ACES: Introduction to Julia

HPRC Training

18 March 2025

High Performance
Research Computing
DIVISION OF RESEARCH

Introduction to Julia: Outline

Part I: A brief overview of Julia

Julia is a high-level general-purpose dynamic programming language primarily designed for **high-performance numerical analysis and computational science**.

- Born in MIT's Computer Science and Artificial Intelligence Lab in 2009
- Combined the best features of Ruby, MatLab, C, Python, R, and others
- First release in 2012
- Latest stable release v1.11.4 as of Mar 10, 2025
- https://julialang.org/
- customized for "greedy, unreasonable, demanding programmers"
- Julia Computing established in 2015 to provide commercial support

Major features of **Julia:**

- **Fast**: designed for high performance
- **General**: supports different programming patterns
- **Dynamic**: dynamically-typed with good support for interactive use
- **Technical**: efficient numerical computing with a mathematics-friendly syntax
- **Optionally typed**: a rich language of descriptive data types
- **Composable**: Julia's packages naturally work well together

"Julia is as programmable as Python while it is as fast as Fortran for number crunching. It is like ***Python on steroids****."*

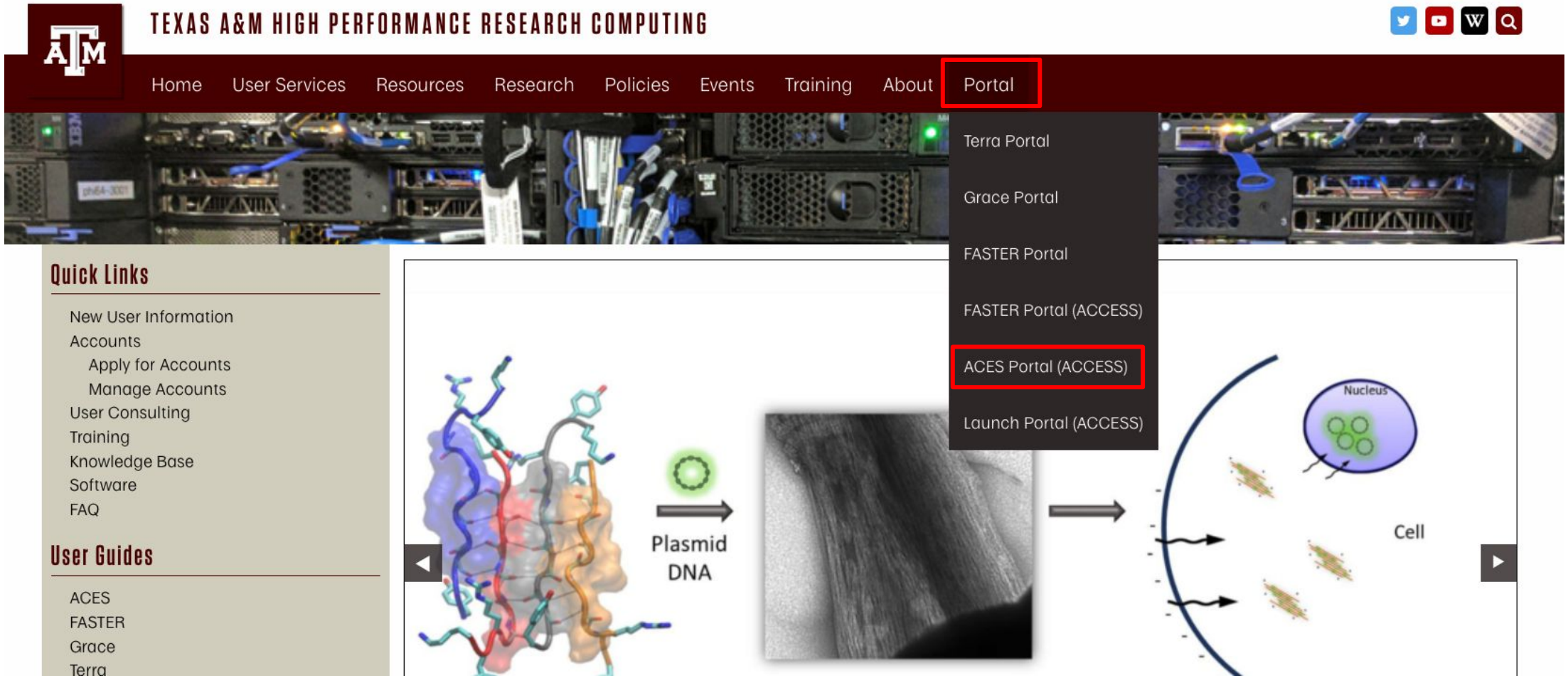
--an anonymous Julia user on the first impression of Julia.

Where to Run Julia

- Juno IDE - developed for the Julia language (no longer under development)
- VSCode - extensions for Julia are actively being managed
- Jupyter Notebook
- Julia REPL
    - Run, Evaluate, Print, Loop
    - Interactive
    - Searchable history, tab-completion, keybindings, dedicated help and shell modes

- More information: https://hprc.tamu.edu/kb/Software/Julia/

Accessing the HPRC ACES Portal



HPRC webpage: hprc.tamu.edu

>_aces Shell Access

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

Message of the Day

ACES Maintenance Status, October 10

The planned maintenance for the PCIe Gen5 composability fabrics has been completed. The PVCs in two Gen5 fabrics will remain unavailable until replacement components arrive tomorrow or next week.

IMPORTANT POLICY INFORMATION

- **Unauthorized use of HPRC resources is prohibited and subject to criminal prosecution.**
- **Use of HPRC resources in violation of United States export control laws and regulations is prohibited.**
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- **Authorized users must also adhere to ALL policies at: https://hprc.tamu.edu/policies**

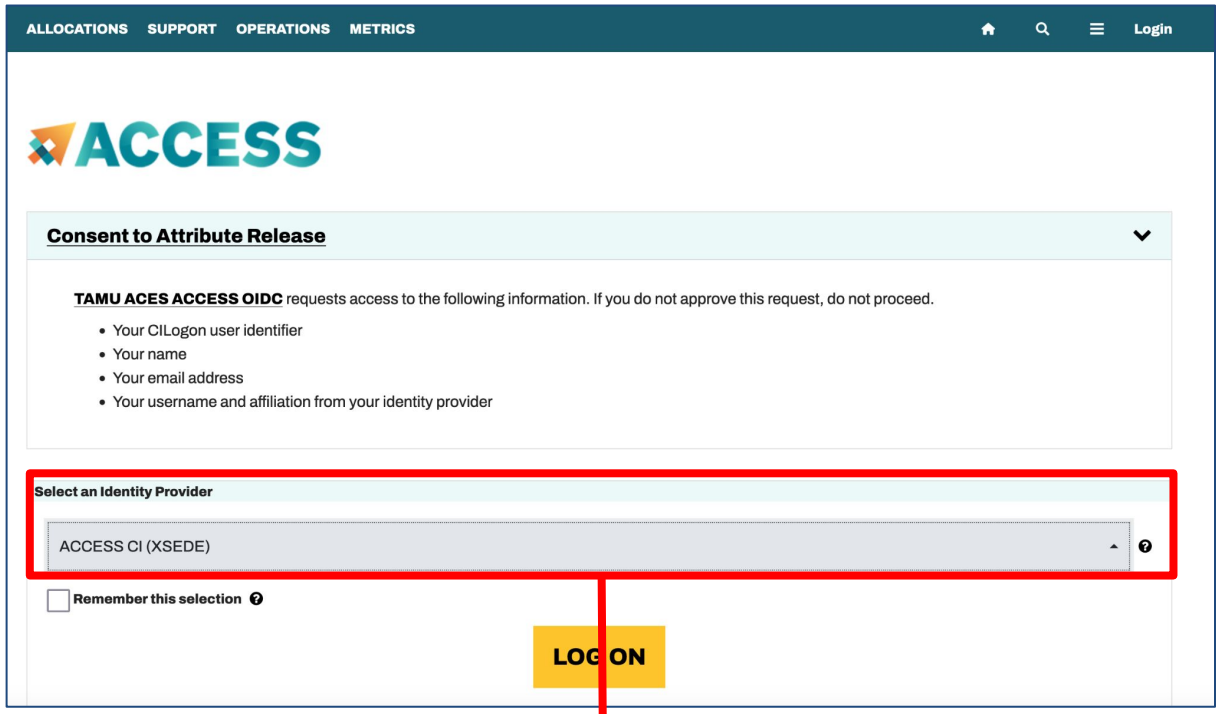
!! WARNING: THERE ARE ONLY NIGHTLY BACKUPS OF USER HOME DIRECTORIES. !!

Run the following commands to install the necessary packages:

```
$ mkdir $SCRATCH/.julia
$ ln -s $SCRATCH/.julia
$ module load Julia/1.11.4-linux-x86_64
$ julia
julia> ]
(v1.10) pkg> add IJulia
(v1.10) pkg> add PrettyTables
(v1.10) pkg> add Plots
(v1.10) pkg> add CSV
(v1.10) pkg> add XLSX
(v1.10) pkg> add DataFrames
(v1.10) pkg> add StatsPlots
```

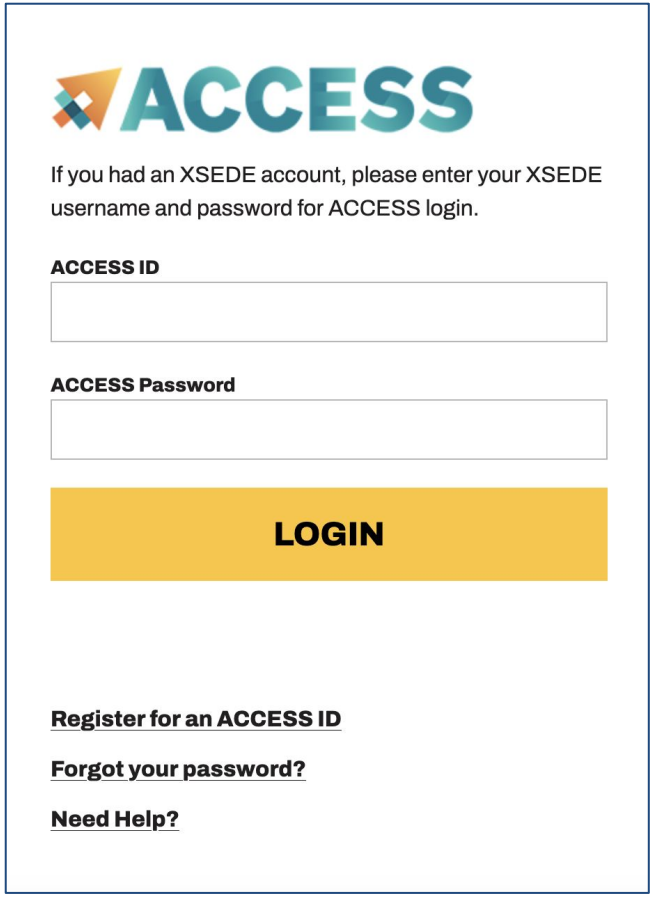
Press backspace to exit the pkg manager and type exit() to quit Julia

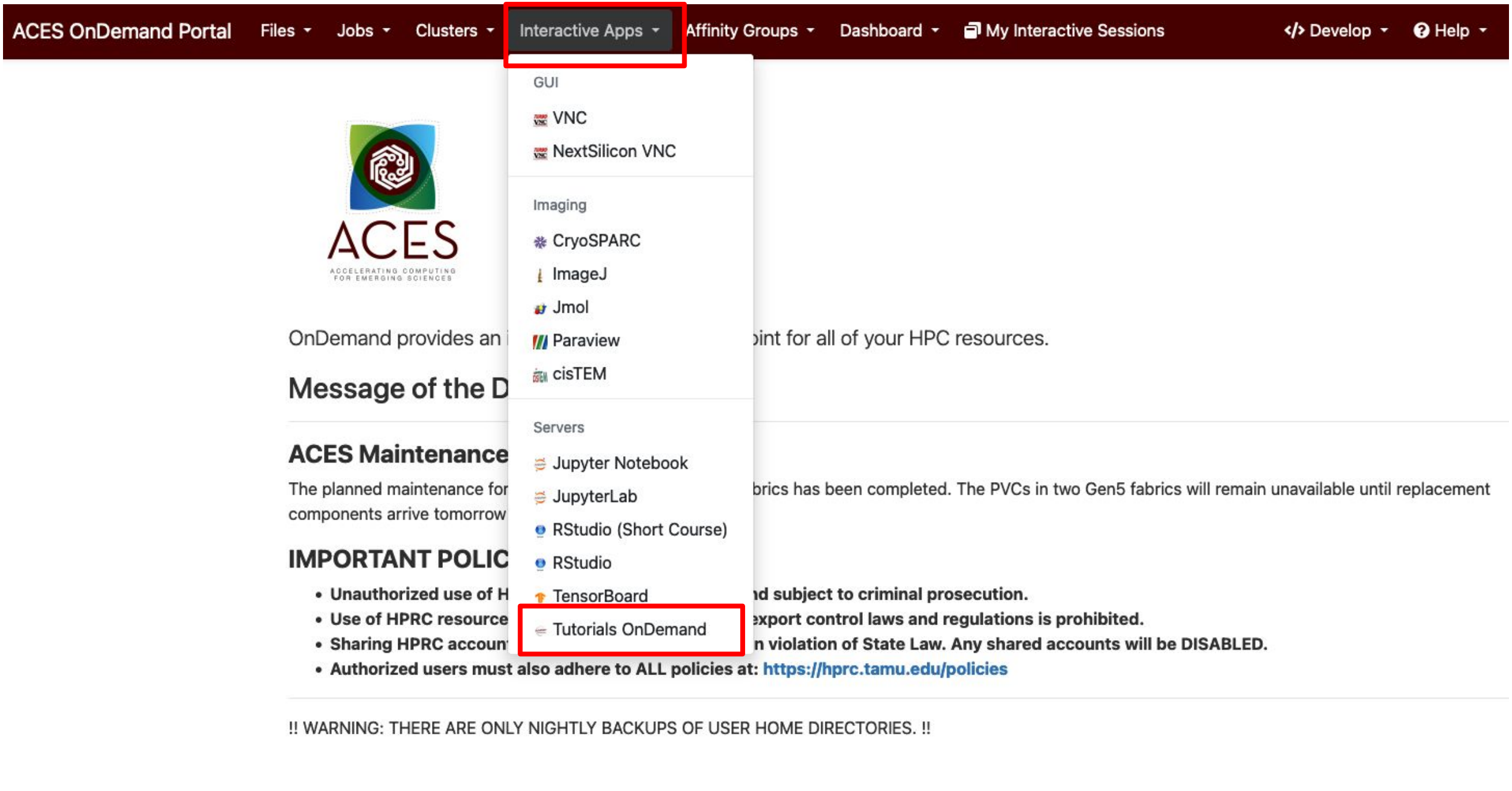
Accessing ACES via the Portal (ACCESS)



Select the Identity Provider appropriate for your account.

Log-in using your ACCESS credentials.




ACES OnDemand Portal
Files
Jobs
Clusters
Interactive Apps
Affinity Groups
Dashboard
My Interactive Sessions
Develop
Help
GUI
VNC
NextSilicon VNC
Imaging
CryoSPARC
ImageJ
Jmol
Paraview
cisTEM
Servers
Jupyter Notebook
JupyterLab
RStudio (Short Course)
RStudio
TensorBoard
Tutorials OnDemand
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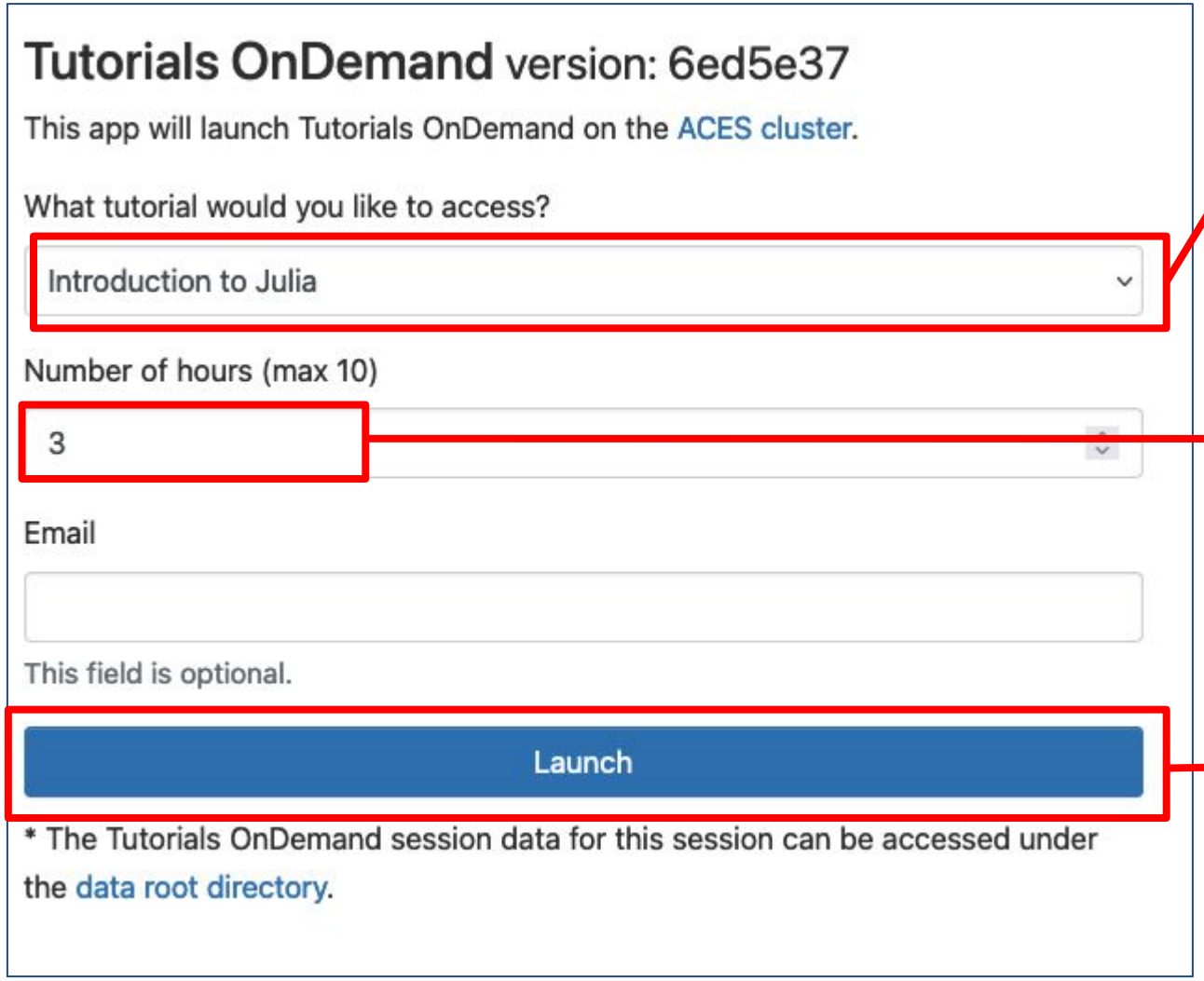


Select “Introduction to Julia” from the dropdown menu

Set number of hours to 3

Click “Launch”

Tutorials OnDemand (280791) 1 node | 2 cores | Running

Host: >_ac009

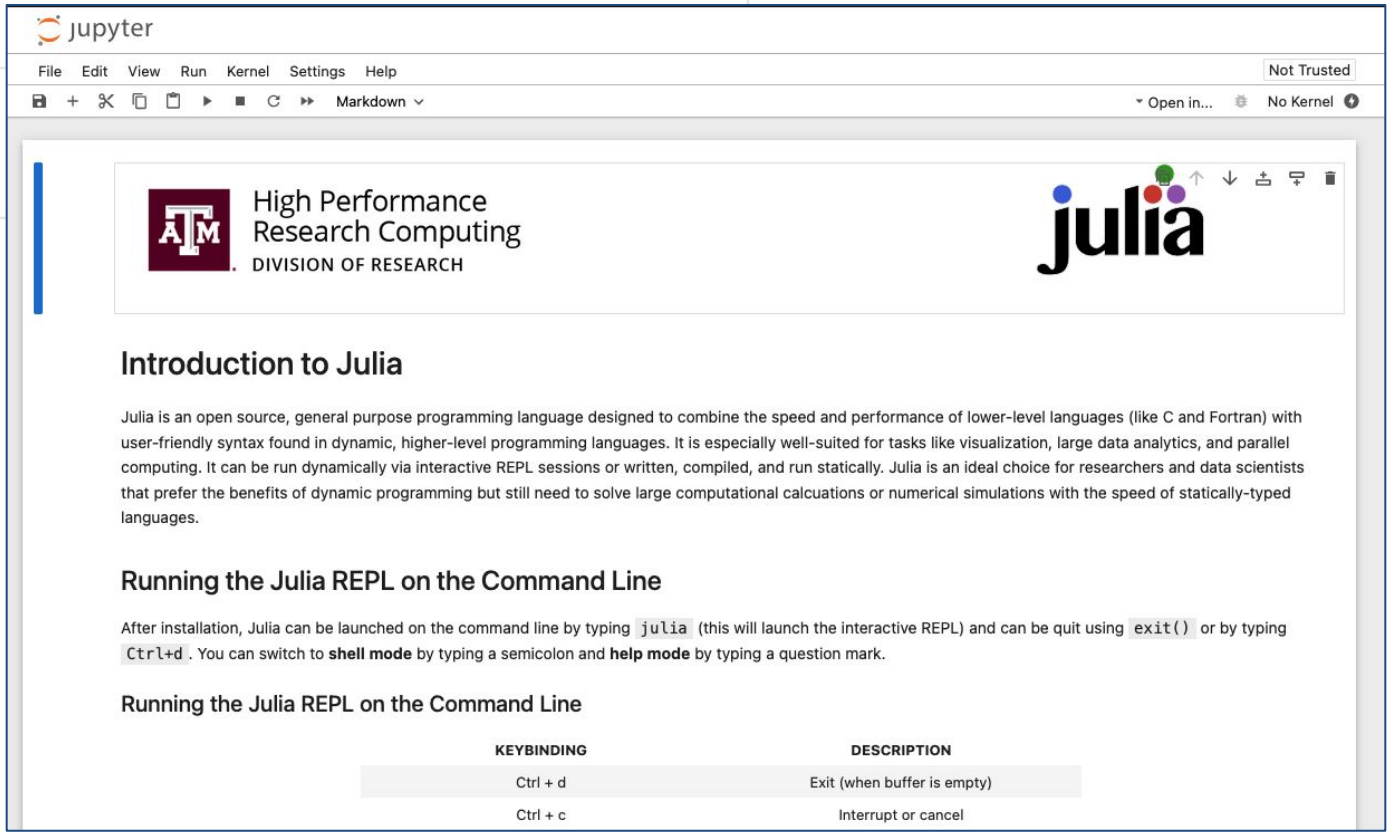
Delete

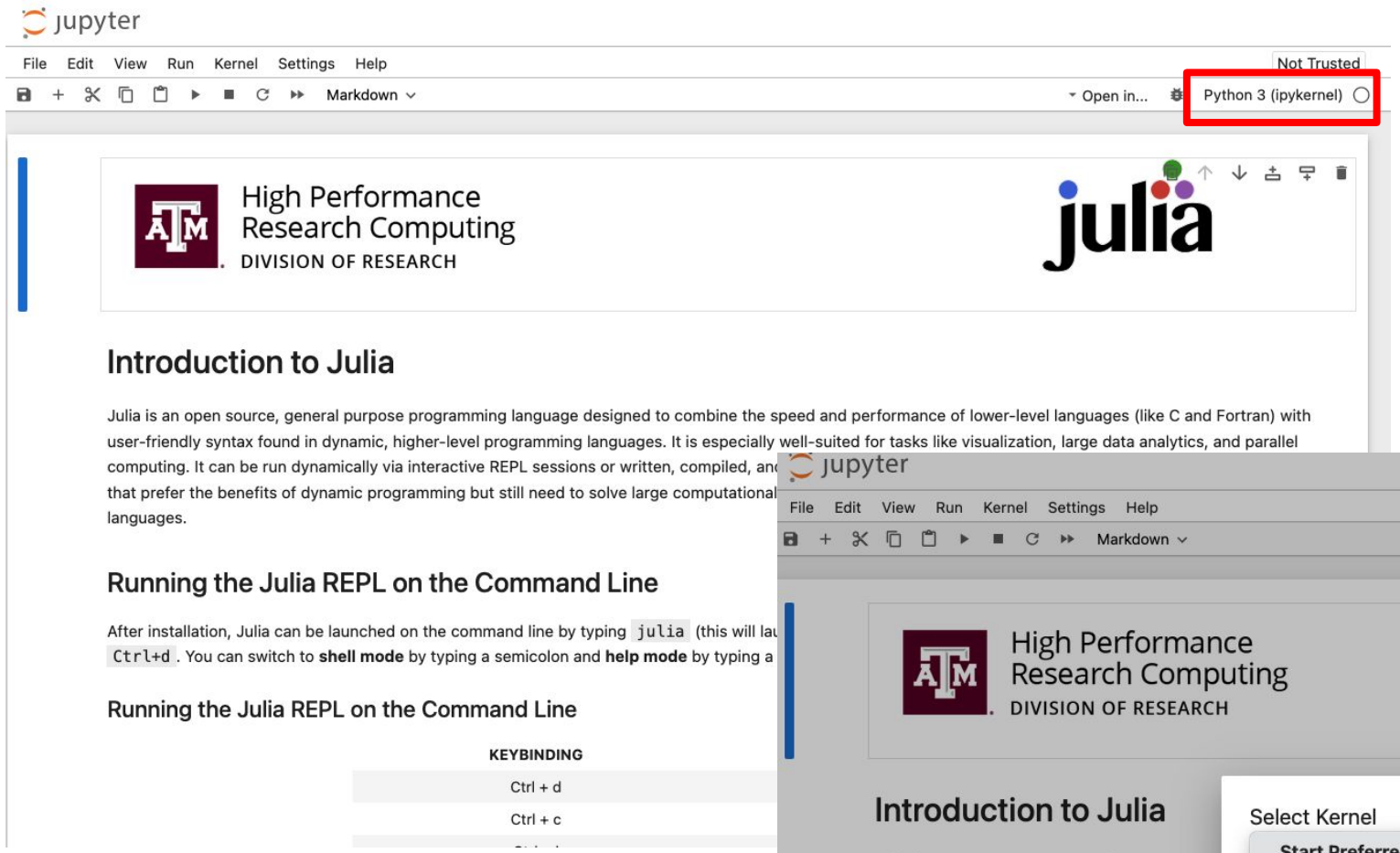
Created at: 2024-10-28 09:04:21 CDT

Time Remaining: 2 hours and 57 minutes

Session ID: bc632df9-70c2-43b8-a9a9-6fa03546a5fa

Connect to Tutorials OnDemand: Introduction to Julia




jupyter
File Edit View Run Kernel Settings Help
Not Trusted
Markdown
Open in...
Python 3 (ipykernel)
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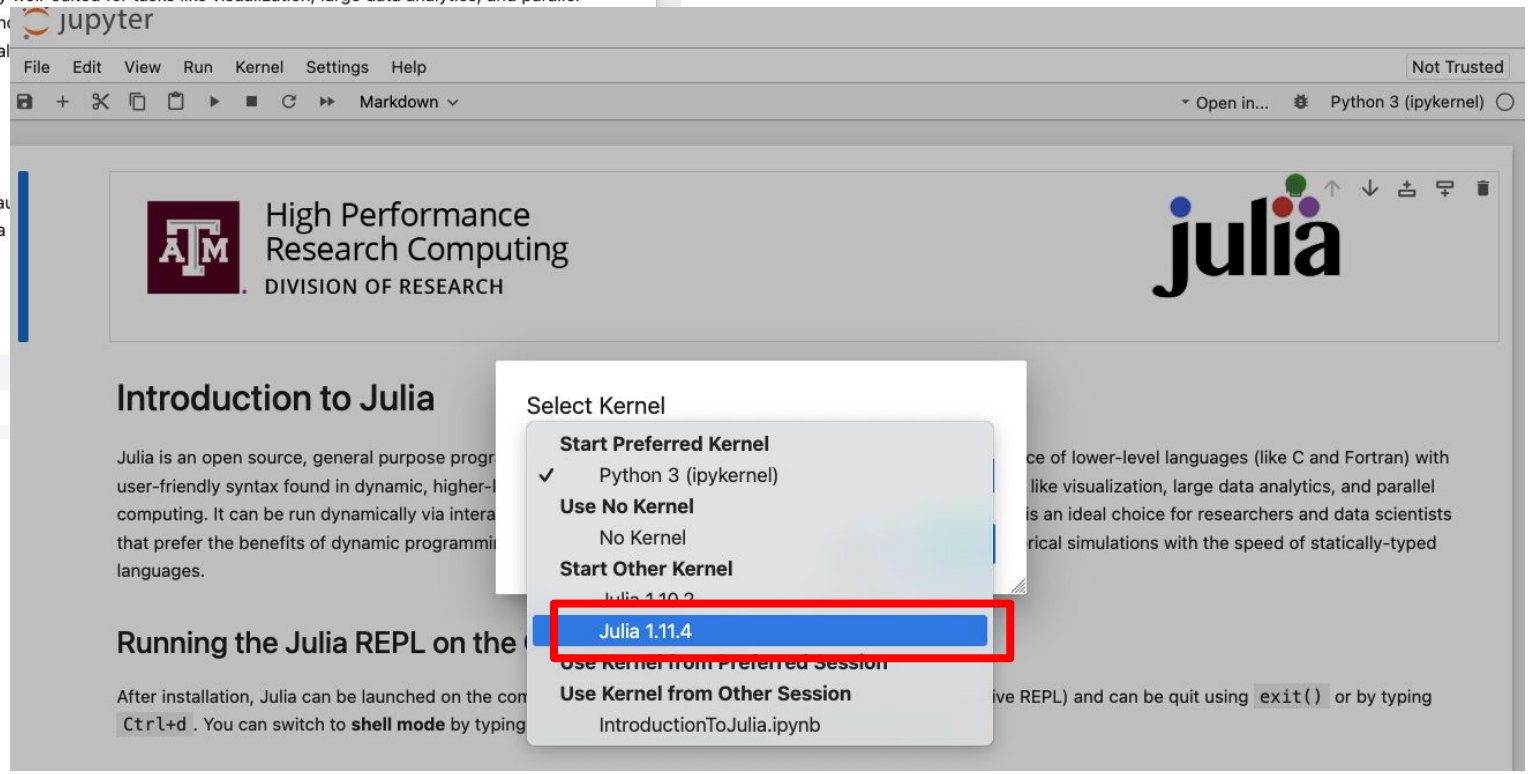
julia
Introduction to Julia
Julia is an open source, general purpose programming language designed to combine the speed and performance of lower-level languages (like C and Fortran) with user-friendly syntax found in dynamic, higher-level programming languages. It is especially well-suited for tasks like visualization, large data analytics, and parallel computing. It can be run dynamically via interactive REPL sessions or written, compiled, an
that prefer the benefits of dynamic programming but still need to solve large computational
languages.
Running the Julia REPL on the Command Line
After installation, Julia can be launched on the command line by typing julia (this will lau
Ctrl+d . You can switch to shell mode by typing a semicolon and help mode by typing a
Running the Julia REPL on the Command Line
KEYBINDING
Ctrl + d
Ctrl + c


jupyter
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julia
Introduction to Julia
Select Kernel
Start Preferred Kernel
Python 3 (ipykernel)
Use No Kernel
No Kernel
Start Other Kernel
Julia 1.11.4
Use Kernel from Other Session
IntroductionToJulia.ipynb
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exit() or by typing

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https://u.tamu.edu/hprc_shortcourse_survey

Help us help you. Please include details in your request for support, such as, Cluster (Faster, Grace, ACES, Launch), NetID (UserID), Job information (Job id(s), Location of your jobfile, input/output files, Application, Module(s) loaded, Error messages, etc), and Steps you have taken, so we can reproduce the problem.