **any** other institution, select 'ACCESS CI (XSEDE)'

A screenshot of a web form titled "Select an Identity Provider". The form has a light green header bar with the title. Below the header, there is a dropdown menu currently showing "ACCESS CI" with a small upward arrow and a green question mark icon to its right. Below the dropdown is a checkbox labeled "Remember this selection" followed by a green question mark icon. At the bottom of the form is a green "Log On" button. Below the button, there is a line of text: "By selecting 'Log On', you agree to [CILogon's privacy policy](#)." data-bbox="212 447 778 882"/>

Select an Identity Provider

ACCESS CI ▲ ?


☐ Remember this selection ?

Log On

By selecting "Log On", you agree to [CILogon's privacy policy](#).

# Logging In (cont.)

- CU Boulder: Authenticate with your Identikey and Password
- CSU: Authenticate with your EID and Password
- RMACC: You will be redirected to the ACCESS-CI login page
  - Use your ACCESS username and password

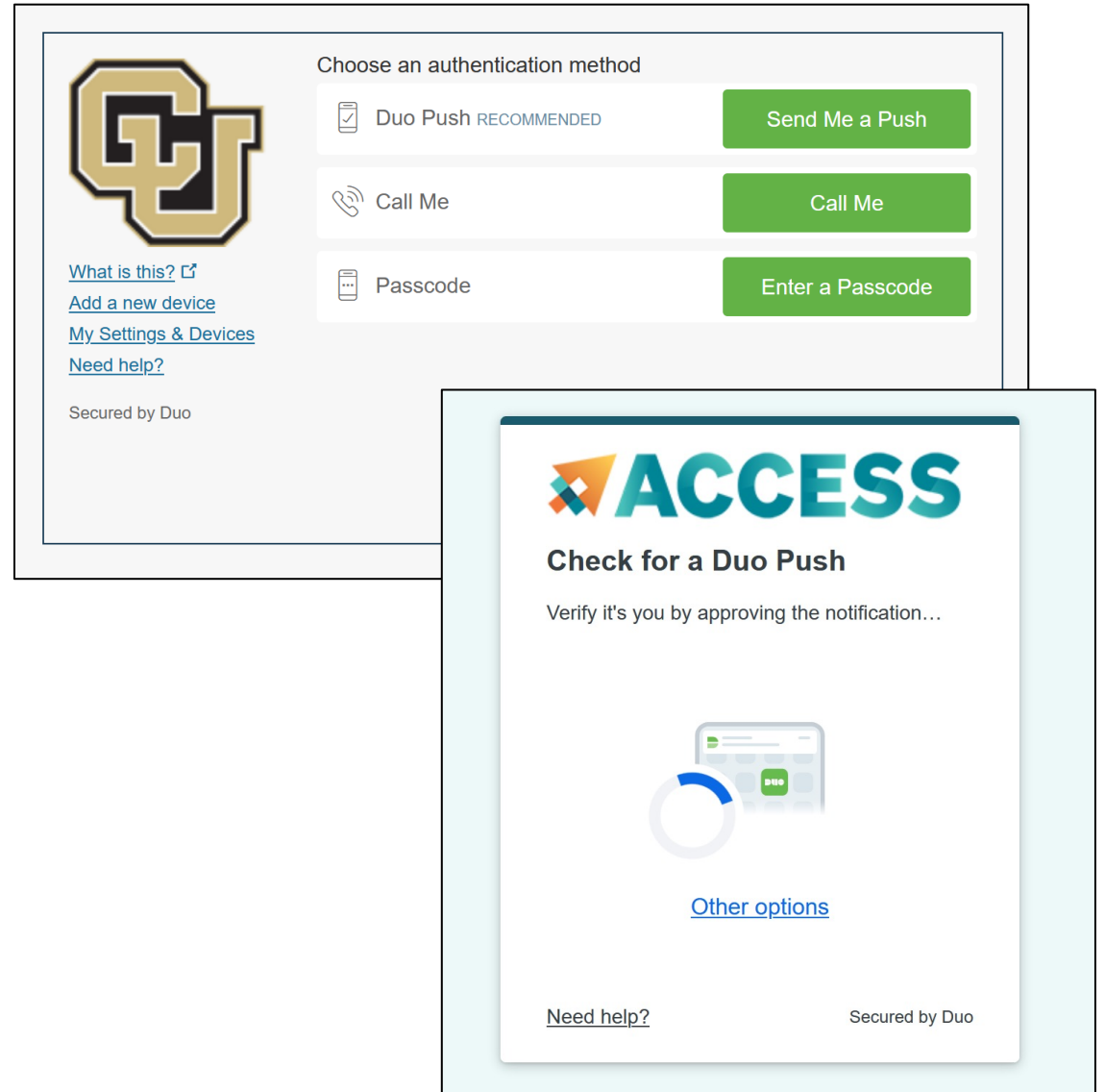


The screenshot shows the ACCESS-CI login interface. At the top left is the ACCESS logo, which consists of a stylized 'A' made of three colored triangles (orange, yellow, blue) followed by the word 'ACCESS' in blue. Below the logo is the text 'Login to CILogon'. There are two input fields: the first is labeled 'ACCESS Username' and the second is labeled 'ACCESS Password'. Below these fields is a blue button with the text 'Login'. At the bottom left is a green circular arrow icon, and to its right is the text 'CILogon' in a green, italicized font.



# Logging In

- Duo 2-Factor Authentication is a requirement for the security of our systems.
- CU Boulder and CSU users must have this configured prior to logging in
- RMACC users will be prompted to set up Duo 2FA upon logging in for the first time



# Demo: Logging in to Open OnDemand

<https://ondemand.rc.colorado.edu/>

<https://ondemand-rmacc.rc.colorado.edu>

# Features of Open OnDemand

# OnDemand Home Page

- From the home page, you can access the following Open OnDemand Features:
  - Files
  - Jobs
  - Clusters
  - Interactive Apps
  - My Interactive Sessions



Files ▼

Jobs ▼

Clusters ▼

Interactive Apps ▼

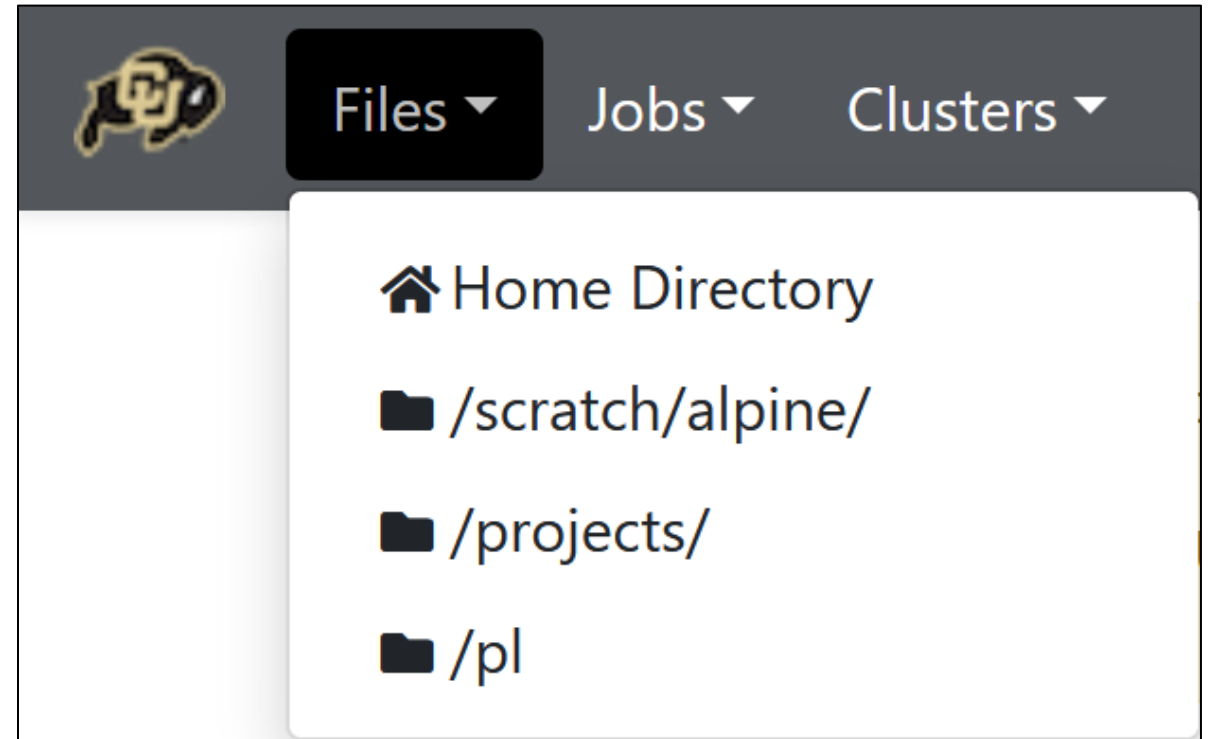


My Interactive Sessions



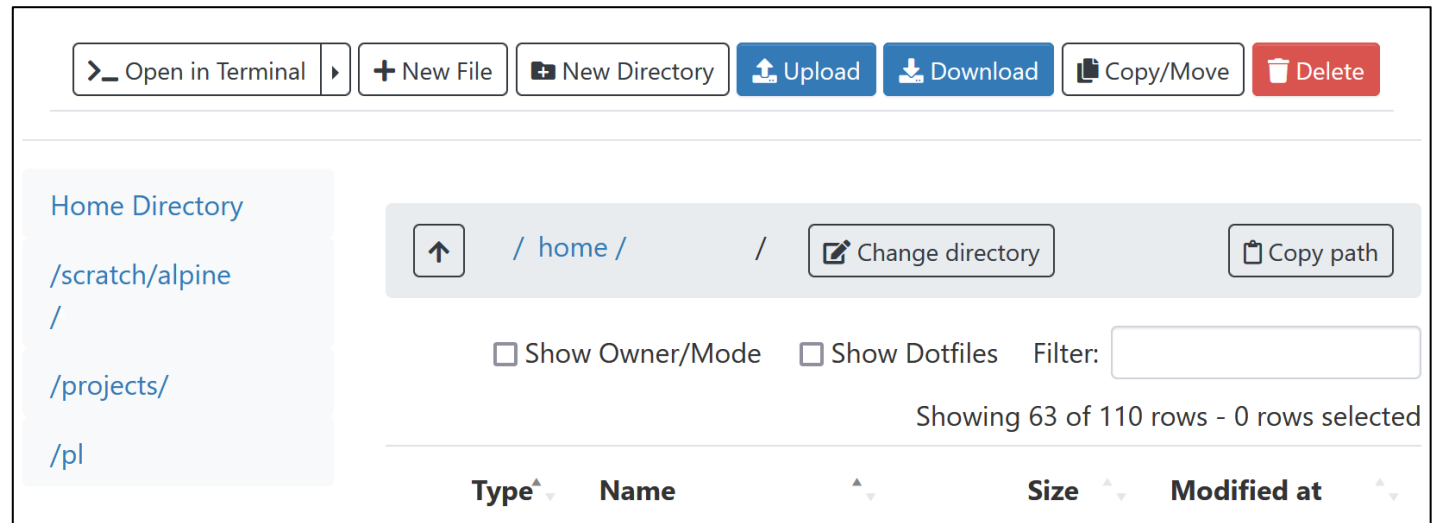
# Files

- Open OnDemand allows you to navigate and manipulate your files
- You can access your entire CURC filesystem using this tool:
  - /home
  - /projects
  - /scratch/alpine
  - /pl (if applicable)



# Files Management

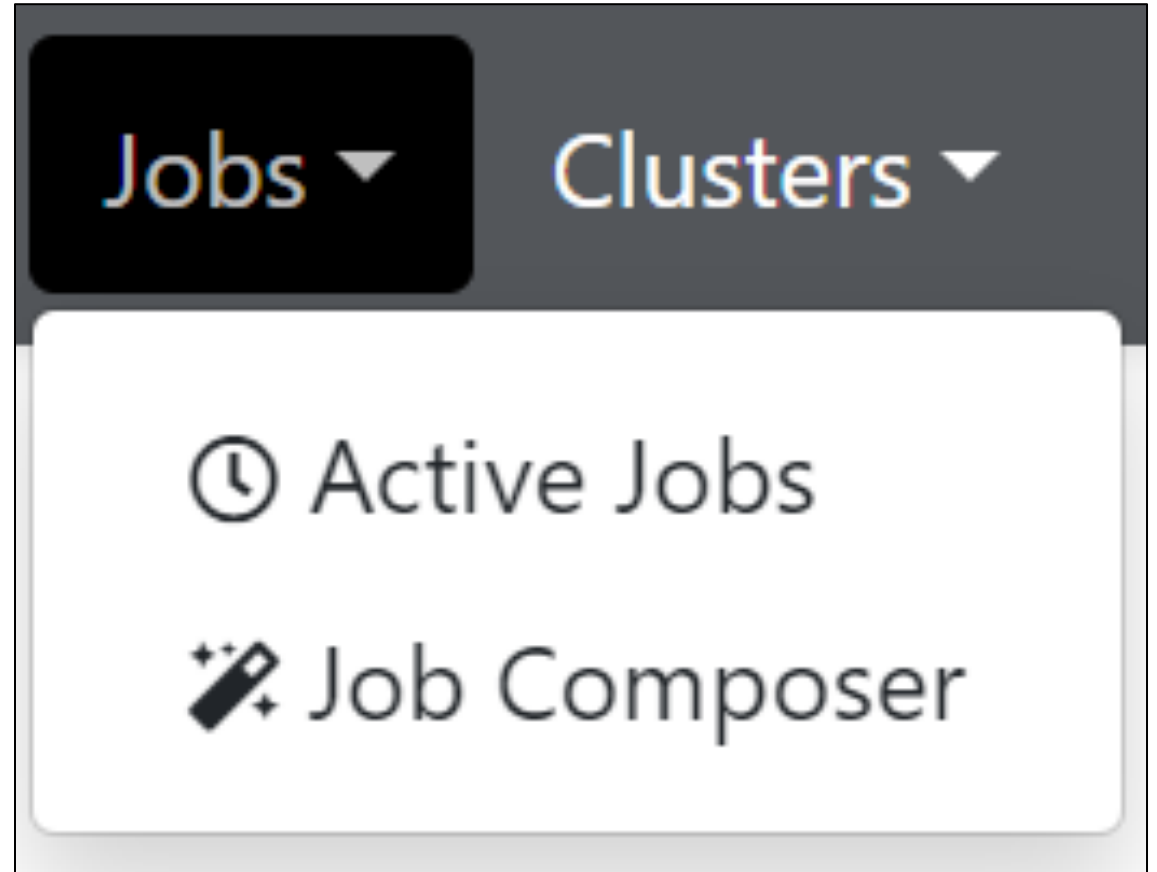
- On the files page you can:
  - Upload data
  - Download files
  - Create new files
  - Edit files
  - Copy/move data
  - Delete files
  - Create directories



# Demo: File Transfer

# Jobs

- Open OnDemand allows you to monitor jobs running on the system
  - You can monitor your own jobs, but you can also monitor **all** queued and running jobs
- You can also create and submit jobs using the **Job Composer** tool





# Active Jobs

## Active Jobs

Show 50 entries

All Jobs All Clusters

Filter:

ID	Name	User	Account	Time Used	Queue	Status	Cluster	Actions
>	17096	sys/dashboard/sys/cu-desktop-presets	rmacc-general	00:33:24	core-gpu	Running	Core	
>	17102	sys/dashboard/sys/cu-desktop-presets	ucb-general	00:08:31	core-gpu	Running	Core	
>	17103	sys/dashboard/sys/bc_desktop/core	ucb-general	00:08:19	viz	Completed	Core	
>	17095	sys/dashboard/sys/bc_desktop/core	ucb-general	01:19:59	viz	Running	Core	
>	17100	sys/dashboard/sys/bc_desktop/core	ucb-general	00:10:58	viz	Running	Core	
>	17068	sys/dashboard/sys/bc_desktop/core	ucb-general	17:51:09	viz	Running	Core	

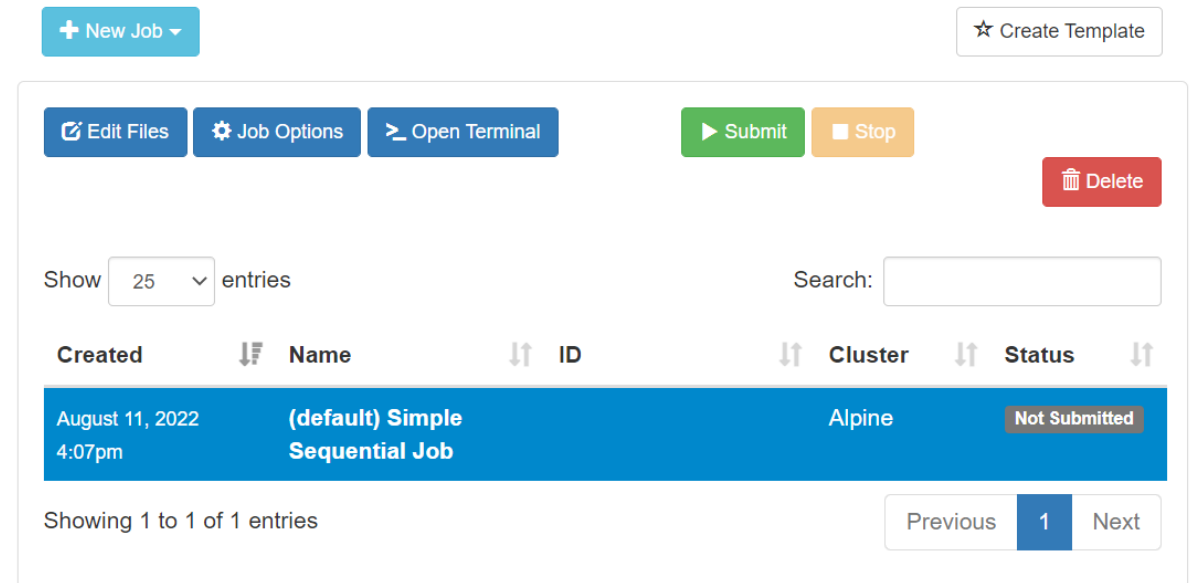
# Active Jobs (cont.)

- Here you'll see a list of jobs on the selected cluster(s)
- If you select one of them, you can see details about the job

Queued AlphaPulldownEx1 2471710	
Cluster	Alpine
Job Id	2471710
Job Name	AlphaPulldownEx1
User	
Account	ucb-general
Partition	aa100
State	PENDING
Reason	PartitionTimeLimit
Total Nodes	1
Total CPUs	8
Time Limit	2-00:00:00
Time Used	0:00
Memory	64000M

# Job Composer

- With the Job Composer, you can create a script and submit to the scheduler
- Default templates are available, but you can use your own templates or edit using the built-in editor



The screenshot displays the Job Composer web interface. At the top left is a '+ New Job' button, and at the top right is a 'Create Template' button. Below these are three buttons: 'Edit Files', 'Job Options', and 'Open Terminal'. To the right of these are 'Submit' and 'Stop' buttons, and a 'Delete' button with a trash icon. Below the buttons is a search bar and a 'Show 25 entries' dropdown. A table lists job entries with columns: Created, Name, ID, Cluster, Status, and a delete icon. The table contains one entry: 'August 11, 2022 4:07pm', '(default) Simple Sequential Job', 'Alpine', and 'Not Submitted'. At the bottom, it says 'Showing 1 to 1 of 1 entries' and has 'Previous', '1', and 'Next' navigation buttons.

Created	Name	ID	Cluster	Status	
August 11, 2022 4:07pm	(default) Simple Sequential Job		Alpine	Not Submitted	

# Job Composer Options

## Name

(default) Simple Sequential Job

## Cluster

Alpine

## Specify job script

main\_job.sh

Files larger than 65KB are omitted for the job script field

## Account

Account is an optional field. If not set, the account may be auto-set by the submit filter.

## Job array specification

1-10

Job arrays are optional. e.g. 1-10

☐ Copy environment

Save

Reset

Back



# Job Composer Script


Submit Script


main\_job.sh


Script contents:

```
#!/bin/bash
# JOB HEADERS HERE

echo "Hello World"
```

 Open Editor

 Open Terminal

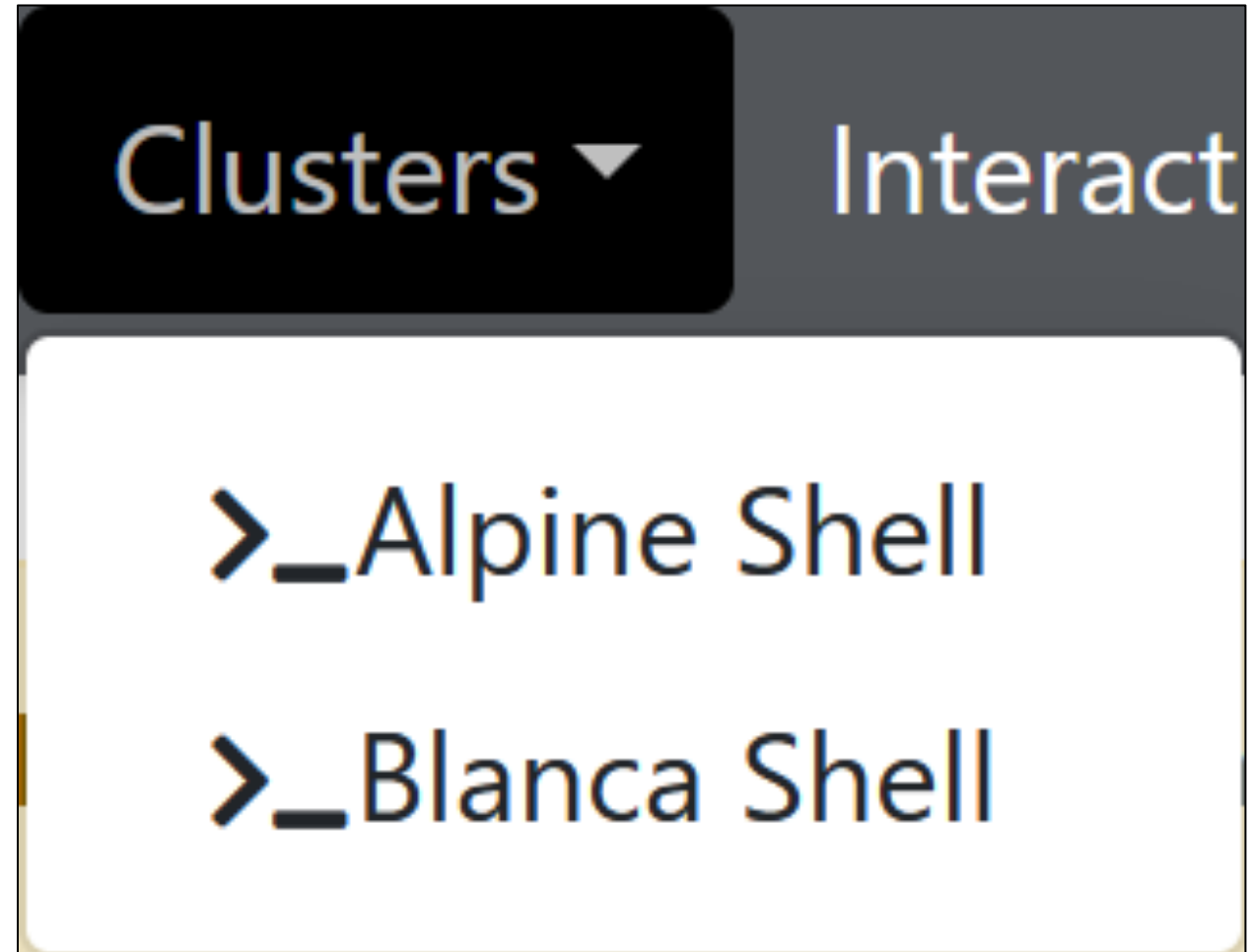
 Open Dir

- Once you've added all of the options for your job, you can view the script template
- You can edit this file using OnDemand's built-in text editor

# Demo: Using the Job Composer

# Clusters

- Open OnDemand allows you to open a terminal in your browser, no SSH required



# Terminal

```
Host: login.rc.colorado.edu
Password:
Welcome to CU-Boulder Research Computing.

* Website http://colorado.edu/rc
* Questions? rc-help@colorado.edu
* Subscribe to system announcements: https://curc.statuspage.io/
* Please type rc-help for the Acceptable Use Policy and a short help page.

You are using login node: login11

trha5176@login11:~$
```

# Interactive Applications

<https://curc.readthedocs.io/en/latest/gateways/OnDemand.html>

# Interactive Apps


- Interactive apps are comprised of built-in Graphical User Interfaces (GUIs) for many of the most popular research applications
- Current Offerings Include:
  - Jupyter Notebooks
  - Remote desktop (Core Desktop)
  - RStudio
  - MATLAB
  - ...with more coming soon!


## Desktops

 Core Desktop (Presets)


 Core Desktop


## GUIs

 MATLAB (Presets)

 MATLAB on Core Desktop

## Servers

 Jupyter Session (Custom)

 Jupyter Session (Presets)

 RStudio Server (Custom)

 RStudio Server (Presets)

# Interactive Apps (cont.)

- Each app comes with two spawning options:
  - ‘Custom’ allows you to spawn a session with customizable configurations
    - If your configurations are incompatible, your job will not run!
  - ‘Presets’ allows you to spawn a session with common, functional configurations
    - Works ‘out of the box’

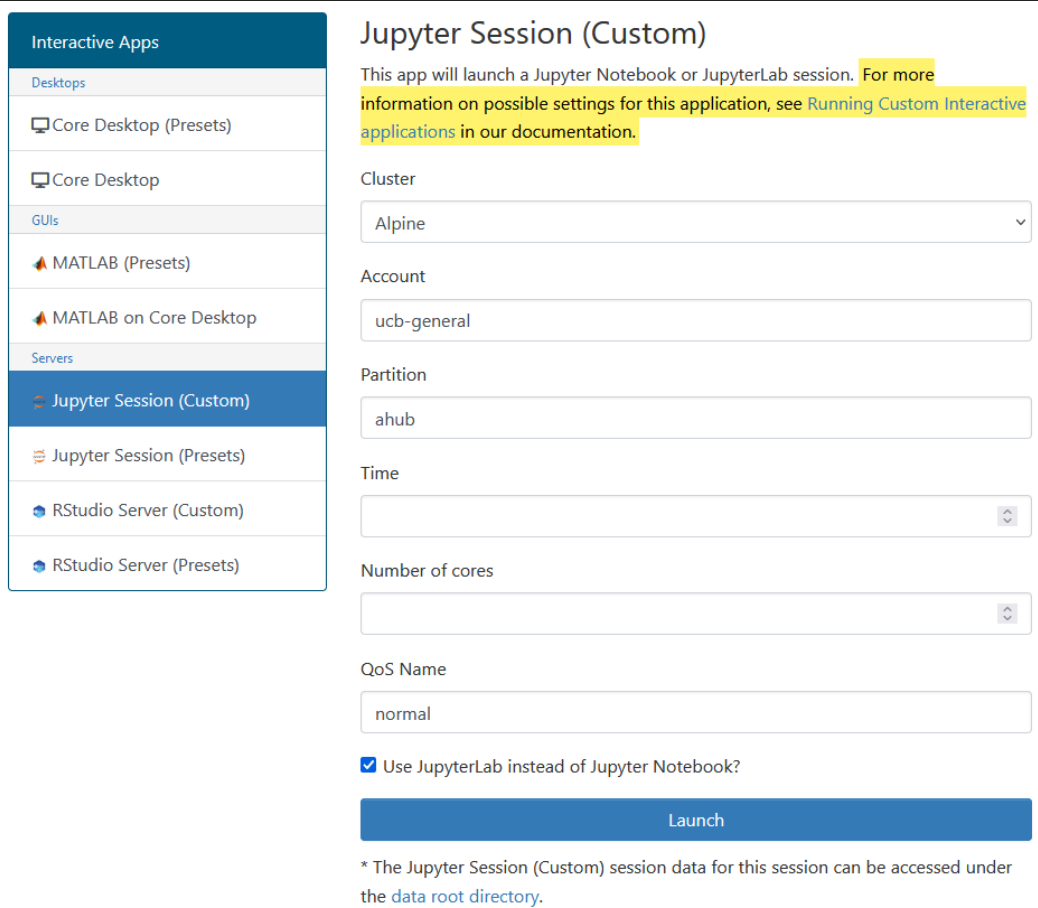


# Custom Application Inputs

Input	Description
Cluster	Possible options are Alpine and Blanca
Account	The account you would like to use: <ul style="list-style-type: none"><li>• Standard CU Boulder value → “ucb-general”</li><li>• Standard CSU value → “csu-general”</li><li>• Standard RMACC value → “rmacc-general”</li><li>• Standard AMC value → “amc-general”</li><li>• Can use project allocations e.g. “ucbXXX_asc1”</li></ul>
Partition	Specifies a particular node type to use e.g. “ahub”
Number of cores	The number of physical CPU cores for the job
Memory [GB]	The total amount of memory allocated for the Job
QoS Name	Quality of Service (QoS) constrains or modifies certain job characteristics
Time	The duration of the job, in hours

# Jupyter Sessions

- You can spawn a Jupyter Notebook using JupyterLab or Jupyter Notebook
- If you want to use a custom environment, you must create a Jupyter Kernel
  - <https://curc.readthedocs.io/en/latest/gateways/jupyterhub.html?#creating-your-own-custom-jupyter-kernel>
  - Easiest to do with a conda environment
- One can access a single Alpine GPU via the “Custom” application



The screenshot shows the 'Interactive Apps' sidebar on the left with categories: Desktops, GUIs, and Servers. Under Servers, 'Jupyter Session (Custom)' is selected. The main panel is titled 'Jupyter Session (Custom)' and contains the following fields:

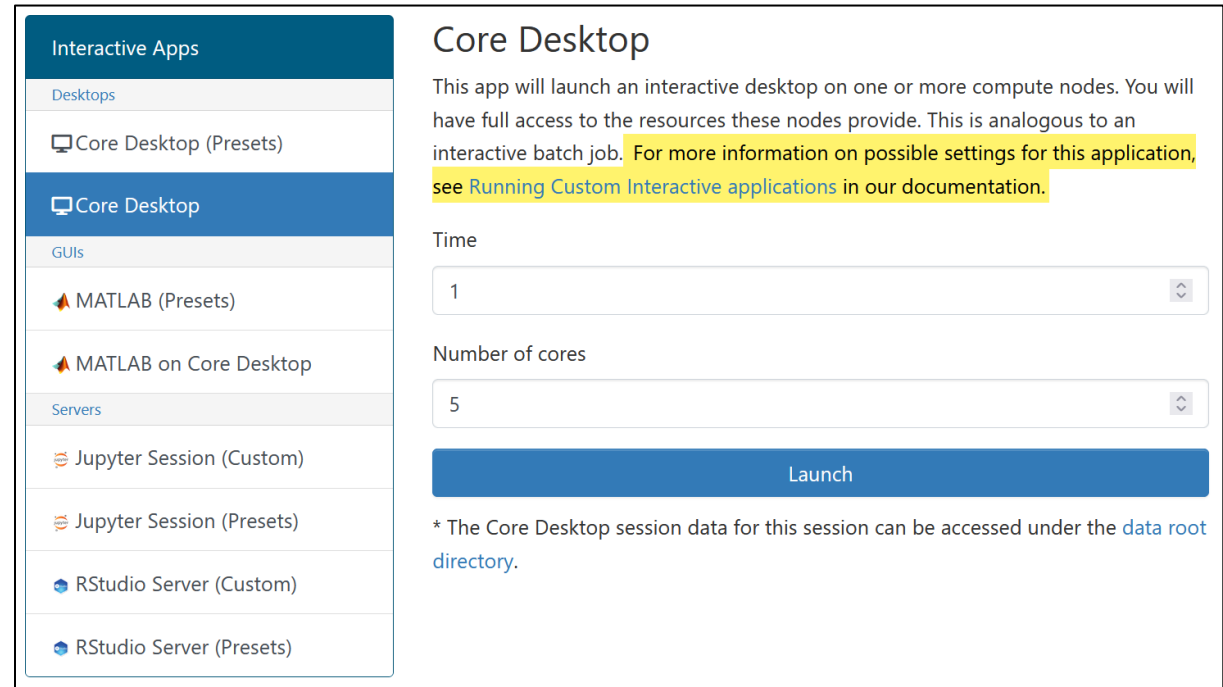
- Cluster:** A dropdown menu with 'Alpine' selected.
- Account:** A text input field containing 'ucb-general'.
- Partition:** A text input field containing 'ahub'.
- Time:** A time selection dropdown.
- Number of cores:** A numeric input field.
- QoS Name:** A text input field containing 'normal'.
- Use JupyterLab instead of Jupyter Notebook?:** A checked checkbox.
- Launch:** A blue button to start the session.

Below the 'Launch' button, a note states: '\* The Jupyter Session (Custom) session data for this session can be accessed under the [data root directory](#).'

# Demo: Jupyter Session

# Core Desktop

- A remote desktop i.e. an interactive desktop
- Ran on their own compute nodes (not Alpine or Blanca)
- All jobs are launched on shared GPUs
  - Not meant for serious GPU workflows!
- **Very useful for running GUI based software**



**Interactive Apps**

Desktops

- Core Desktop (Presets)
- Core Desktop**

GUIs

- MATLAB (Presets)
- MATLAB on Core Desktop

Servers

- Jupyter Session (Custom)
- Jupyter Session (Presets)
- RStudio Server (Custom)
- RStudio Server (Presets)

### Core Desktop

This app will launch an interactive desktop on one or more compute nodes. You will have full access to the resources these nodes provide. This is analogous to an interactive batch job. For more information on possible settings for this application, see [Running Custom Interactive applications](#) in our documentation.

Time

1

Number of cores

5

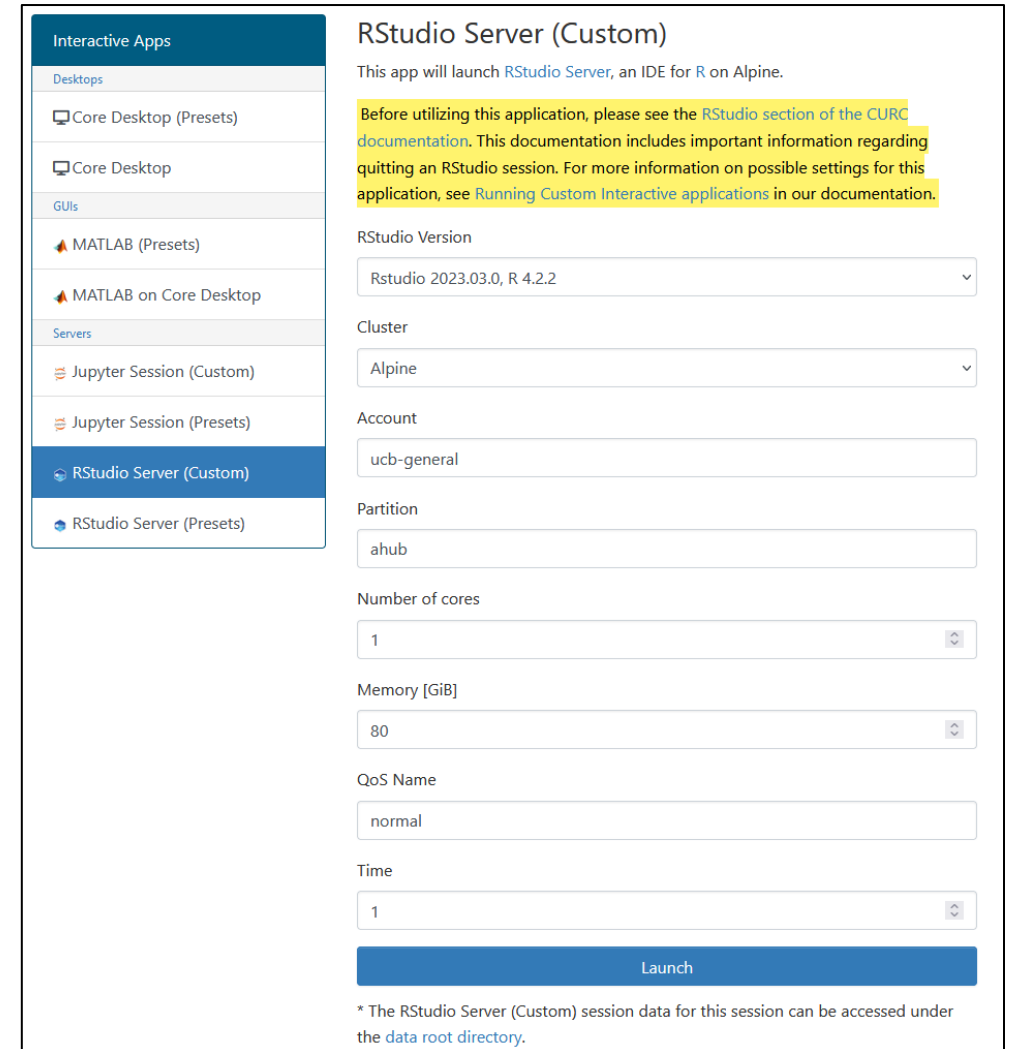
**Launch**

\* The Core Desktop session data for this session can be accessed under the [data root directory](#).

# Demo: Core Desktop

# RStudio Server

- Allows you to use RStudio, an Integrated Development Environment (IDE) for R
- Currently in a Beta phase
  - Quirks may pop up
- Ran inside an Apptainer container
  - Most R libraries are easily installable, but some may fail
    - We can help, just reach out to us!



The screenshot shows the 'Interactive Apps' configuration page for 'RStudio Server (Custom)'. On the left, a sidebar lists categories: Desktops, GUIs, and Servers. Under Servers, 'RStudio Server (Custom)' is selected. The main panel contains the following configuration options:

- RStudio Version:** A dropdown menu showing 'Rstudio 2023.03.0, R 4.2.2'.
- Cluster:** A dropdown menu showing 'Alpine'.
- Account:** A text input field containing 'ucb-general'.
- Partition:** A text input field containing 'ahub'.
- Number of cores:** A dropdown menu showing '1'.
- Memory [GiB]:** A dropdown menu showing '80'.
- QoS Name:** A text input field containing 'normal'.
- Time:** A dropdown menu showing '1'.

At the bottom of the configuration panel is a blue 'Launch' button. Below the button, a note states: '\* The RStudio Server (Custom) session data for this session can be accessed under the [data root directory](#).'

At the top of the main panel, a note reads: 'This app will launch [RStudio Server](#), an IDE for R on Alpine. Before utilizing this application, please see the [RStudio](#) section of the [CURC documentation](#). This documentation includes important information regarding quitting an RStudio session. For more information on possible settings for this application, see [Running Custom Interactive applications](#) in our documentation.'

# Demo: RStudio



# MATLAB

- Launches a MATLAB GUI using Core Desktop
  - Same setup as Core Desktop
- Not meant for serious workflows!
- Several MATLAB versions are available
  - Using the default R2021b can improve load times (locally installed)

Interactive Apps

Desktops

Core Desktop (Presets)

Core Desktop

GUIs

**MATLAB (Presets)**

**MATLAB on Core Desktop**

Servers

Jupyter Session (Custom)

Jupyter Session (Presets)

RStudio Server (Custom)

RStudio Server (Presets)

### MATLAB on Core Desktop

This app will launch a MATLAB GUI on one Core CURC node. You will be able to interact with MATLAB through a VNC session. For more information on possible settings for this application, see [Running Custom Interactive applications in our documentation](#).

MATLAB version

R2021b

Number of cores

1

Time

1

Memory [GB]

default

Specifying **default** will assign 4 GB per task.

Account

ucb-general

Partition

viz

Launch

\* The MATLAB on Core Desktop session data for this session can be accessed under the [data root directory](#).

# Demo: MATLAB

# Review: Learning Goals

- ~~About Open OnDemand~~
  - ~~What is ACCESS-CI?~~
- ~~How to log in to Open OnDemand~~
- ~~Features of Open OnDemand~~
  - ~~Using the Shell~~
  - ~~File Transfer~~
  - ~~Job Monitoring and Composer~~
- ~~Interactive Applications~~
  - ~~Demos!~~

# Questions?

CURC User Policies: <https://curc.readthedocs.io/en/latest/additional-resources/policies.html?highlight=policies#curc-user-policies>

# Survey and feedback

<http://tinyurl.com/curc-survey18>