SC-HEP Allocations at NERSC

Eric Church, HEP Detallee (PNNL)
NERSC Users Group meeting
12-Oct-2022
HEP develops and supports a specific portfolio of projects:

- Makes **significant, coherent contributions to facilities/experiments** selected for the program, including project management
- Supports **R&D that will advance the state-of-the-art in particle accelerators and detectors** that will lead to new, more capable facilities
- Supports **R&D to enable new and transformative capabilities** in AI/ML, QIS, and cross-cutting technology areas
- Supports vibrant theory program to **provide the vision and extend our knowledge** of particles, forces, space-time, and the universe
- **DOE-HEP supports ~85% of U.S. particle physics (in $), including ~all national laboratories**
HEP Org chart
HEP programs

- The High Energy Physics Programs
  - Intensity Frontier
  - Energy Frontier
  - Cosmic Frontier
  - Theory
  - ... Accelerators, Advanced Detectors, SBIR, QIS ...
  - Experiment Operations
  - ... and Computational Physics – Us! -- manages compute and AI/ML projects ... and things like HEP’s presence at NERSC
  - Jeremy Love, Program Director
  - Eric Church, detailee
Talk Outline

- New Allocation Year (AY) applications
  - Via ERCAP
  - Will focus on AY22-23

- Intra-AY Rebalancing
  - Via IRIS
  - Mainly AY22 experience

- Out-Year Planning
  - For our current large consumers
  - Doesn’t really make accommodation for new large consumers, who we know are coming ...
In October the ERCAP deadline closes and ~80 applications for AY22-23 are filed which ask for an HEP allocation

- Jeremy and I filter them for relevance to HEP
- Some things which are not obviously in the program mission may be filtered at this step
  - e.g., esoteric astrophysics studies
  - Gravitational Waves work
  - Mis-targeted things
    - FES, NP proposals, for example
We are dominated by giants

- Our top 10 projects use 85% of our allocation.

- Our top 3 would happily gobble up the entire HEP allocation.
AY23’s proposals

This form continues on below what’s shown us. Our GPU requests sum to almost what’s available for us this year to allocate out.

Note that we’re being asked for more CPU node hours than HEP has.
Those numbers for CPU node hours for us to allocate out (requested) is down from AY2022:

- AY23: 2.6(3.2) E6

This is the effect of Cori going away

For which we have tried to prepare the HEP community

- The HEP CPU request is down not because the need for CPU time is lower but because we have gone through the planning to manage the pain of Cori’s decommissioning. NERSC could not meet the CPU needs of HEP in AY22 and it is really falling short in AY23.
**AY22 requests**

**Just a snapshot of the ~80 proposals**

<table>
<thead>
<tr>
<th>Proposal Title</th>
<th>Year</th>
<th>Sponsor</th>
<th>Lab/Department</th>
<th>Code</th>
<th>Code Area</th>
<th>Code Subarea</th>
<th>Proposal Summary</th>
<th>Type</th>
<th>Allocation</th>
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<tbody>
<tr>
<td>[Proposal 1] (Physics, High Energy Physics, Experiment...)</td>
<td>2022</td>
<td>[Principal Investigator]</td>
<td>Berkeley Lab</td>
<td>[CCE Training Code]</td>
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<td>m2145</td>
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<td>[Principal Investigator]</td>
<td>Berkeley Lab</td>
<td>Large-Scale Structure of the Universe</td>
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<td>m3806</td>
<td>This is a repository used by students...</td>
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<tr>
<td>[Proposal 3] (Physics, Cosmology)</td>
<td>2022</td>
<td>[Principal Investigator]</td>
<td>SLAC</td>
<td>LSST Dark Energy Science Collaboration...</td>
<td>LSST, DESC</td>
<td>m3727</td>
<td>The Vera C. Rubin Observatory's Legacy...</td>
<td>DOE Mission Science</td>
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<td>[Proposal 4] (Physics, Accelerator Science)</td>
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<td>SLAC</td>
<td>Advanced Modeling for Particle Accelerators</td>
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<td>[Proposal 5] (Physics, Cosmology)</td>
<td>2022</td>
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<td>NASA JPL</td>
<td>Simulating High-Multiplicity Events</td>
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<td>DESI: 600k+ redshifts</td>
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<td>FNAL-IF</td>
<td>m3245</td>
<td>The HER2Cloud Facility is an intelligent...</td>
<td>DOE Mission Science</td>
<td>Provisioned</td>
</tr>
</tbody>
</table>

(There’s seldom a shortage of proposals from Berkeley/LBL)

And clicking on the shown project (chosen randomly)...
Rubin/DESC, as an example

A modest request for both CPU and GPU
Factors going into awarded allocations

- Here our guidelines
- We have obligations to Cosmic Frontier experiments which we must try to meet
  - because many have been urged over past years by HEP to use NERSC for their Production/Operations/Research computing to conserve resources
  - By agreement between HEP and ASCR ADs: Jim Siegrist and Barb Helland.
- We generally accommodate modest requests fully
  - Particularly if there is a history of using previous allocations
  - A lot of these are in the noise
- Historically large, efficient power users making large requests again are accommodated, as possible
  - Year-over-Year request over ~30% requires a conversation
- Large requests from users with a history of not using allocations in the past will frequently receive scaled back allocations in coming AY
- We run our proposal by the HEP Program Managers for concurrence
- We Hold Back ~15% for later allocation
- Similar consideration for GPU and storage
  - Knowing that GPU on Permutter was to be uncharged most of AY22
Ongoing adjustments

- During the year at a discrete point NERSC (Clayton Bagwell) makes their own adjustments, clawing back from under-users

- We come in around September and make our own adjustments
  - Clawing back from users under a certain CPU usage
  - Offering to add to those above some threshold
    - Points for maximizing charged-machine usage
  - Lots of communication back/forth before action
    - Good reasons for under-usage generally result in inaction

- We also do epsilon tuning to maximize usage in Nov/December

- This is done on the *iris* system
Sorted by CPU node hours used

Note that some users have pegged the needle already, 3mo’s before AY end. Some groups’ compute appetites are insatiable.

Storage increase requests: 20 Tbytes have been historically been granted mid-AY (not by us, by NERSC)
Out-Years NERSC usage

- With an eye toward gauging HEP demand
  - In the past year we have held discussions with ~8 of our historically heavy users, e.g.
    - LHC experiments
    - Lattice QCD projects
  - NERSC explicitly uninterested in our out-years

- We have asked these projects’ anticipated usage for the next ~3 years
  - To the Point we’ve asked for this in their ERCAP proposals
  - And urged them toward ever-more GPU usage
    - Some groups are more prepared than others
    - A few have reported unreliable Perlmutter GPU running and expressed concern