

Navigating and Connecting to NERSC



New User Training
February 15, 2024

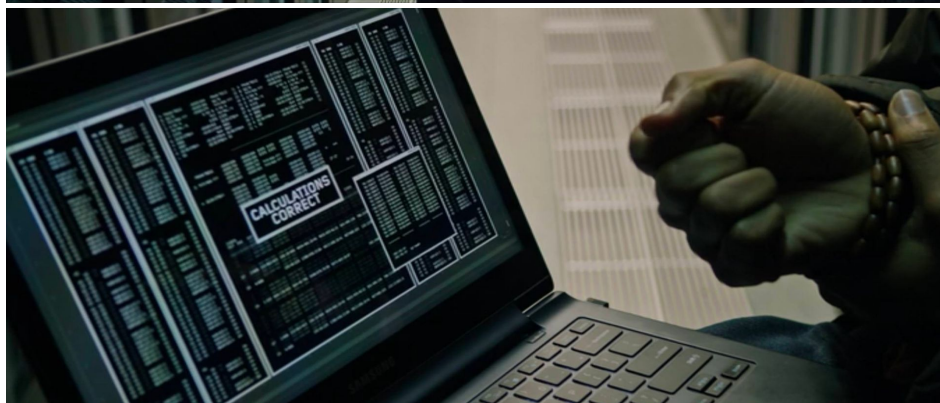
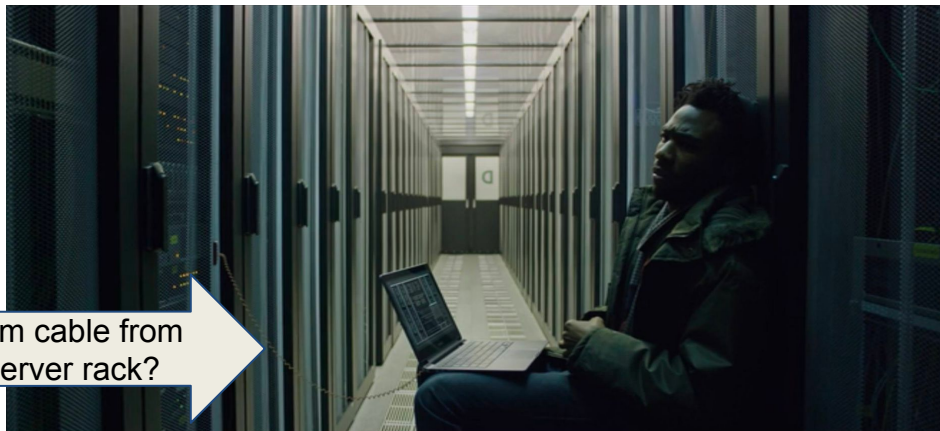
Lipi Gupta, PhD
Science Engagement Engineer
User Engagement Group

What NOT to do!

I love this movie, by the way. This is just NOT how to connect to an HPC resource!



some random cable from laptop to server rack?



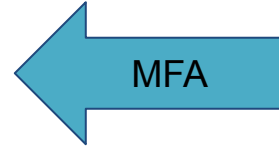
Connecting to NERSC is EASY

What you DO need:

- An internet connection
- a laptop or computer with terminal
- Username, password and Multi-Factor Authentication method

Agenda

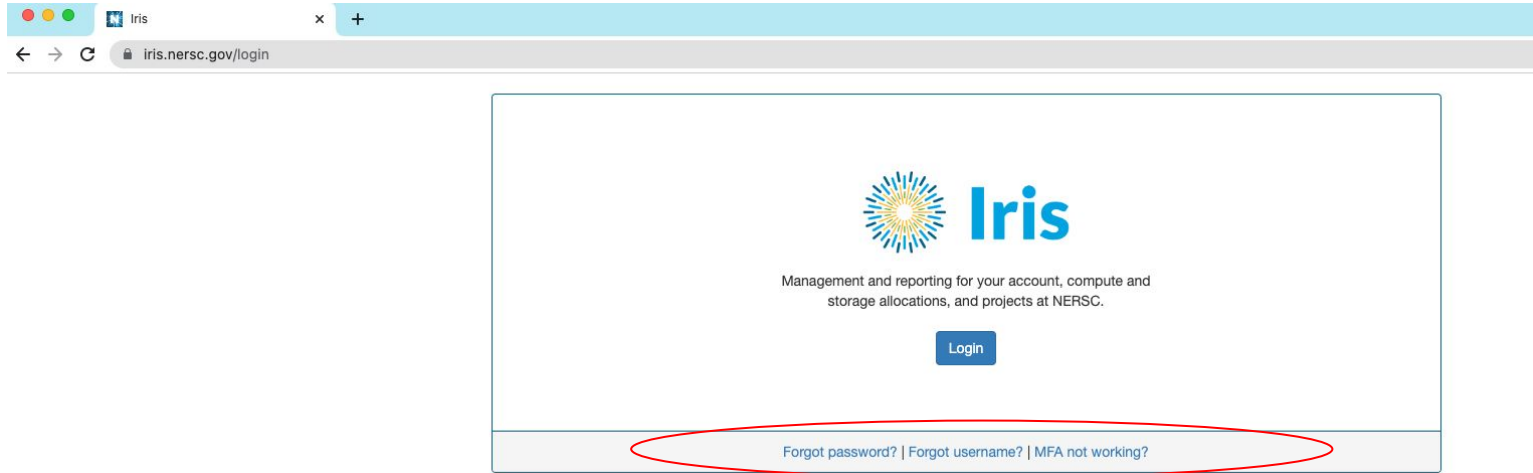
- Navigating Iris (<https://iris.nersc.gov>)
- Connecting to Perlmutter
 - a. Connecting with SSH
 - b. <https://jupyter.nersc.gov> notebooks and terminals in your browser
 - c. NoMachine (<https://docs.nersc.gov/connect/nx/>) for GUI apps
- Submitting a User Ticket (<https://help.nersc.gov>)
- Navigating NERSC Documentation
- Navigating NERSC Home Page



Navigating Iris

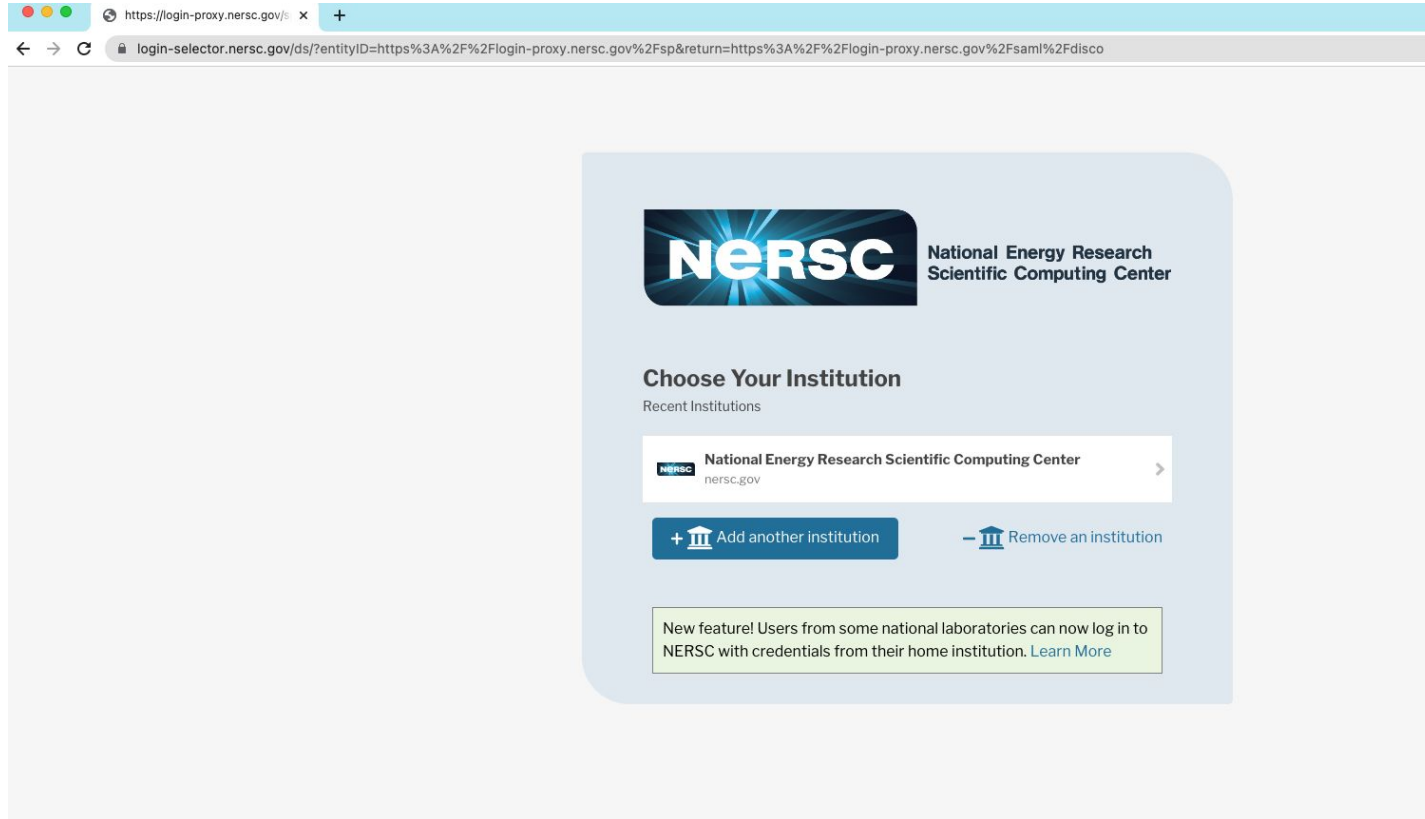


Iris (<https://iris.nersc.gov>) for Your Account



 [Help](#) | [ERCAP](#) | [Docs](#) | [MyNERSC](#)

Iris (<https://iris.nersc.gov>) for Your Account



The screenshot shows a web browser window with the URL `https://login-proxy.nersc.gov/ds/?entityID=https%3A%2F%2Flogin-proxy.nersc.gov%2Fsp&return=https%3A%2F%2Flogin-proxy.nersc.gov%2Fsaml%2Fdisco`. The main content area features the NERSC logo and the text "National Energy Research Scientific Computing Center". Below this is the heading "Choose Your Institution" and the sub-heading "Recent Institutions". A single institution is listed: "National Energy Research Scientific Computing Center" with the domain "nersc.gov". There are two buttons: "+ Add another institution" and "- Remove an institution". A text box at the bottom states: "New feature! Users from some national laboratories can now log in to NERSC with credentials from their home institution. [Learn More](#)".

Iris (<https://iris.nersc.gov>) for Your Account

NERSC Login

<https://shib.nersc.gov/idp/profile/SAML2/Redirect/SSO?execution=e1s2>



NERSC National Energy Research Scientific Computing Center

Username

Password

Log In

[Forgot your password?](#)

  U.S. DEPARTMENT OF ENERGY
Office of Science

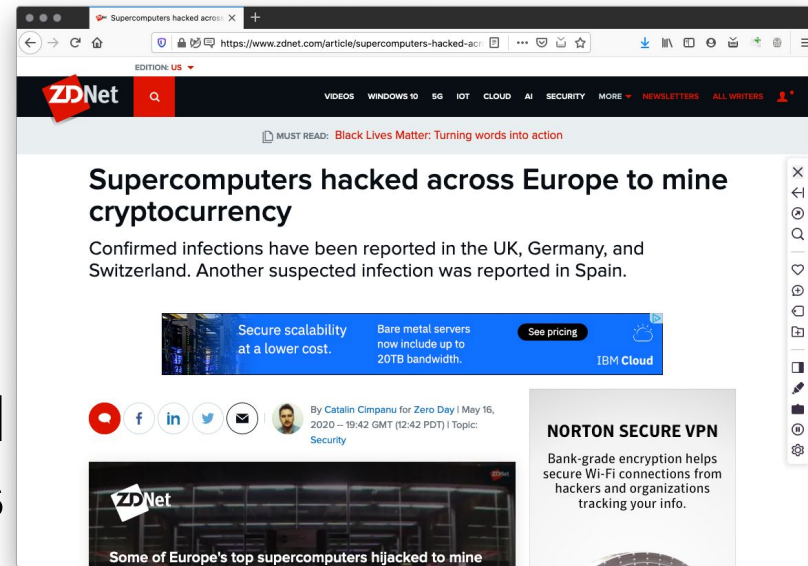
[Contact us](#)
[Privacy & Security Notice](#)



Multi-Factor Authentication (MFA)

Tip: you will use this a LOT

- Protects NERSC users from attacks like this →
- **Log into NERSC resources with your NERSC password plus a one-time code that is provided by an app**



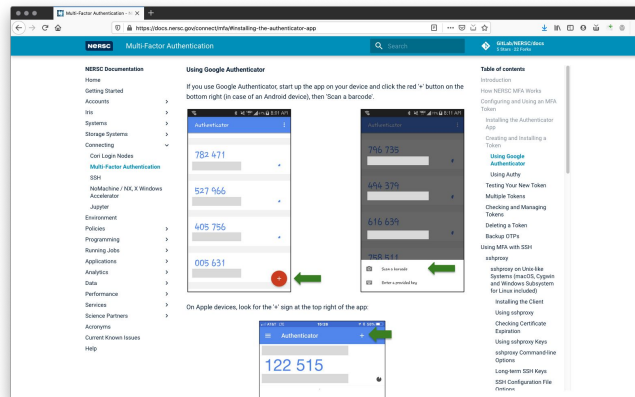
Setting Up MFA in Iris

- First install Google Authenticator on your smartphone (and/or Authy on your computer)

<https://play.google.com/store/apps/details?id=com.google.android.apps.authenticator2&hl=en>
<https://itunes.apple.com/us/app/google-authenticator/id388497605?mt=8>

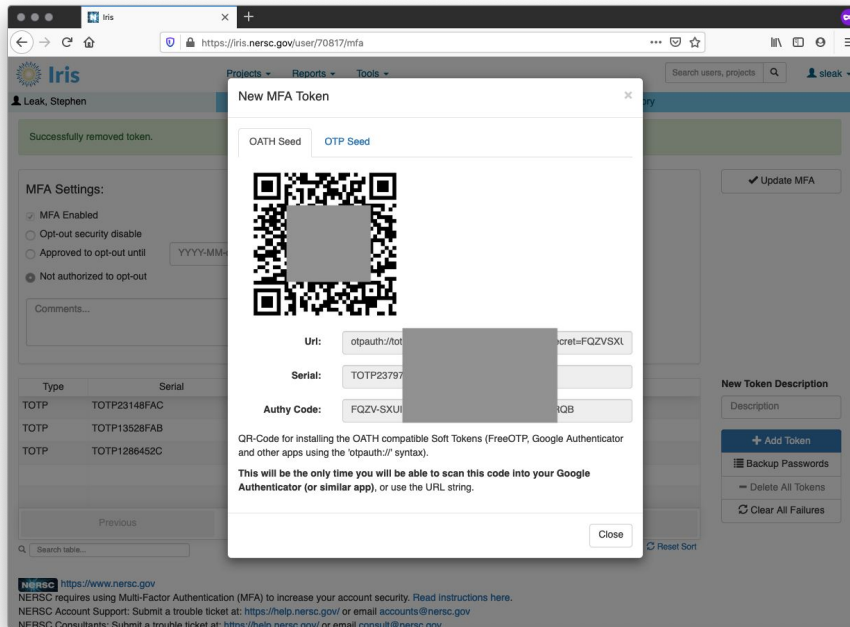
<https://authy.com>

Search "MFA" at
<https://docs.nersc.gov>



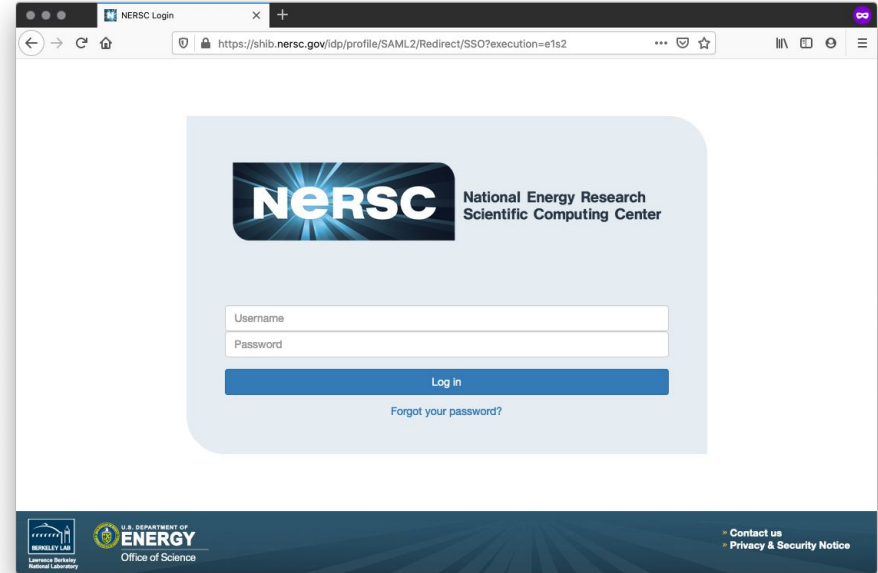
Setting Up MFA in Iris

- Click the "MFA" tab
- Click the "Add Token" button
- Scan the QR code with the Authenticator app (or, paste the Authy code into Authy)



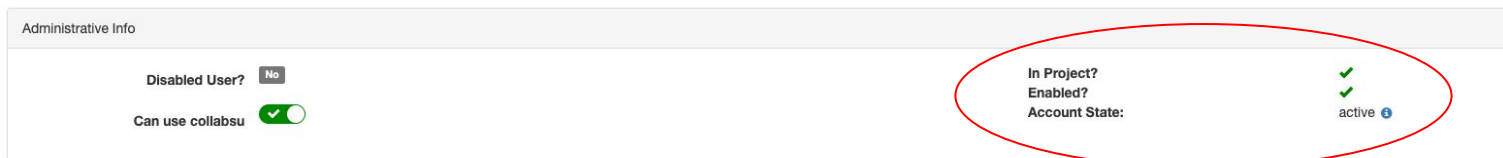
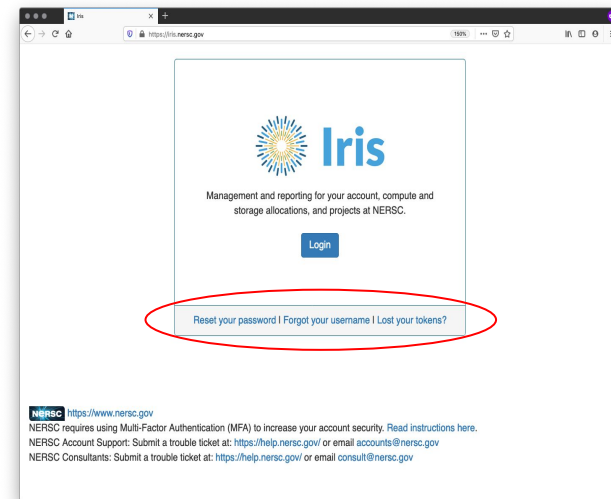
Logging in with MFA

After single-sign-on page you'll be asked for your one-time password (6 digits from app)



Troubleshooting Account Access

- I can't login to Iris
 - New account? It may not be approved yet (can take a few days)
 - Forgot password? Lost MFA tokens? Use the links on the Iris login page
- I can login to Iris, but not Cori or Perlmutter
 - Are you in a project? Check "Roles" tab



Navigating Iris - Menu Bar

CPU Account Membership

GPU Account Membership

Storage Details

NERSC Account Membership

MFA Token

Profile Information

Audit Log

Unix Group Membership

Organization

Organization	Lawrence Berkeley National Laboratory - NERSC
Role	PROSTAFF
Org Type	NERSCOPS
Address	1 Cyclotron Road
City	Berkeley
State	CA
Province	
Postal Code	94720
Country	United States of America (US)
Website	www.nersc.gov
ROR ID	https://ror.org/05v3mvq14

Job Details

ORCID Id

ORCID

All NERSC users are required to have a valid ORCID id. You can easily obtain an ORCID ID by using this [link](#)
If you are unable to create and connect an ORCID id, you can set the value to "n/a".

Navigating Iris - Finding Account Details

Iris Role:

Project Roles:

Project	Description	Role	Accounts	Groupers	Created	Updated
m4232	The Weather Research an...	pi_proxy	m4232_g (DOE) m4232 (DOE)	✓	2023-05-10 10:40	2023-05-10 10:40
m4388	SHI HPC Projects	pi_proxy	m4388 (DOE) m4388_g (DOE)	✓	2023-05-24 04:48	2023-05-24 04:48
nstaff	NERSC Staff Accounts	user	nstaff (DOE) nstaff_g (DOE)	✓	2023-03-24 04:44	2023-03-24 04:44

Iris

m4232 CPU GPU Jobs Storage Roles Groups Details History

Project Overview

Click image to edit

Project funding

Allocation Pool: DOE Allocation Pool
Allocation Type: DOE Mission Science
Office: Biological and Environmental Research
Program: Earth and Environmental Systems Sciences Division (EESSD)
Science Category: Earth Systems : Atmosphere
Slurm Category:

ERCAP project details

Organization: Pacific Northwest National Laboratory (PNNL), US
DOE Sensitive Identifiers:
Compute requested in ERCAP: 2.5 K hours
GPU requested in ERCAP: 0.0 hours
HPSS requested in ERCAP: 1.0 TB
CFS storage available: 20.0 TB
CFS files available: 20.0 M
CFS max projectdirs: 10
Funded by DOE Office of Science? Y
Request # ERCAP0025429

Project owners

pi: [Sakaguchi, Koichi](#)
Koichi.Sakaguchi@pnnl.gov

pi proxy: [Leak, Stephen](#)
sleak@lbl.gov

pi proxy: [He, Yun \(Helen\)](#)
yhe@lbl.gov

pi proxy: [Lively, Charles](#)
charleslively@lbl.gov

pi proxy: [Gupta, Lipi](#)
lipigupta@lbl.gov

Navigating Iris - Changing User Shell

Server Logins

Ldap Tree	Home Directory	Login Shell	Username	GID	Group	Actions
	/global/homes/s/siddiq90	/bin/bash	siddiq90	92503	siddiq90	Edit Delete Search
	/global/homes/s/siddiq90	/bin/zsh	siddiq90	92503	siddiq90	Edit Delete Search
	/global/homes/s/siddiq90	/bin/zsh	siddiq90	92503	siddiq90	Edit Delete Search
	/global/homes/s/siddiq90	/bin/zsh	siddiq90	92503	siddiq90	Edit Delete Search
	/home/s/siddiq90	/bin/bash	siddiq90	92503	siddiq90	Edit Delete Search
	/global/homes/s/siddiq90	/bin/zsh	siddiq90	92503	siddiq90	Edit Delete Search
	/home/siddiq90	/bin/bash	siddiq90	92503	siddiq90	Edit Search
	/global/homes/s/siddiq90	/bin/zsh	siddiq90	92503	siddiq90	Edit Delete Search
	/global/homes/s/siddiq90	/bin/bash	siddiq90	92503	siddiq90	Edit Delete Search
	/home/siddiq90	/bin/bash	siddiq90	92503	siddiq90	Edit Delete Search

Previous Page 1 of 2 10 rows Next

Search table... [.csv](#) [Options](#)

Add a new Server Login

Server

Home Directory

Login Shell

Username

GID

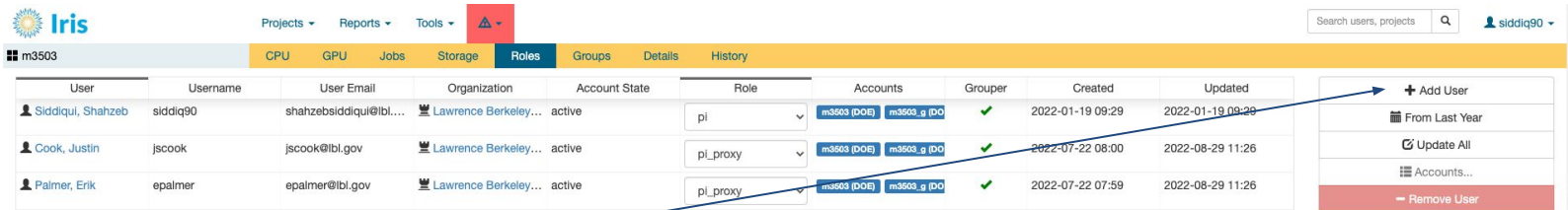
Group Name

Save Changes

Cancel

Navigating Iris - Adding User to Account

PI and PI Proxy only!



User	Username	User Email	Organization	Account State	Role	Accounts	Group	Created	Updated
Siddiqui, Shahzeb	siddiq90	shahzebsiddiqui@lbl...	Lawrence Berkeley...	active	pi	m3503 (DOE) m3503_g (DOE)		2022-01-19 09:29	2022-01-19 09:29
Cook, Justin	jscook	jscook@lbl.gov	Lawrence Berkeley...	active	pi_proxy	m3503 (DOE) m3503_g (DOE)		2022-07-22 08:00	2022-08-29 11:26
Palmer, Erik	epalmer	epalmer@lbl.gov	Lawrence Berkeley...	active	pi_proxy	m3503 (DOE) m3503_g (DOE)		2022-07-22 07:59	2022-08-29 11:26

Add a user to Project **m3503**

Use this form to add an **active** NERSC user to this project. To add a **new** or **deactivated** user, please [invite them](#) instead.

Select a user
Please select a valid user.

Role

You can either grant this user a number of node hours they cannot exceed, or a percentage of the project's compute allocation. The latter takes precedence in case they're both specified.

CPU allocation

Allocated Hours

% of Project's Hours

GPU allocation

Allocated Hours

% of Project's Hours

Please specify what is the max percent of the project's HPSS allocation that can come from this user.

% of HPSS Storage

Connecting to NERSC Systems



Connecting with SSH

↑
the internet!



You will need a (text) terminal program!

- Mac: terminal (built-in) or "iTerm2" (<https://www.iterm2.com/>)
- Windows: PuTTY (<https://www.putty.org/>), MobaXterm (<https://mobaxterm.mobatek.net/>) or XWin32 or Git BASH
- Linux: Your own favorite :)
- Chromebook: crosh (developer mode) or Crostini (Linux-in-a-container) or SSH App

Connecting to NERSC systems

Connect to NERSC Computational Systems

Please make sure you have configured [Multi-Factor Authentication \(MFA\)](#) prior to login.

To access Perlmutter via `ssh` you can do the following:

```
ssh <user>@perlmutter-p1.nersc.gov
```

or

```
ssh <user>@saul-p1.nersc.gov
```

Similarly, you can access Cori with

```
ssh <user>@cori.nersc.gov
```

Connecting with SSH

```
ssh -l siddiq90 -Y perlmutter-p1.nersc.gov
* ~/ ssh -l siddiq90 -Y perlmutter-p1.nersc.gov
The authenticity of host 'perlmutter-p1.nersc.gov (128.55.126.9)' can't be established.
RSA key fingerprint is SHA256:Db9s2Fa4J3qx7An5oIMgUqUAdK7UWJGTPGoIKD44+Gs.
Are you sure you want to continue connecting (yes/no/[fingerprint])?
```

This means your laptop doesn't recognize the computer. The first time you log in, this is expected. But if your laptop **should** recognize Perlmutter, it's a red flag

The screenshot shows the NERSC website page titled "Connecting to NERSC". The main content area is titled "Key fingerprints" and contains the following information:

NERSC may occasionally update the host keys on the major systems. Check here to confirm the current fingerprints.

Perlmutter

```
4096 SHA256:Db9s2Fa4J3qx7An5oIMgUqUAdK7UWJGTPGoIKD44+Gs perlmutter-p1.nersc.gov [R]
```

Cori

```
4096 SHA256:35yiNfemgwzHCHFrPGWwJBCCqERqLt0VSR36s1DaPc cori.nersc.gov (RSA)
256 SHA256:Y0ycBUgqcXq5Zi045oG8JKNo9sek07n0C1Xo0MpQZtc cori.nersc.gov (ECDSA)
256 SHA256:/bLlKa0JDbE1rot71v1f+CQC3tFC+e9cKCCObtS+o cori.nersc.gov (ED25519)
```

The left sidebar contains a navigation menu with "Connecting" selected. The right sidebar contains a "Table of contents" with "Key fingerprints" highlighted. The bottom right corner features the AB logo with the tagline "Bringing Science Solutions to the World".

Connecting with SSH

When you ssh in, you'll see a prompt like:

Password + OTP:

Enter your (iris) password, then the 6 digits from Authenticator, with no spaces etc between

Example: **Pa\$w0rd!123456**

Nothing will appear at prompt as you type! (this is normal)

If you only get "Password: (no "+ OTP)", your account may not be ready yet

```
~/ ssh -l siddiq90 -Y perlmutter-p1.nerisc.gov
Warning: Permanently added the RSA host key for IP address '128.55.126.12' to the list of known hosts.
*****
NOTICE TO USERS
*****
Lawrence Berkeley National Laboratory operates this computer system under
contract to the U.S. Department of Energy. This computer system is the
property of the United States Government and is for authorized use only.
Users (authorized or unauthorized) have no explicit or implicit
expectation of privacy.

Any or all uses of this system and all files on this system may be
intercepted, monitored, recorded, copied, audited, inspected, and disclosed
to authorized site, Department of Energy, and law enforcement personnel,
as well as authorized officials of other agencies, both domestic and foreign.
By using this system, the user consents to such interception, monitoring,
recording, copying, auditing, inspection, and disclosure at the discretion
of authorized site or Department of Energy personnel.

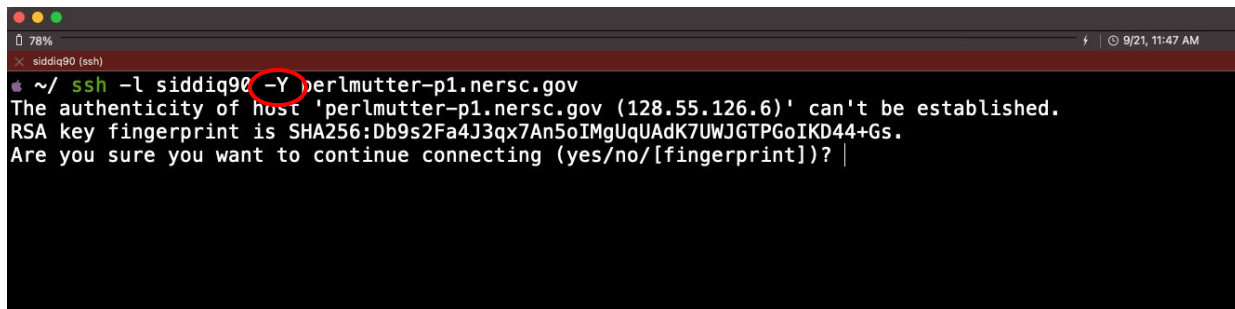
Unauthorized or improper use of this system may result in administrative
disciplinary action and civil and criminal penalties. By continuing to use
this system you indicate your awareness of and consent to these terms and
conditions of use. LOG OFF IMMEDIATELY if you do not agree to the conditions
stated in this warning.

*****

Login connection to host x3116c0s17b0n0:
Password + OTP: ʘ
```

SSH Options

Wait, what was that "-Y" ?



```
~/ ssh -l siddiq90 -Y perlmutter-p1.nersc.gov
The authenticity of host 'perlmutter-p1.nersc.gov (128.55.126.6)' can't be established.
RSA key fingerprint is SHA256:Db9s2Fa4J3qx7An5oIMgUqUAdK7UWJGTPGoIKD44+Gs.
Are you sure you want to continue connecting (yes/no/[fingerprint])?
```

"ssh -Y" (or "ssh -X")

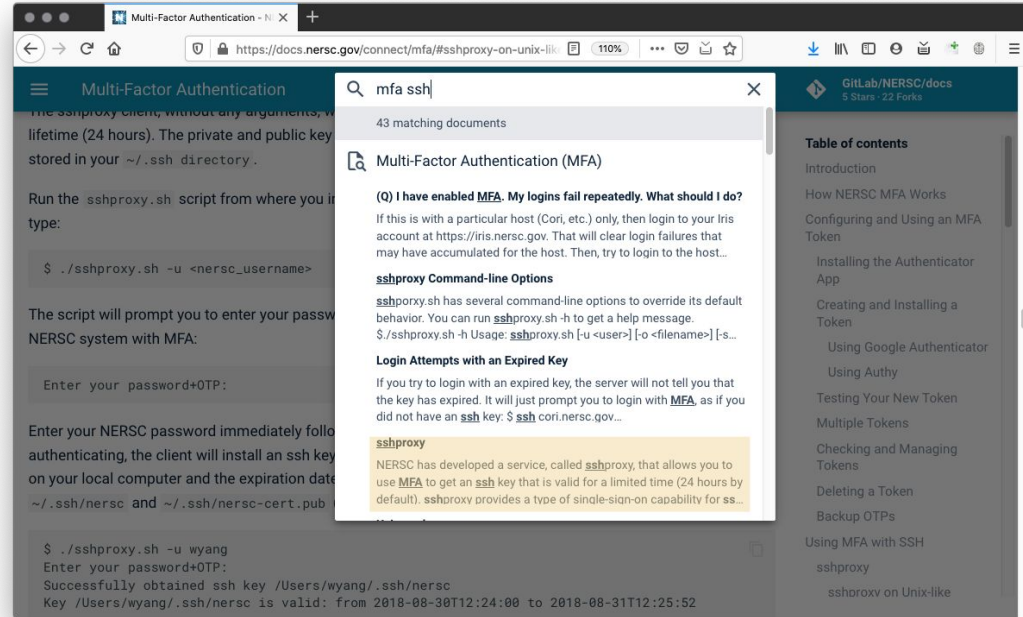
allow X (ie, GUI) programs to display on your local monitor.

- You need an X-server (<https://www.xquartz.org/> for Mac or <http://x.cygwin.com/> for Windows)
- Can be very slow - alternatives coming up!

sshproxy

- Tired of repeatedly typing password + OTP?

- **sshproxy.sh** creates a short-term (24 hours) certificate
- Run **sshproxy.sh** once, then you can ssh to NERSC systems for the next 24 hours before being asked for password+OTP again

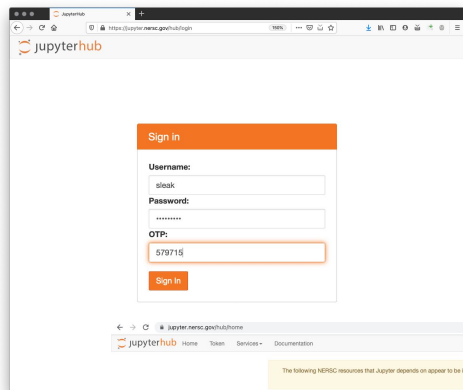


- Search "MFA SSH" at <https://docs.nersc.gov>

Jupyter

You can access NERSC systems from any web browser, via

<https://jupyter.nersc.gov>

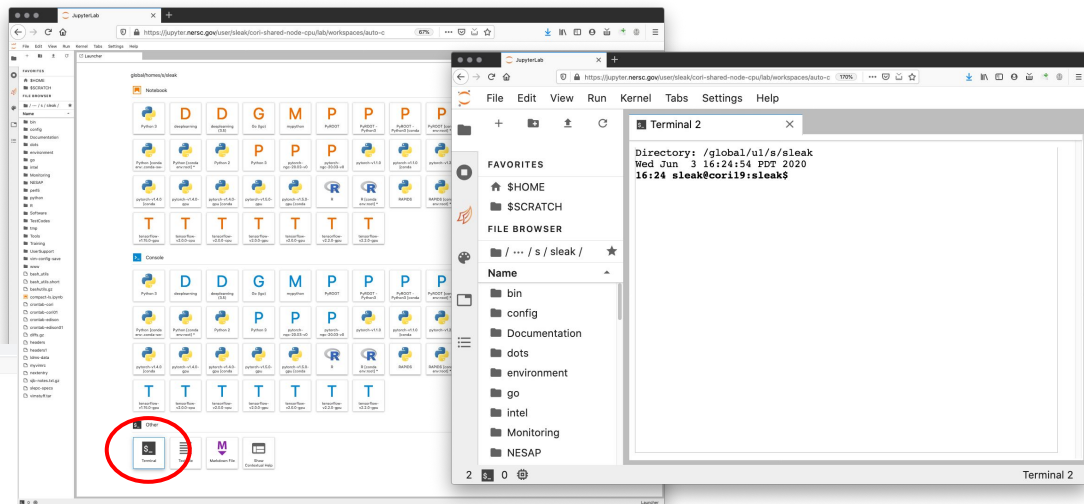


The following NERSC resources that Jupyter depends on appear to be in maintenance or having issues. This may impact Jupyter. See the [NERSC MDTD](#) for further information. Platform status: degraded.

	Shared CPU Node	Shared GPU Node	Exclusive CPU Node	Exclusive GPU Node	Exclusive Large Memory Node	Configurable GPU	Configurable DDX
Alvarez	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>
Muller	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>
Gerty	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>
Perlmutter	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>
Cori	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>	<input type="button" value="start"/>

Resources: Use a node shared with other users' notebooks but outside the local domain. Use your own node within a job allocation using defaults. Use multiple compute nodes with specialized settings.

Use Cases: Visualization and analysis that do not need memory intensive and can run on just a few cores. Visualization, analysis, machine learning that is compute or memory intensive but can be done on a single node. Multi-node analysis jobs, jobs in iterations, custom project changing, and more.

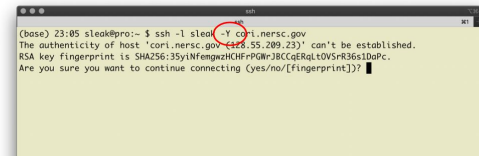


Running GUI Apps

GUI apps eg Matlab, DDT
(debugging), Nsight (performance)
can be painfully slow over a network

Why is this, and how can we fix it?

SSH Options



Wait, what was that "-Y" ?

"ssh -Y" (or "ssh -X")

allow X (ie, GUI) programs on Cori to display on your local monitor.

- You need an X-server (<https://www.xquartz.org/> for Mac or <http://x.cygwin.com/> for Windows)
- **Can be very slow** - alternatives coming up!



24



NoMachine

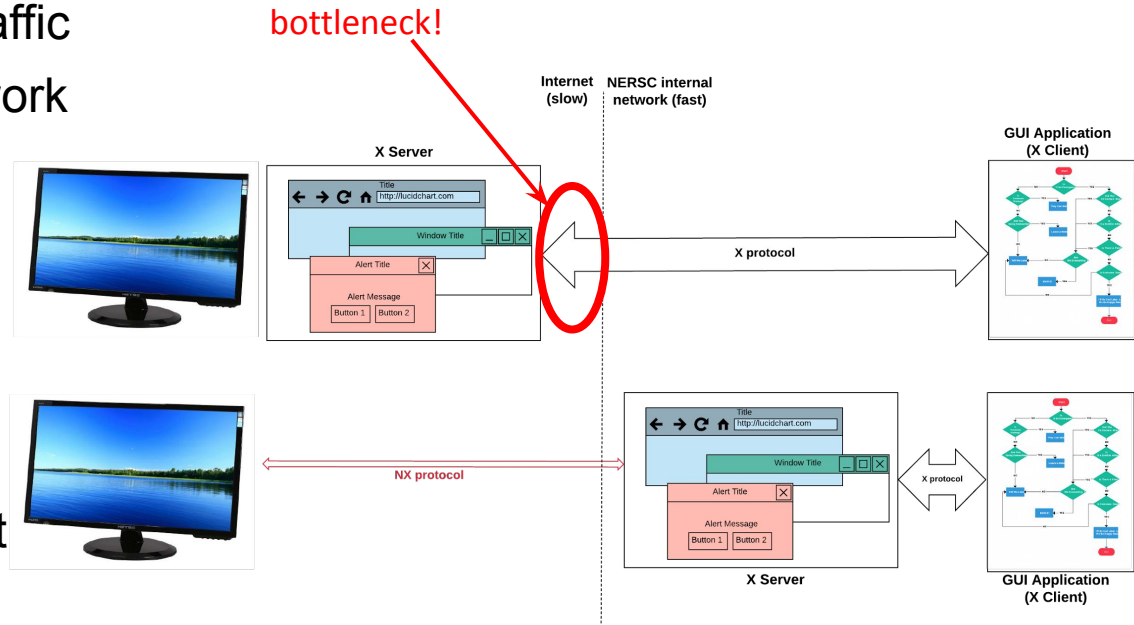


NoMachine: Accelerated X

X protocol makes a lot of traffic

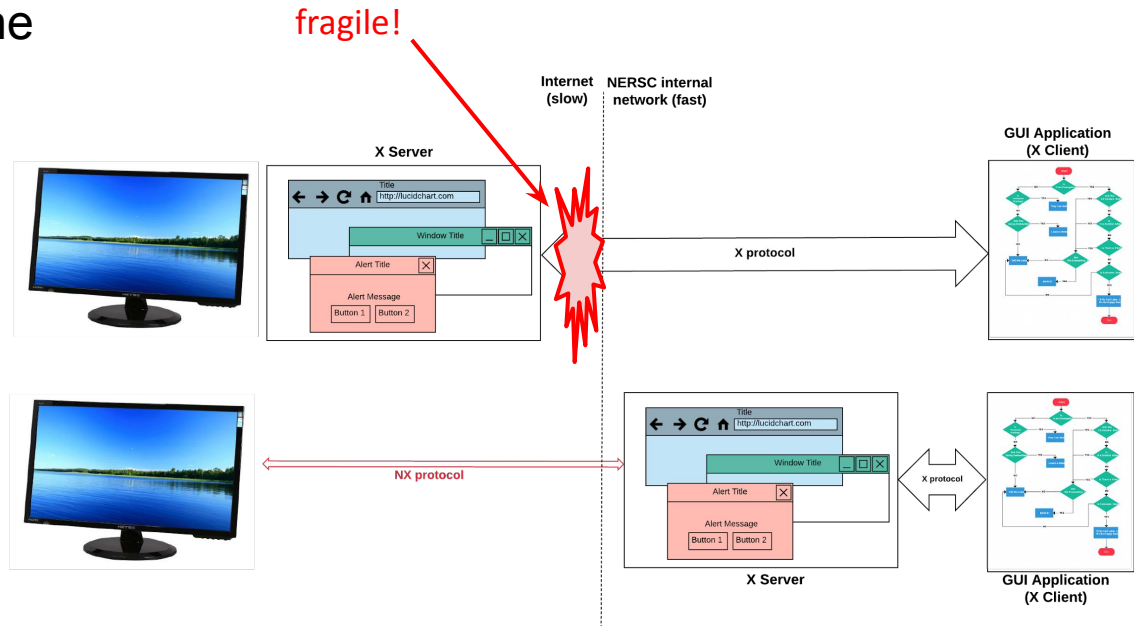
- OK over the (fast) network internal to NERSC
- Not OK over the (slow) internet

NoMachine runs **inside** NERSC, and sends less data over the (slow) internet



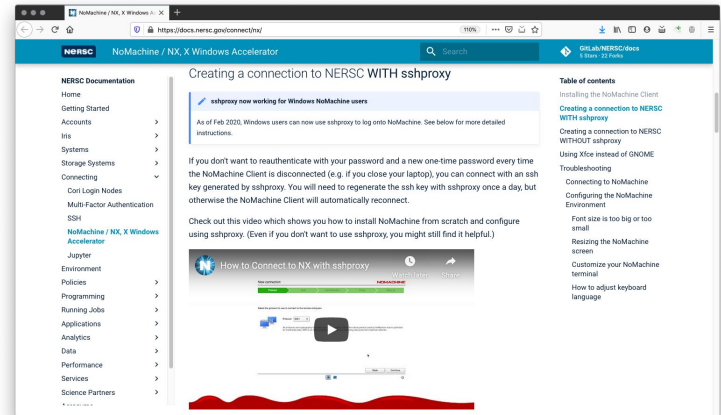
NoMachine: Accelerated X

NoMachine also removes the weakest link, so broken connections don't kill your application



How to Set It Up

- <https://docs.nersc.gov/connect/nx/> has detailed instructions
 - Download the client (<https://www.nomachine.com/download-enterprise#NoMachine-Enterprise-Client>) (Make sure to get the **client**, not the server or workstation)
 - Setup a connection (can optionally use the key you generated with `sshproxy.sh`)



Getting Help! (Submitting a User Ticket)



NERSC Help Portal: <https://help.nersc.gov/>

neresc.servicenowservices.com/sp/

Perlmutter Job Submissions
Project allocation on Perlmutter CPU-only node jobs use (#SBATCH -A mXXXX); for the Perlmutter GPU node jobs you must use the _g_ accounts (#SBATCH -A mXXXX_g).

NERSC

Classic View NERSC Homepage

NERSC Help Portal

Search Incidents and Requests

Documentation
Technical documentation for users, including examples

Open Ticket
Contact NERSC support to report a problem

Open Request
Quota increases, reservations, databases, etc.

Service Announcements
No upcoming maintenances in the next two weeks

Useful Links

- Password Reset
- Book Consulting appointment
- NERSC Status Page
- NERSC Users Slack
- ERCAP
- IRIS

My Recent Incidents

- Sije account do not deactivate**
INC0189990 • Closed • 3d ago

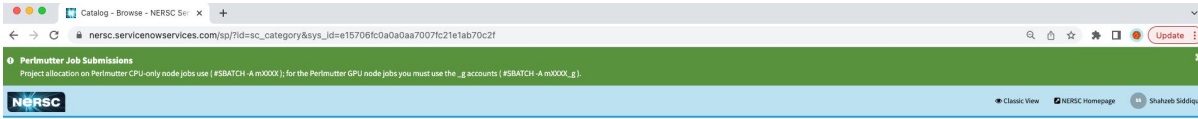
My Watchlist Open Incidents

- BerkeleyGW epsilon run not normal**
INC0177149 • 10mo ago • User Updated • Tang, Hong (tang2017)
- disk quota**
INC0190580 • 9h ago • Awaiting User Info • Prota, James (jprota)
- Quantum chemistry programs on Perlmutter**
INC0190578 • 8d ago • Awaiting User Info • Greenman, Loren (loreng)

My Projects' Open Incidents

- Compute Reservation Request**
INC0190690 • 11d ago • Active-Expectations Set • Ross, Hannah (hross)
- Unable to login to NERSC systems**
INC0190549 • 13d ago • Awaiting User Info • Bhalachandra, Sridutt (sriduttb)
- Degraded Performance on Perlmutter nid001532**
INC0190502 • 13d ago • New • Bhalachandra, Sridutt (sriduttb)
- Compute Reservation Request**
INC0185551 • 4mo ago • Active • Blaschke, Johannes (blaschke)
- DGEMM performance issues with Perlmutter Nodes (nid003069 and nid003177)**
INC0179995 • 7mo ago • Awaiting Vendor • Bhalachandra, Sridutt (sriduttb)
- HPSS Allocations**
INC0180078 • 8mo ago • User Updated • Nugent, Peter (nugent)

Request Forms



- CNAMES
 - Request a nersc.gov CNAME
- Collaboration Account
 - Request a collaboration account
- Compute Reservations
 - Reserve time on compute nodes in advance
- Cori GPU Node Access
 - Request access to Cori GPU nodes
- Databases
 - Request a NERSC hosted science database
- IP Addresses
 - Request a NERSC IP address
- Large Memory Nodes Access
 - Request access to Large Memory Nodes
- NERSC VAST Filesystem Account
 - Request a NERSC VAST filesystem account
- Realtime Queue Access
 - Request realtime queue access
- Report a ServiceNow Issue
 - Report an issue on the ServiceNow platform
- Storage Quota
 - Request an increase in storage space or inodes
- Superfacility API or SSH Proxy Extended Access Request
 - Request read/write/execute access to the Superfacility API or an SSH Proxy certificate with an extended lifetime
- Training Accounts
 - Request NERSC Training Accounts
- VASP License Confirmation Request
 - Request to gain access to the VASP binaries provided by NERSC
- Workflow Node Access
 - Request access to workflow nodes

A screenshot of the 'Storage Quota' request form. The form is titled 'Storage Quota' and includes a 'Submit' button. The form fields are: 'Which filesystem?' (dropdown menu), 'New total storage allocation or space quota (TB)' (text input), 'New inode (number of files and directories) quota (millions)' (text input), 'Impact on your work' (dropdown menu), 'Is your project continuing during next AY?' (dropdown menu), 'Quota change expiration date' (calendar icon), and 'Reason for this request' (text area). A blue arrow points from the 'Storage Quota' link in the left sidebar to the form title. The form also includes a 'Required Information' section with links: 'Which filesystem?', 'Is your project continuing during next AY?', 'Quota change expiration date', and 'Reason for this request'.

How to file a Good Ticket

Do Include:

- error messages, JobID, location of relevant files on system, output of module list
- Steps to reproduce

Don't Include:

- Screenshots! (This seems helpful but usually cannot be read easily, and can't copy/paste text from an image!)



**Pasting
a bare
error message**



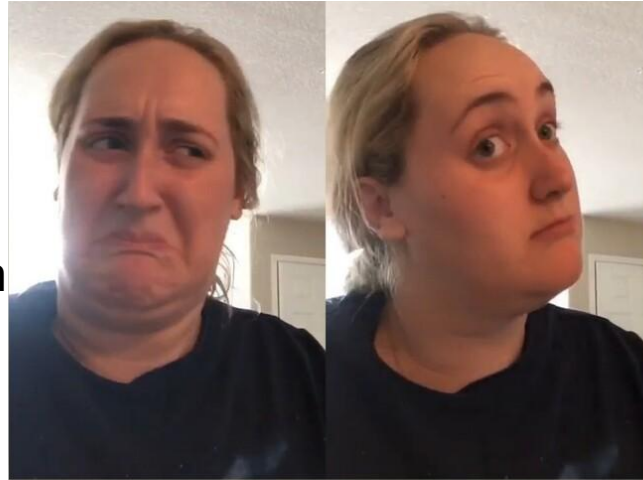
**Providing
all
the steps
to reproduce**

<https://docs.nersc.gov/getting-started/#how-to-file-a-good-ticket>

For Example!

Hard to troubleshoot

- My code is slow
- My job won't start
- Perlmutter is broken



It's always helpful to include the actual error message, even if it's long!

Better to troubleshoot

- JobID 123456 was 3x slower than JobID 234566.
- The jobscript located at `$HOME/submit_job.sh` works on Cori but not on Perlmutter. This was the error message:...
- Running `python $SCRATCH/test_cori.py` crashes with this error message.

Navigating NERSC User Documentation



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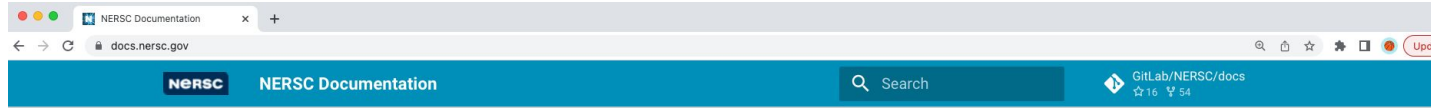
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NERSC Systems

NERSC is one of the largest facilities in the world devoted to providing computational resources for scientific computing.

Perlmutter

[Perlmutter](#) is a HPE (Hewlett Packard Enterprise) Cray EX supercomputer, named in honor of Saul Perlmutter, an astrophysicist at Berkeley Lab who shared the 2011 Nobel Prize in Physics for his contributions to research showing that the expansion of the universe is accelerating.

Perlmutter, based on the HPE Cray Shasta platform, is a heterogeneous system comprising both CPU-only and GPU-accelerated nodes, with a performance of 3-4 times Cori when the installation completes.

We are in the process of Perlmutter Phase 2 integration (adding CPU only nodes and upgrading our system network to Slingshot 11). The final system will consist of 1536 GPU accelerated nodes with 1 AMD Milan processor and 4 NVIDIA A100 GPUs, and 3072 CPU-only nodes with 2 AMD Milan processors. The actual number of nodes available will be in flux during the integration and acceptance of the full system.

Cori (retired)

[Cori](#), a Cray XC40 with a peak performance of about 30 petaflops, was retired on May 31, 2023. The system was named in honor of American biochemist [Gerty Cori](#), the first American woman to win a Nobel Prize and the first woman to be awarded the prize in Physiology or Medicine.

Data transfer nodes

The [data transfer nodes](#) are NERSC servers dedicated to performing transfers between NERSC data storage resources such as HPSS and the NERSC Global File System (NGE), and storage



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Perlmutter

Cori (retired)

Data transfer nodes

NERSC Documentation - Storage Overview

The screenshot shows a web browser window with the URL `docs.nersc.gov/filesystems/`. The page title is "File System overview". The navigation menu on the left includes "NERSC Documentation", "Home", "Getting Started", "Tutorials", "Accounts", "Iris", "Systems", "Storage Systems" (highlighted), "Backups", "Connecting", "Environment", "Policies", "Development", and "Developer Tools". The "Storage Systems" dropdown menu is open, showing "Unix File Permissions", "Quotas and Purging", "Perlmutter scratch", "Cori scratch", "Community", "Archive (HPSS)", "Global Home", "Global Common", "Cori Burst Buffer", "Project", and "Backups". The main content area is titled "File System overview" and "Storage System Usage and Characteristics". It includes a "Summary" section with the text: "File systems are configured for different purposes. Each machine has access to at least three different file systems with different levels of performance, data persistence and available capacity, and each file system is designed to be accessed and used either by a user individually or by their project, as reported in the 'Access' column." Below this is a table with the following data:

File System	Snapshots	Backup	Purging	Access
Home	yes	yes	no	user
Common	no	no	no	project
Community	yes	no	no	project
Cori scratch	no	no	yes	user
Perlmutter scratch	no	no	yes	user
HPSS	no	no	no	user

On the right side, there is a "Table of contents" section with a list of links: "Storage System Usage and Characteristics", "Summary", "Global storage", "Home", "Common", "Community", "Scratch", "Archive (HPSS)", "Local storage", "Burst Buffer", "Temporary per-node Shifter file system", "Local temporary file system", "Data sharing", "Sharing Data Inside NERSC", "Sharing Data Within Your Project", "Sharing Data Outside Your Project", and "Sharing Data Outside of NERSC".

NERSC Documentation - Connecting to NERSC

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Connecting to NERSC

Login Nodes

Opening an [SSH connection](#) to NERSC systems results in a connection to a login node. Typically systems will have multiple login nodes which sit behind a load balancer. New connections will be assigned a random node. If an account has recently connected the load balancer will attempt to connect to the same login node as the previous connection.

Connect to NERSC Computational Systems

Please make sure you have configured [Multi-Factor Authentication \(MFA\)](#) prior to login.

To access Perlmutter via `ssh` you can do the following:

```
ssh <user>@perlmutter.nersc.gov
```

or

```
ssh <user>@saul.nersc.gov
```

If you have configured [sshproxy](#) then you can run the following:

```
ssh -i ~/.ssh/nersc <user>@perlmutter.nersc.gov # or 'ssh -i ~/.ssh/nersc <user>
```

This assumes your identity file is in `~/.ssh/nersc`. The sshproxy route will be convenient if you have multiple ssh connections without having to authenticate every time.

X11 Forwarding

X11 forwarding allows one to display remote computer to your local machine, this can be done as follows:

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NERSC Documentation - Running Jobs

NERSC NERSC Documentation

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Running Jobs

NERSC uses [Slurm](#) for cluster/resource management and job scheduling. Slurm is responsible for allocating resources to users, providing a framework for starting, executing and monitoring work on allocated resources and scheduling work for future execution.

Additional Resources

- Documentation: <https://slurm.schedmd.com/documentation.html>
- Tutorial: <https://slurm.schedmd.com/tutorials.html>
- Manual: https://slurm.schedmd.com/man_index.html
- FAQ: <https://slurm.schedmd.com/faq.html>

Jobs

A **job** is an allocation of resources such as compute nodes assigned to a user for an amount of time. Jobs can be interactive or batch (e.g., a script) scheduled for later execution.

Tip

NERSC provides an extensive set of [example job scripts](#)

Once a job is assigned a set of nodes, the user is able to initiate parallel work in the form of job steps (sets of tasks) in any configuration within the allocation.

When you login to a NERSC system you land on a [login node](#). Login nodes are for editing, compiling, or preparing jobs. They are not for running jobs. From the login node you can interact with Slurm to submit job scripts or start interactive jobs.

NERSC's environment is configured to support a diverse workload including high-throughput

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NERSC Documentation - Programming Models

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Programming Models

A wide variety of programming models are used on NERSC systems. The most common is MPI + OpenMP, but many others are supported.

Parallel programming models at NERSC

Since the transition from vector to distributed memory (MPP) supercomputer architectures, the majority of HPC applications deployed on NERSC resources have evolved to use MPI as their sole means of expressing parallelism. As single processor core compute nodes on MPP architectures gave way to multicore processors, applying the same abstraction (processes passing messages) to each available core remained an attractive alternative - no code changes were required, and vendors made an effort to design optimized fast-paths for on-node communication.

However, as on-node parallelism rapidly increases and competition for shared resources per processing element (memory per core, bandwidth per core, etc.) does as well, now is a good time to assess whether applications can benefit from a different abstraction for expressing on-node parallelism. Examples of desirable functionality potentially available through the latter include more efficient utilization of resources (e.g. through threading) or the ability to exploit unique architectural features (e.g. vectorization).

Perlmutter, and beyond: Performance and portability

Perlmutter has a mixture of CPU-only nodes and CPU + GPU nodes. Each CPU + GPU nodes has 4 GPUs per CPU node.

NERSC has made an effort to provide guidance on parallel programming approaches. Chief among these is the combination of MPI for inter-node parallelism and OpenMP for intra-node parallelism (or potentially MPI per NUMA domain with OpenMP within each).

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- Parallel programming models at NERSC
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- Why MPI + OpenMP?
- Combining Programming Models
 - Distributed memory (inter-node) parallelism
 - Shared memory (intra-node) parallelism
 - CPU
 - GPU

Jobscript Generator

The screenshot shows a web browser window with the URL `my.nersc.gov/script_generator.php`. The page title is "Jobscript Generator". On the left is a navigation sidebar with links: Sign In, Dashboard, Jobs (expanded), Jobscript Generator (selected), Completed Jobs, Cori Queues, Queue Backlog, Center Status, File Browser, Service Tickets, Data Dashboard, PI Toolbox, Jupyter Hub, NERSC Homepage, Documentation Portal, and Accounts Portal. The main content area is titled "Jobscript Generator" and contains the following sections:

- Job Information**: A descriptive paragraph stating the tool generates a batch script template with process and thread binding configurations.
- Machine**: A dropdown menu with "Cori - Haswell" selected.
- Application Name**: A text input field containing "myapp.x".
- Job Name**: An empty text input field.
- Email Address**: An empty text input field.
- Quality of Service**: A dropdown menu with "regular" selected.
- Wallclock Time**: Three input fields for duration: "0" hours, "30" minutes, and "0" seconds.
- Number of Nodes**: A label for the next section.

On the right side of the form is a large grey box with the text "Your script will be displayed here."

Navigating NERSC Home Page



Navigating www.nersc.gov (NERSC Training)

NERSC Powering Scientific Discovery Since 1974

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NERSC TRAINING

See also the NERSC Events Calendar

Filter by Year

NERSC/NVIDIA AI for Scientific Computing Bootcamp

October 18, 2023

NERSC, in collaboration with the OpenACC organization and NVIDIA, is hosting a virtual, three-day AI for Scientific Computing Bootcamp October 18 - 20, 2023. [Apply by October 4, 2023. Read More »](#)

SpinUp Workshop: October 2023

October 18, 2023

Spin is a container-based platform at NERSC designed for you to deploy your own science gateways, workflow managers, databases, API endpoints, and other network services to support your scientific projects. Services in Spin are built with Docker containers and can easily access NERSC systems and storage. Users must apply for and complete the SpinUp instructional workshop before using Spin. Completion of the SpinUp workshop is required for access/October 2023 Location: All... [Read More »](#)

GPU Profiling (Performance Profile: Omniperf): Part 5 of HIP Training Series

October 16, 2023

AMD presents a multi-part HIP training series intended to help new and existing GPU programmers understand the main concepts of the HIP programming model. [Read More »](#)

OLCF AI Training Series: AI for Science at Scale - Part 2

October 19, 2023

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Code of Conduct

NEW USER TRAINING: SEPTEMBER 7-8, 2023

SEPTEMBER 7, 2023

NERSC is hosting a virtual training event for new users on two half-days on Thursday and Friday, September 7-8, 2023.

The goal is to introduce new users to NERSC

- Computational systems,
- Accounts and allocations,
- Programming environment,
- Running jobs, tools, and best practices, and
- The NERSC data ecosystem.

The training will be focused on *Perlmutter* and using NERSC resources effectively.

Registration

Please use [this form](#) to register and please see the Tentative Agenda for this two half-day virtual event below.

Topic: NERSC New User Training

Join Zoom Meeting
<https://bnl.zoom.us/j/99223413236?pwd=OG5TU1U1qMWFyRWFkVHpmSQ13M96QT09>

Meeting ID: 992 2341 3236
Passcode: 187869

Day 1 Agenda

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HOME ABOUT SCIENCE SYSTEMS FOR USERS NEWS R & D **EVENTS** LIVE STATUS STAFF ONLY

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NERSC EVENTS CALENDAR

NERSC Training & Events Calendar
Today ◀ ▶ **September 2023** Print

Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	31	Sep 1	2
	10am Training: Po		9am SpinUp: Hact	1pm SpinUp: Hact	10am Spin Office I	
3	4	5	6	7	8	9
		1pm FUN Office H		9am New User Tr	9am New User Tr	10am Spin Office I
10	11	12	13	14	15	16
	9am Perlmutter G				10am Spin Office I	
17	18	19	20	21	22	23
	9am Perlmutter G 10am Training: AN			11am NUG Monthl 11am NUG Monthl 11am NUG Monthl	10am Spin Office I	
24	25	26	27	28	29	30
	9am Perlmutter G	NERSC User Group (NUG) Annual Meeting			10am Spin Office I	

Events shown in time zone: Pacific Time - Los Angeles GoogleCalendar

NERSC Training & Events

Today ◀ ▶ **Thursday, September 7** Print

Thursday, September 7

9:00am New User Training, Day 1

Friday, September 8

9:00am New User Training, Day 2

10:00am Spin Office Hours

Monday, September 11

Live Status: (<https://www.nersc.gov/live-status/motd/>)

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HOME ABOUT SCIENCE SYSTEMS FOR USERS NEWS R & D EVENTS **LIVE STATUS**

LIVE STATUS

- Live Status (MOTD)
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Home » Live Status » Live Status (MOTD)

LIVE STATUS (MOTD)

Compute Systems:

System	Status	Jobs Running	Jobs Queued	Cores in Use	Load	Description/Notes
Perimutter:	Up					

Global Filesystems:

System	Status	Description/Notes
Community File System (CFS):	Up	
DNA:	Up	
Data Transfer Nodes:	Up	
Global Common:	Up	
Global Homes:	Up	

Mass Storage Systems:

System	Status	Description/Notes
HPSS Archive (User):	Up	
HPSS Regent (Backup):	Up	

Service Status:

All services are available.

Planned Outages:

Spin:	02/13/24 14:00-18:00 PST Scheduled Maintenance Workloads in the development cluster may be unavailable for brief periods (1-2 min) during the window for a time-sensitive upgrade to system software.
HPSS Regent (Backup):	02/15/24 9:00-12:00 PST Scheduled Maintenance Some retrievals may be delayed during tape library maintenance.
Perimutter:	02/21/24 6:00-16:00 PST Scheduled Maintenance Perimutter will be unavailable during the listed times due to scheduled maintenance.
Spin:	02/21/24 13:00-18:00 PST Scheduled Maintenance Workloads in the production cluster will be unavailable for brief periods (1-2 min) during the window for an upgrade to system software.
HPSS Regent (Backup):	03/06/24 9:00-13:00 PST Scheduled Maintenance System down for quarterly maintenance.
HPSS Archive (User):	03/13/24 9:00-13:00 PDT Scheduled Maintenance System down for quarterly maintenance.

Lipi's Top Tip:
Add disruptive outages to your calendar so you can plan ahead!

Navigating www.nersc.gov (Scheduled System Outages)

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NERSC SCHEDULED SYSTEM OUTAGES

NERSC Outages

Today Thursday, September 7

Print Week Month Agenda

Wednesday, September 13

- 6:00am Perimutter Scheduled Maintenance
- 9:00am HPSS Regent (Backup) Scheduled Maintenance
- 9:30am Globus Scheduled Maintenance

Tuesday, September 19

- 9:30am Globus Scheduled Maintenance

Wednesday, September 20

- 6:00am Perimutter Scheduled Maintenance

Showing events until 11/15. [Look for more](#)

Events shown in time zone: Pacific Time - Los Angeles

GoogleCalendar

Last edited: 2018-05-02 15:38:06

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NERSC USERS GROUP (NUG)

The NERSC Users' Group, NUG, welcomes participation from all NERSC users. NUG provides advice and feedback to NERSC on the current state and future delivery of NERSC resources and services. NUG promotes the effective use of the high performance computing facilities at NERSC by sharing information about experiences in using the facility, suggesting new research and technology directions in scientific computing, and voicing user concerns.

NUG members converse with NERSC and DOE through monthly teleconferences, NUG email lists, and yearly face-to-face meetings.

NERSC holds annual face-to-face meetings.

Monthly NUG Webinars »

This page lists the NERSC User Group (NUG) monthly user telecons and webinars.
[Read More »](#)

NUG Annual Meetings »

NUG holds annual meetings. The annual meetings usually consist of one "business day" and one to three days of High Performance Computing training. [Read More »](#)

SIG Experimental Facility Users »

NUG is sponsoring a Special Interest Group (SIG) within the NERSC Users Group for Experimental Facility Users. [Read More »](#)

NUG Executive Committee (NUGEX) »

NUGEX is the voice of the user community to NERSC and DOE. While all NUG events are open to all NERSC users, NUGEX members regularly participate in the monthly teleconferences and the annual face-to-face meeting. NUGEX is consulted on many NERSC policy issues, e.g., batch configurations, disk quotas, services and training offerings. Members of NUGEX also participate in their office's NERSC Requirements Reviews of High Performance Computing and Storage. There are three representatives from each office and three members-at-large. [Read More »](#)

NUGEX Positions - Now accepting nominations »

We are currently seeking volunteers and nominations for NUGEX - if you would like to participate, or to nominate a potential NUGEX member, please fill in and submit the form at <https://forms.fcl3d/hispd6wlv/77> The Executive Committee (NUGEX) of the NERSC User's Group (NUG) is a group of NERSC users who oversee NUG activities for the benefit of NERSC's user community of over 8,000 researchers across all scientific domains of the DOE Office of Science. NUGEX will meet regularly (up to 1... [Read More »](#)

Charles Lively (CharlesLively) | Logout
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MONTHLY NUG WEBINARS

NUG holds monthly teleconferences with NERSC, usually on the second Thursday of the month, from 11 a.m. to 12 p.m. Pacific Time. All NERSC users, regardless of experience or sophistication, are welcome and encouraged to attend. Connection details are sent monthly via email to all NERSC users.

NUG teleconferences are also listed on the [Events Calendar](#).

NUG Meeting August 24, 2023 »

August 24, 2023
Date: Thursday, August 24, 2023 Time: 11:00 PST The Monthly NUG Meeting is a regular opportunity for our users to show off what they've done, for NERSC to get feedback from users, and for users to exchange ideas. Zoom: <https://lbnl.zoom.us/j/285479463> (full connection details below). We'll also use the NERSC Users Slack #webinars channel for discussion before, during and after the meeting. Add meeting series to calendar/Agenda Announcements and Calls for... [Read More »](#)

NUG Meeting July 20, 2023 »

July 20, 2023
Date: Thursday, July 20, 2023 Time: 11:00 PST The Monthly NUG Meeting is a regular opportunity for our users to show off what they've done, for NERSC to get feedback from users, and for users to exchange ideas. Zoom: <https://lbnl.zoom.us/j/285479463> (full connection details below). We'll also use the NERSC Users Slack #webinars channel for discussion before, during and after the meeting. Add meeting series to calendar/Agenda Announcements and Calls for Participation: Upcoming... [Read More »](#)

NUG Meeting June 15, 2023 »

June 15, 2023
Date: Thursday, June 15, 2023 Time: 11:00 PST The Monthly NUG Meeting is a regular

FOR USERS

- Getting Started
- Accounts & Allocations
- Getting Help
- Live Status
- Documentation
- NERSC Code of Conduct
- Policies
- My NERSC
- Training & Tutorials
- NERSC Users Group
- Monthly NUG Webinars

August 24, 2023 - Best Practices for Reading and Writing Data on Perlmutter

July 20, 2023 - How to Submit a Good Ticket at NERSC

June 15, 2023 - Jupyter at NERSC

May 25, 2023 - SLURM Tips and Tricks at NERSC

April 25, 2023 - Julia at NERSC

March 16, 2023 - Science Highlights

Feb 16, 2023 - Cori Retirement

Jan 19, 2023 - User Community Engagement

Dec 15, 2022 - Allocation Year Transition

Nov 17, 2022 - Migrating from Cori to



Thank You and
Welcome to
NERSC!

