

LSU

HPC

DEMO

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WHAT IS AN HPC?

- HPC: High Performance Computing
 - An HPC is an extremely large and powerful computer that allows multiple people to access
 - It allows you to create and run code that a normal computer cannot run, as well as store large amounts of data
- How is it different than a normal computer?

- Laptop: 4- 16 GB RAM, 256 – 512 GB of Storage
- Gaming PC: 16 – 64 GB of RAM, 512 GB – 1+ TB
- (LSU) HPC: Total is over 23,000 GB(23 TB) of RAM, Over 840 TB
 - Note this is the total. LSU divides this up based on how much storage and RAM user's request

WHY WOULD WE USE AN HPC?

Run code that
needs more
processing
power than
our local
computers
can provide

Store large
amounts of
output

Easily share
code or files
with
collaborators

HOW TO LOG IN



SSH

Through the
terminal/ command
prompt



ONDemand

Online Interactive
Website

SSH

- Log in through the command prompt
- Everything you do will be done using Linux commands.

PRO:

- Fast
- Can log in from anywhere (as long as you have an internet connection)
- If you set up a job you can walk away from your computer

CON:

- No user interface
- Will not be able to use the mouse
- Cannot see the output right away

ONDEMAND

Log in through a website on your browser and start coding

PROS:

- Easy Log in
- Without a vpn , you will need to be on the LSU Wifi to access it

CONS:

- Slower to log in
- Code can take longer to run
- You will need to periodically check on the computer
- (Currently) Has no access to the terminal
- If you want to use it outside of LSU, you will need to set a VPN provided by LSU called Global Protect:
 - <https://tigerware.lsu.edu/Software/277/GlobalProtect - VPN#>

LOG IN USING SSH

- Open your terminal/command prompt
- Type in: ssh -xy
username@smic.hpc.lsu.edu
 - Note: if this is your first time logging in this way, you will need to set up 2 factor authentication, I recommend using the Microsoft authenticator app.
- Press enter and then type your password
 - Note: there will be no indication that the password is being inputted, so you will just need to type and enter
- Enter the code from the authenticator

```
C:\Users\victo>ssh -xy vgarza@smic.hpc.lsu.edu
(vgarza@smic.hpc.lsu.edu) Password:
(vgarza@smic.hpc.lsu.edu) TOTP Authenticator Token:
```

```
#####
Send questions and comments to the email ticket system at sys-help@loni.org.
#####

SuperMIC at LSU
```

```
https://www.hpc.lsu.edu/resources/hpc/system.php?system=SuperMIC
```

```
/home quota 5GB, please do not use /home for batch job I/O
/work no quota, files older than 60 days are eligible to permanently purged.
/project See https://accounts.hpc.lsu.edu/allocations.php
```

```
There are quotas on file counts. Manage your files, but it is against our
policy to blatantly circumvent the purge procedure.
Misconfigured jobs that are wasting CPU resources are subject to deletion.
```

```
*****
Allocations are required. To see allocations run: showquota $USER
*****
SuperMike /work and /project files are available on SuperMIC. If you already
had SuperMIC /work or /project files, they were moved to a "mike2" subdirectory.
```

```
# July 15 2024
```

```
## HPC@LSU SuperMIC Cluster - Conversion to the Slurm Workload Manager
For details using slurm see the announcement email with above subject or visit:
https://www.hpc.lsu.edu/docs/slurm.php
```

```
# 16 September, 2024
```

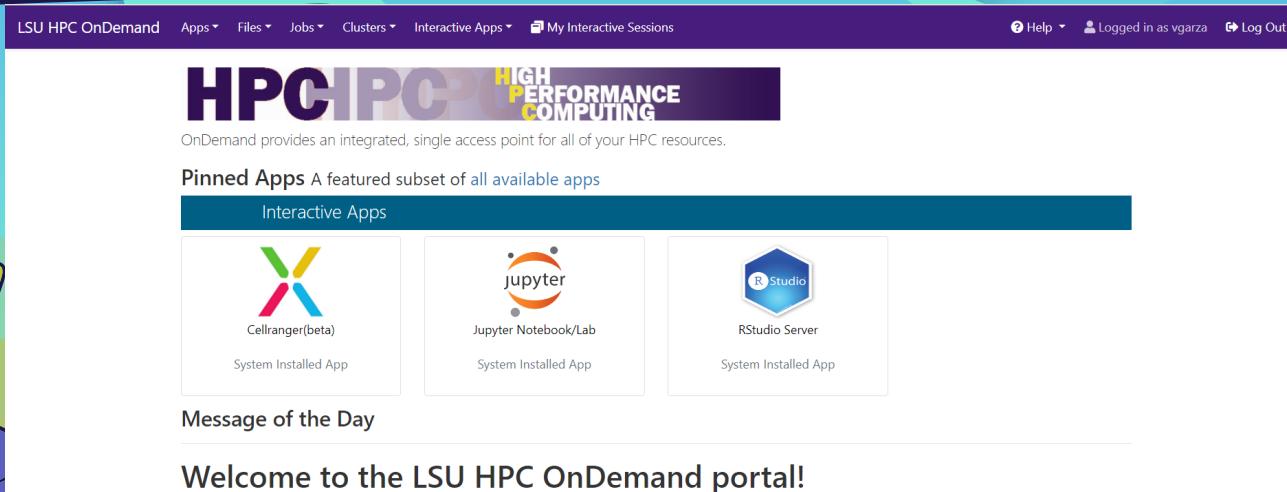
```
## Multi-factor Authentication Enrollment
```

```
Please see: http://hpc.lsu.edu/docs/systems/twofa.php
```

```
Last login: Mon Oct 21 12:19:22 2024 from 10-51-07-9d-4e-6e.wlan.lsu.edu
[vgarza@smic2 ~]$
```

LOG IN USING ONDEMAND

- Access OnDemand using this website provided by LSU:
<https://ondemand.mike.hpc.lsu.edu/>
- Enter your username and password and then hit enter or press log in



The screenshot shows the LSU HPC OnDemand portal homepage. At the top, there is a purple navigation bar with the text "LSU HPC OnDemand" and several dropdown menus: Apps, Files, Jobs, Clusters, Interactive Apps, and "My Interactive Sessions". To the right of the menu are links for "Help", "Logged in as vgarza", and "Log Out". Below the navigation bar is a large banner with the text "HIGH PERFORMANCE COMPUTING" and "OnDemand provides an integrated, single access point for all of your HPC resources.". A section titled "Pinned Apps" displays three "Interactive Apps": Cellranger(beta), Jupyter Notebook/Lab, and RStudio Server, each with a small icon and the text "System Installed App" below it. At the bottom of the page, there is a "Message of the Day" section with the text "Welcome to the LSU HPC OnDemand portal!".

LSU HPC STRUCTURE

- Once a user gets access to the HPC they will be able to access the super computers. The super computer is broken down into 3 separate file systems:
- Work, Home, and Project
- Each of those file systems have different sets of rules for file storage and common practices

HOME DIRECTORY

- Where you will automatically be every time you log in
- Files are always backed up and will not get deleted
 - If anything bad happens you can reach out to help desk and they can restore the files
- You only have 10 GB of storage space
- Commonly used to only store scripts and text documents
 - No input or output data
- Location: /home/username

PROJECT DIRECTORY

- Files will not get deleted, but are not backed up
- Data depends on how much space you request when you ask for an allocation
- Commonly used to store code information, output, and project specific data
- Location: /project/username

WORK DIRECTORY

- Files are not backed up and can be deleted
- There is no set space maximum for this. Files can be deleted at any moment
 - “If capacity approaches 80%, an automatic purge process is started by management. This process targets files with the oldest age and size, removing them in turn until the capacity drops to an acceptable level.”
<https://www.hpc.lsu.edu/users/LSU-HPC-Storage-helper.php#work>
- Commonly used to hold checkpoints or files that are being processed.
- Not suitable for long-term storage
- Location: /project/username

RUNNING A JUPYTER NOTEBOOK

1. On the dropdown section, press the “Interactive Apps” section and then from there press “Jupyter Notebook”
2. From there it will ask a series of questions about your session which can be modified to your use (Example and explanation on the next 2 slides)

The screenshot shows the LSU HPC OnDemand web interface. At the top, there is a purple navigation bar with the text "LSU HPC OnDemand" and dropdown menus for "Apps", "Files", "Jobs", and "Clusters". To the right of these is a search bar and a button labeled "My Interactive Sessions". Below the navigation bar, the main content area has a header "Home / All Apps" and a "Show 10 entries" dropdown. There are two tables: one for "Desktops" and one for "Category". The "Desktops" table lists "AlphaFold", "Cellranger(beta)", "Jupyter Notebook/Lab", and "RStudio Server". The "Category" table lists "SMIC Desktop (beta)" and "MATLAB".

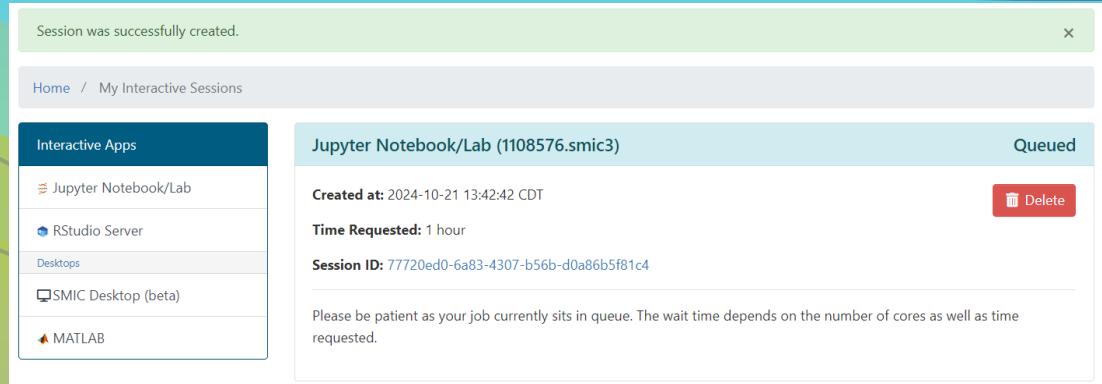
Name	Category
AlphaFold	
Cellranger(beta)	
Jupyter Notebook/Lab	
RStudio Server	
SMIC Desktop (beta)	Files
MATLAB	

- Python module: python/3.6.2
- Jupyter Working Directory:
- If you would like to work out of a different directory indicate it here
- HPC allocation to use: hpc_smartsco3
- If there is a different project you would like to use change it here
- Job queue: single
 - Depending on how long or much computing power you want you can choose more options:
 - single - Used for jobs that will only execute on a single node, i.e. nodes=1:ppn=1-20. It has a wallclock limit of 72 hours (3 days). Jobs in the single queue should not use more than 3GB memory per core. If applications require more memory, scale the number of cores (ppn) to the amount of memory required i.e. max memory available for jobs in single queue is 12GB for ppn=4.
 - workq - Used for jobs that will use at least one node, i.e. nodes>=1:ppn=20. Currently, this queue has a wallclock limit of 72 hours (3 days). Jobs in workq are not preemptable, which means that running jobs will not be disrupted before completion.
 - checkpt - Used for jobs that will use at least one node. Jobs in the checkpt queue can be preempted if needed.
 - bigmem - Used for jobs that want to use the 256 GB nodes. This queue has a wallclock limit of 72 hours (3 days).

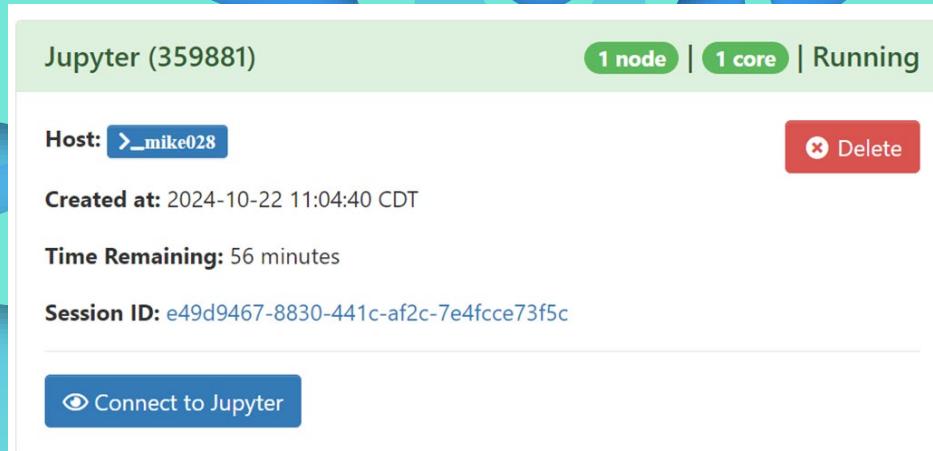
- Number of hours: 1
 - How long you would like the code to run
- Number of nodes: 1
 - How many nodes you would like to use
 - More nodes = more processing power
- Number of cores: 1
 - How many cores you would like to use
 - If you are not doing parallelized processing or multiple codes at a time you can do 1
- Press “Launch”

WAITING FOR THE QUEUE

- After you hit launch you will be waiting for your queue to launch
- If you requested a lot of computing power or a long time, then your queue will probably take a while to load
- If you close your page while you wait, you can press “My Interactive Sessions” on the top of the menu to see the status



LAUNCHING JUPYTER NOTEBOOK



Once you are outside of the queue, you can press
“Connect to Jupyter” and continue as usual

HOW TO GET HELP

- If you ever run into any issues, the HPC systems support is extremely helpful. You can reach out to them by emailing: sys-help@loni.org
- Email them a description of the problem as well as the path to any file locations.

GETTING YOUR OWN ALLOCATION

- Your PI/Advisor will need to request an allocation at:
https://accounts.hpc.lsu.edu/allocations.php?only_mach=smic
- The request page will ask information about how many hours you would like, description of project, grants, etc.

OTHER HPC'S

NCAR: NCAR offers a super computer called derecho, which you can use for free if you have an NSF account

<https://ncar.ucar.edu/what-we-offer/computational-resources>



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