Some Logistics

- Please change your name in Zoom as "first_name last_name (nersc_user_name)", such as "Helen He (yunhe)"
  - Click "Participants", then "More" next to your name to rename.
- You can click the CC button to toggle captions and view full transcript
- Slides to be uploaded soon. Videos available in a few days after split/trim
  - https://www.nersc.gov/users/training/events/migrating-from-cori-to-perlmutter-training-march2023/
- We do Q&As in GDoc (preferred over Zoom chat)
  - https://tinyurl.com/3yted8ek
  - NERSC staff standing by to answer questions
- Please help us with Survey afterwards
  - https://tinyurl.com/2t9jnnzk

About This Training

- This is a rerun of the Dec 1, 2022 migration training, with some updates
- It covers
  - Perlmutter architectures
  - Recommended programming models
  - Performance tips
  - Programming environment
  - Building and running jobs on CPUs and GPUs
  - Focus on differences between Cori and Perlmutter
- It does not cover
  - Teaching coding and optimization of using CPU and GPU programming models
  - Data analytics software and workflow usages

Agenda

Time (PST)	Topic	Presenters
9:00 - 9:15 am	Introduction: Migrating from Cori to Perlmutter Training	Helen He, Rebecca Hartman-Baker
9:15 - 10:00 am	Intro to Perlmutter and GPUs	Jack Deslippe
10:00 - 10:50 am	Migrating from Cori to Perlmutter: CPU Codes	Erik Palmer, Helen He
10:50 - 11:10 am	Break	
11:10 - 11:50 am	Migrating from Cori to Perlmutter: GPU Codes	Muaaz Awan, Steve Leak, Helen He
11:50 am -12:20 pm	More Q&A and start Hands-on	All
12:20 - 1:00 pm	Lunch Break	
1:00 - 2:30 pm	Hands-on and help with users' own codes (cont'd)	All

Hands-on Exercises

- Feel free to use some NERSC prepared CPU and GPU examples at
  https://github.com/NERSC/Migrate-to-Perlmutter

  or bring your own applications codes today.

- Perlmutter Compute node reservations today, 11:30 - 14:30:
  - CPU: #SBATCH --reservation=pm_cpu_mar10 -A ntrain8 -C cpu
  - GPU: #SBATCH --reservation=pm_gpu_mar10 -A ntrain8 -C gpu
  - Existing NERSC users are added to the ntrain8 project to access node reservations

Cori Will Be Retired in Apr 2023

- Cori was installed in 2015, and at 6+ years may be NERSC's longest lasting system
- AY2023 allocations are based on Perlmutter's capability, and NERSC hours allocated can be used on Cori
- We will give users more time and help to transition from Cori to Perlmutter
- Cori will be retired in **end of Apr 2023 (as T in next slide)**

Cori Retirement Timeline

- **Oct 2022:** Software freeze (no new user-facing software installed by NERSC)
- **AY 2023:** All allocations based on Perlmutter's capacity only
- **Nov-Mar:** Cori to Perlmutter transition training focus & office hours
- **Jan 2023:** Announced **final date (T), end of April** for decommissioning
  - Note: Cori GPU and Cori large memory nodes retires end of March
  - Cori Haswell and KNL nodes expire end of April
- **T - 1 week:** Implement reservation, preventing new jobs from running effective T
- **T:** Delete all jobs from queue, no new jobs can be submitted; continue to allow login to retrieve files from Cori scratch
- **T + 1 week:** Close login nodes permanently
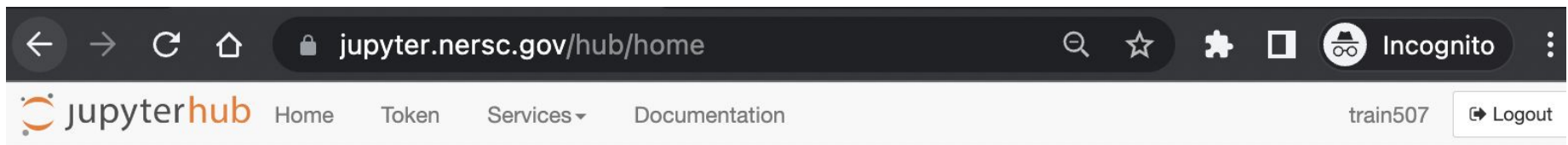- **T + 1 month:** Disassembly begins

Access Perlmutter via SSH

- **ssh elvis@perlmutter-p1.nersc.gov**
  or **ssh elvis@saul-p1.nersc.gov**
  (substituting your username for **elvis**)
- Use MFA (password + one-time password) in same way as Cori
  - Can use sshproxy to reduce frequency of authentication

Access Perlmutter via JupyterHub

Can open a "terminal" as well as choosing many other JupyterHub kernels (such as Python, PyTorch, etc.)

File Systems and Data Considerations

- Files/data in your global home and CFS directories on Cori are available on Perlmutter
  - The old symlink /global/project/projectdirs to CFS on Cori does not exist on Perlmutter; be sure to remove this from old scripts!
- Files/data on Cori scratch not accessible on Perlmutter
  - Perlmutter has its own scratch file system
  - Cori scratch will be retired with Cori
  - Can migrate Cori scratch data onto CFS or HPSS via Globus or scp first, then access on Perlmutter (details)

Cori / Perlmutter Comparison: Similarities

- Cray user environment
  - Compiler wrappers (cc, CC, ftn)
  - PrgEnv modules
- Slurm
  - Similar queues set up (regular, premium, overrun, shared, etc.)
- CPU nodes
  - AMD instead of Intel, but standard CPU architecture with no major surprises
  - Similar to Haswell in clock speed, similar to KNL in number of cores per node

Cori / Perlmutter Comparison: Differences

- Lmod *vs* modules
  - Many similarities, but some major differences
  - Modules may not be initially visible due to dependencies; using **module spider** will find hidden modules
- GPU nodes
  - Substantially different programming models required to exploit GPU nodes
  - Codes may have different GPU-compatible and CPU-only versions
- Compiler/PrgEnv versions
  - No Intel compiler

Data Analytics Documentations on Perlmutter

- [Jupyter](#)
- [Using Pythton on Perlmutter](#)
- [Preparing Python for Perlmutter GPU](#)
- [Julia](#)
- [Shifter](#)
- [Workflow Tools](#)
- [Analytics](#)
- [Machine Learning](#)

Some Existing Training Materials

- NERSC Training Events and Archives (slides, recordings): https://www.nersc.gov/users/training/events/
  - **+** Using Perlmutter Training, Jan 2022
  - **+** New User Training, Sept 2022
  - **+** Data Day 2022, Oct 2022
  - GPUs for Science Day 2022, Oct 2022
  - OpenMP Offload Training, Aug-Sep 2022
  - **+** AI for Science Bootcamp, Aug 2022
  - 9-part CUDA Training Series. Jan 2020 - Oct 2021
  - 3-part OpenACC Training Series, Apr - Jun 2020
  - SYCL Training, Mar 2022
  - Codee Training, Apr 2022
  - Nvidia HPC SDK Training, Jan 2022
  - Migrating from Cori to Perlmutter Training, Dec 2022
  - …

+: events covers
Data related topics

More Info and Training Opportunities

- **Migrating from Cori to Perlmutter documentation**
  - https://docs.nersc.gov/systems/cori/migrate_to_perlmutter/
- Cori to Perlmutter Transition Office Hours
  - Held 10 office hours since Nov, met with 150+ users
  - More scheduled: Wed, Mar 15; Fri, Mar 31
- N-Ways for GPU Programming Bootcamp (Apr 5-6)
  - OpenMP Offload, OpenACC, CUDA, Standard Language Parallelization, etc. Application deadline Mar 22
- DOE Cross-facility Workflows training (April 12)
  - GNU Parallel, Parsl, FireWorks, and Balsam. Deadline Apr 5
- Codee training (Apr 25-26)
  - A developer tool to help inserting OpenMP and OpenACC directives

Thanks for your attention!

More questions? Need help? ...
http://help.nersc.gov/