

The Sol Supercomputer at Arizona State University

Douglas M. Jennewein, **Johnathan Lee**, Chris Kurtz, William Dizon, Ian Shaeffer, Alan Chapman, Alejandro Chiquete, Josh Burks, Amber Carlson, Natalie Mason, Arhat Kobawala, Thirugnanam Jagadeesan, Praful Bhargav Basani, Torey Battelle, Rebecca Belshe, Deb McCaffrey, Marisa Brazil, Chaitanya Inumella, Kirby Kuznia, Jade Buzinski, Dhruvil Shah, Sean M. Dudley, Gil Speyer, **Jason Yalim**

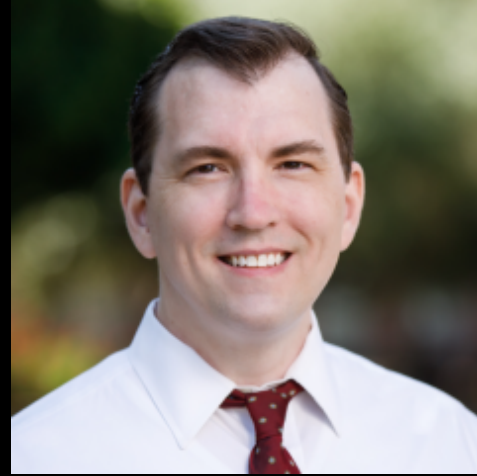


People

Sean Dudley
Assoc VP, Knowledge
Enterprise



Douglas Jennewein
Senior Director, Research
Technology Office



Marisa Brazil
Associate Director,
Research Services



Torey Battelle, Ph.D.
Associate Director,
Quantum Collaborative



Gil Speyer, Ph.D.
Director, Computational
Research Accelerator



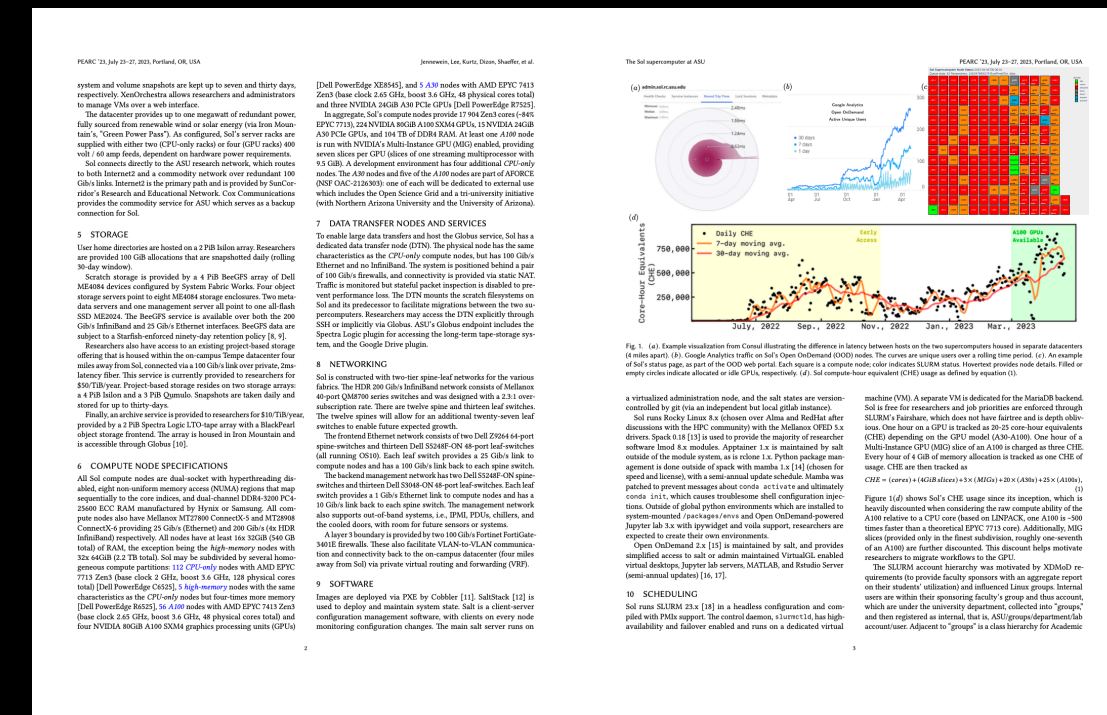
Introduction

388	Sol - PowerEdge XE8545, AMD EPYC 7413 24C 2.65GHz, NVIDIA A100 SXM4 80 GB, MT28908 ConnectX-6 200 Gib/s, DELL EMC Arizona State University United States	41,856	2.27	3.32
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- First time getting University funding for supercomputing (\$10 million)
- First time in a decade that an Arizona supercomputer made the Top500 (#388).
- As of this week, 117+ regular meetings (~1000 staff hours), for planning, executing, and maintaining the system
- The initial planned launch was Fall, 2021, with initial orders in Spring of 2021.
- The pandemic was a wrench.
- Sol's CPUs came online for researchers Fall 2022, and GPUs followed March 2023.
- Plan to expand in the future and avoid delays

Why write a paper

- It is important to provide to the community as best we can
- Our independent research relied on meetings with vendors and experts in this community
- A significant amount of time, money, and effort went into the system, and the contributions to the Practice and Experience in Advanced Research Computing should be discoverable in the peer-reviewed literature
- One reviewer suggested it would be better to submit to an HPC or supercomputing conference...
- The paper is our attempt at a community template
- The paper allows researchers to acknowledge via citation (easier to track than acknowledgements)
- Please contribute and allow others to cite and grow from your experience!

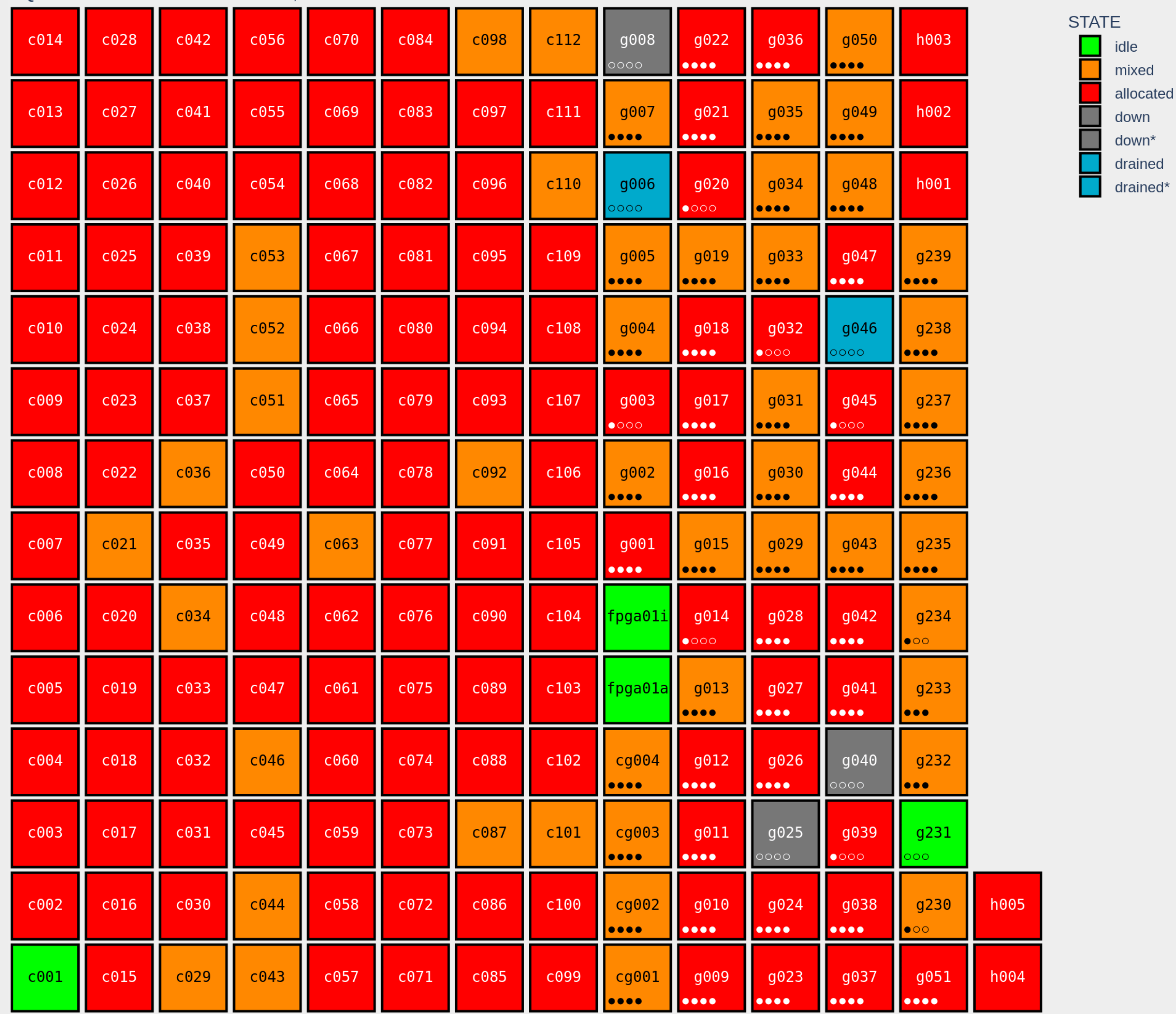


Sol Overview

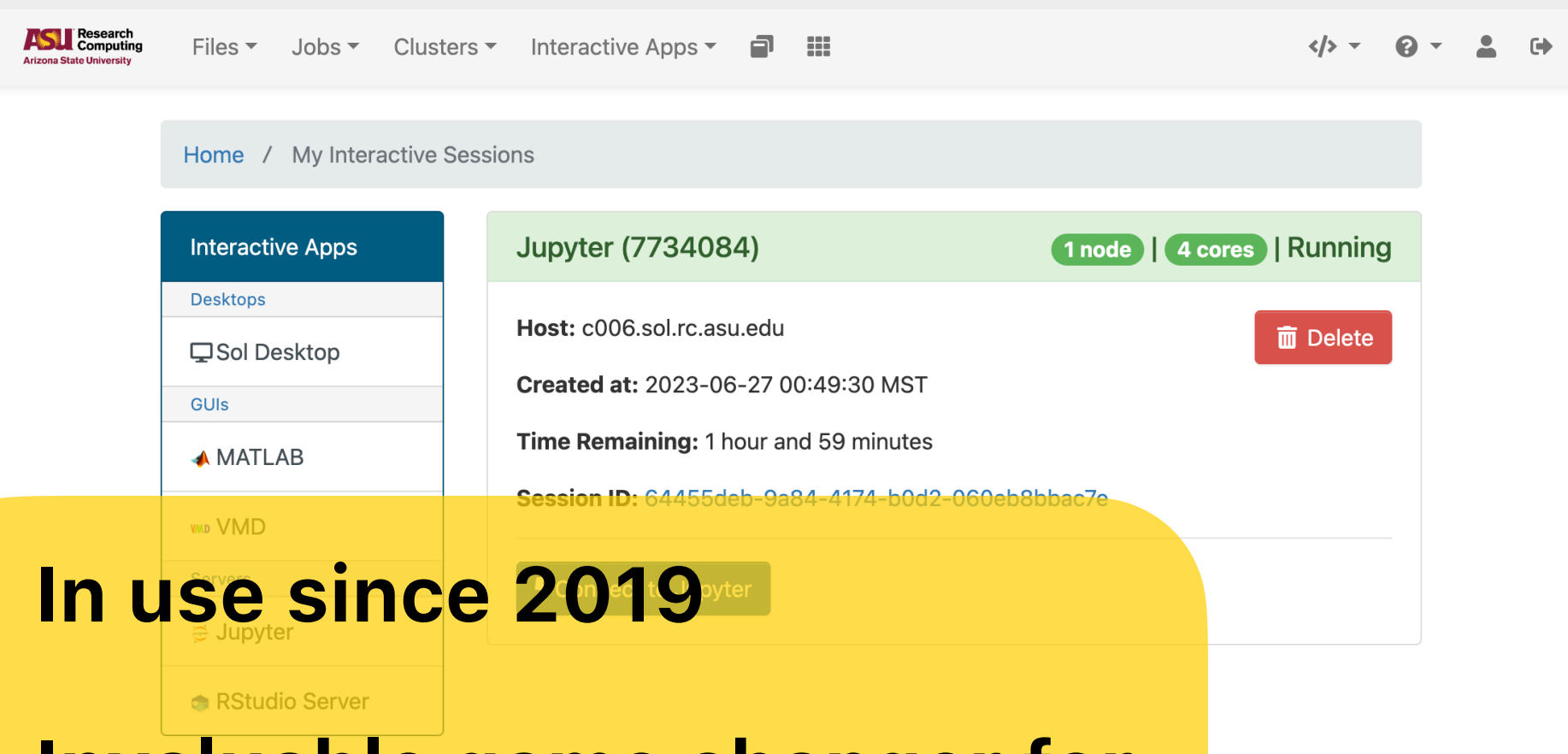
- All nodes have at least 512 GiB of RAM (5 nodes with 2 TiB).
- 112+5x nodes with AMD Zen3 dual socket Epyc 7713. Available since April, 2022.
- 56 nodes with 4x 80GiB A100 SXM4. Available since Feb. 2023.
- 5 nodes with 3x 24GiB A30 PCIe GPUs
- 4 PiB BeeGFS array, 4 OSS, 2 MDS, 1 MGT, *eventual* 90-day automatic purge policy
- All users get 100 GiB /home space. Project-based storage available (first 100 GiB free, then \$50 / TiB / year). Archive tape storage available (BlackPearl/Spectra Logic) @ \$10 / TiB / year [since Nov. 2022].
- 200 Gib/s Infiniband (2.3:1 oversubscription rate)
- Open OnDemand access

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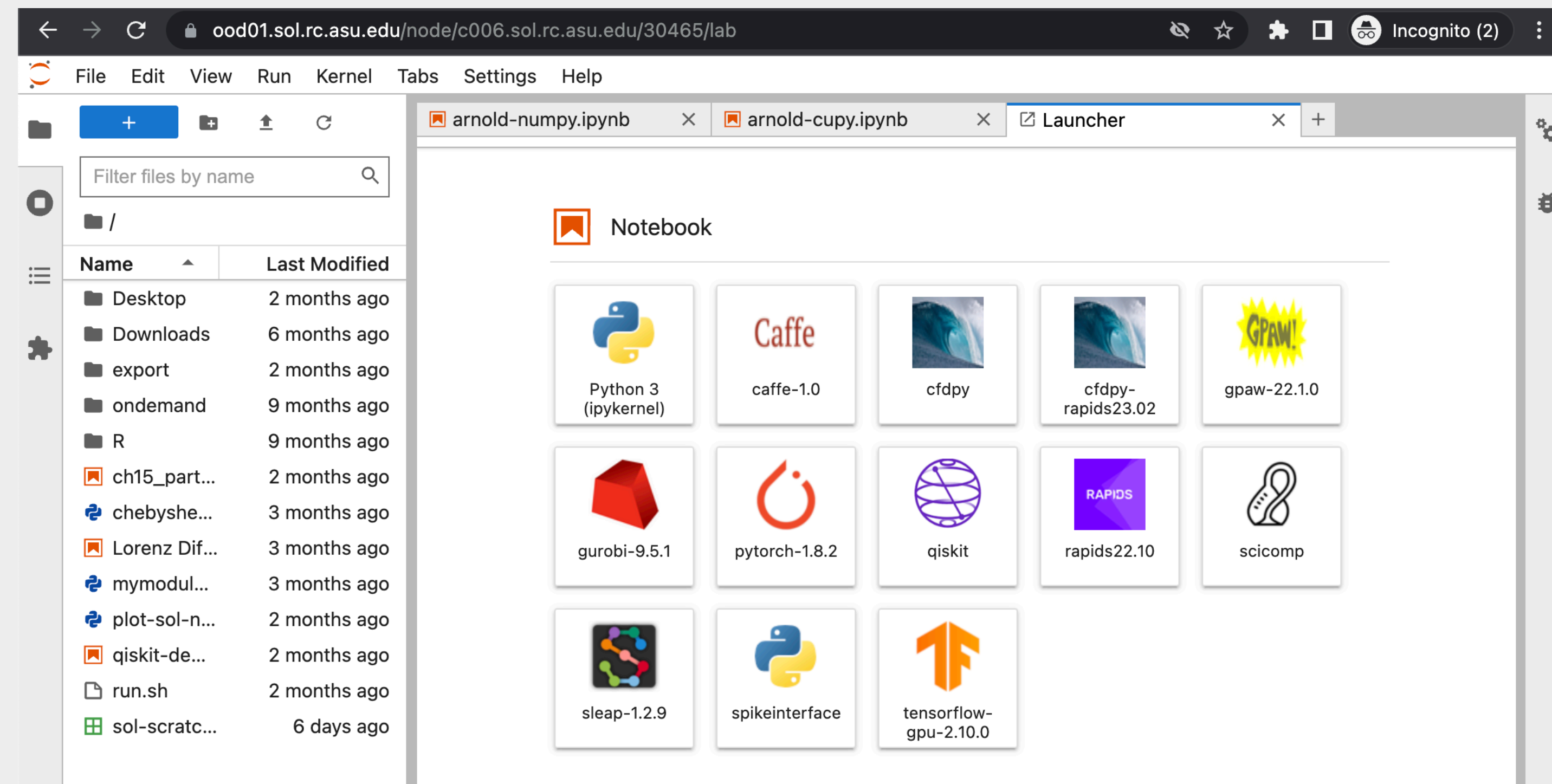
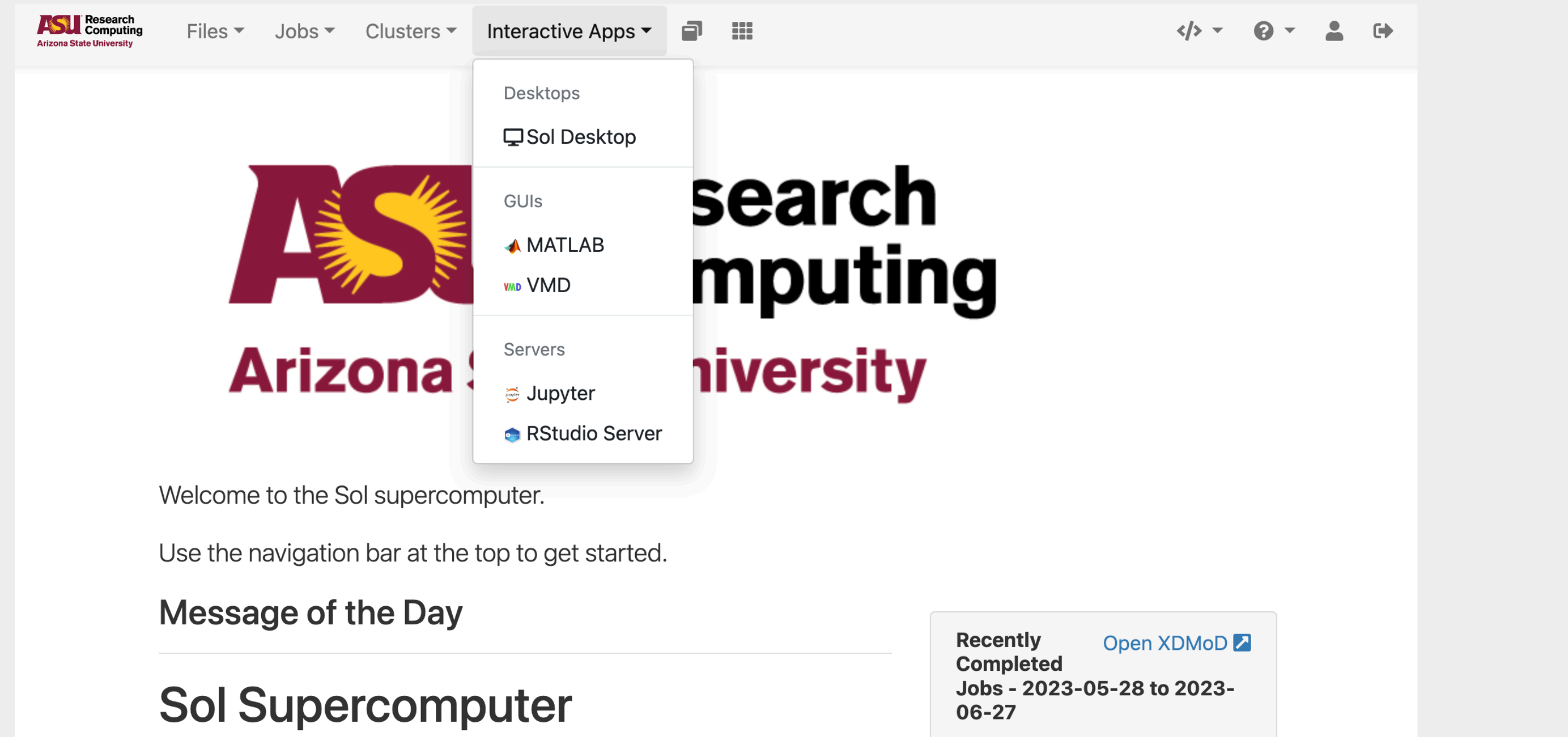
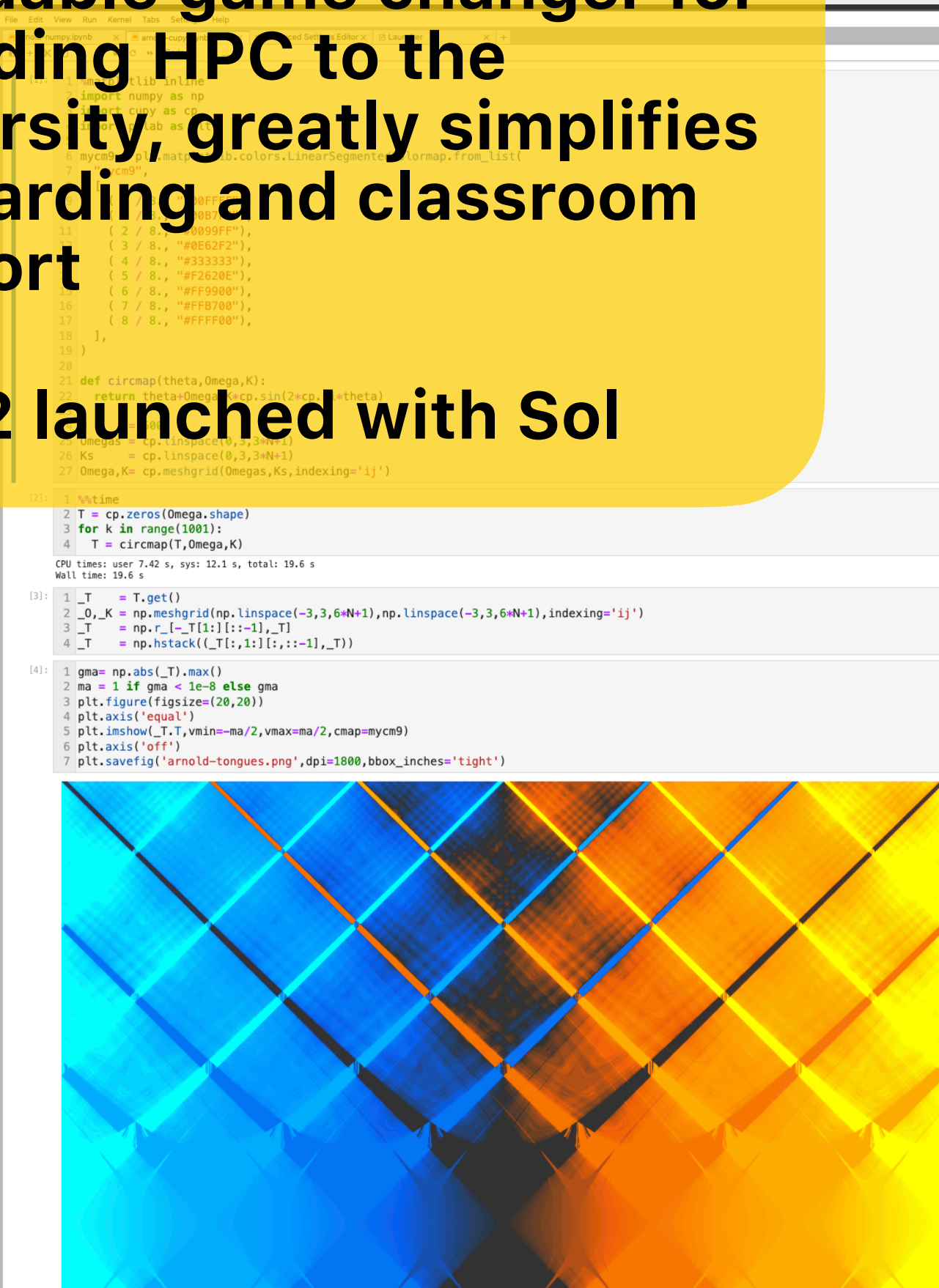
Queue stats: 42 Researchers, 1410/4768/6178 Run/Pend/Tot. Jobs



Open OnDemand Web Portal



- In use since 2019
- Invaluable game changer for providing HPC to the university, greatly simplifies onboarding and classroom support
- OOD2 launched with Sol

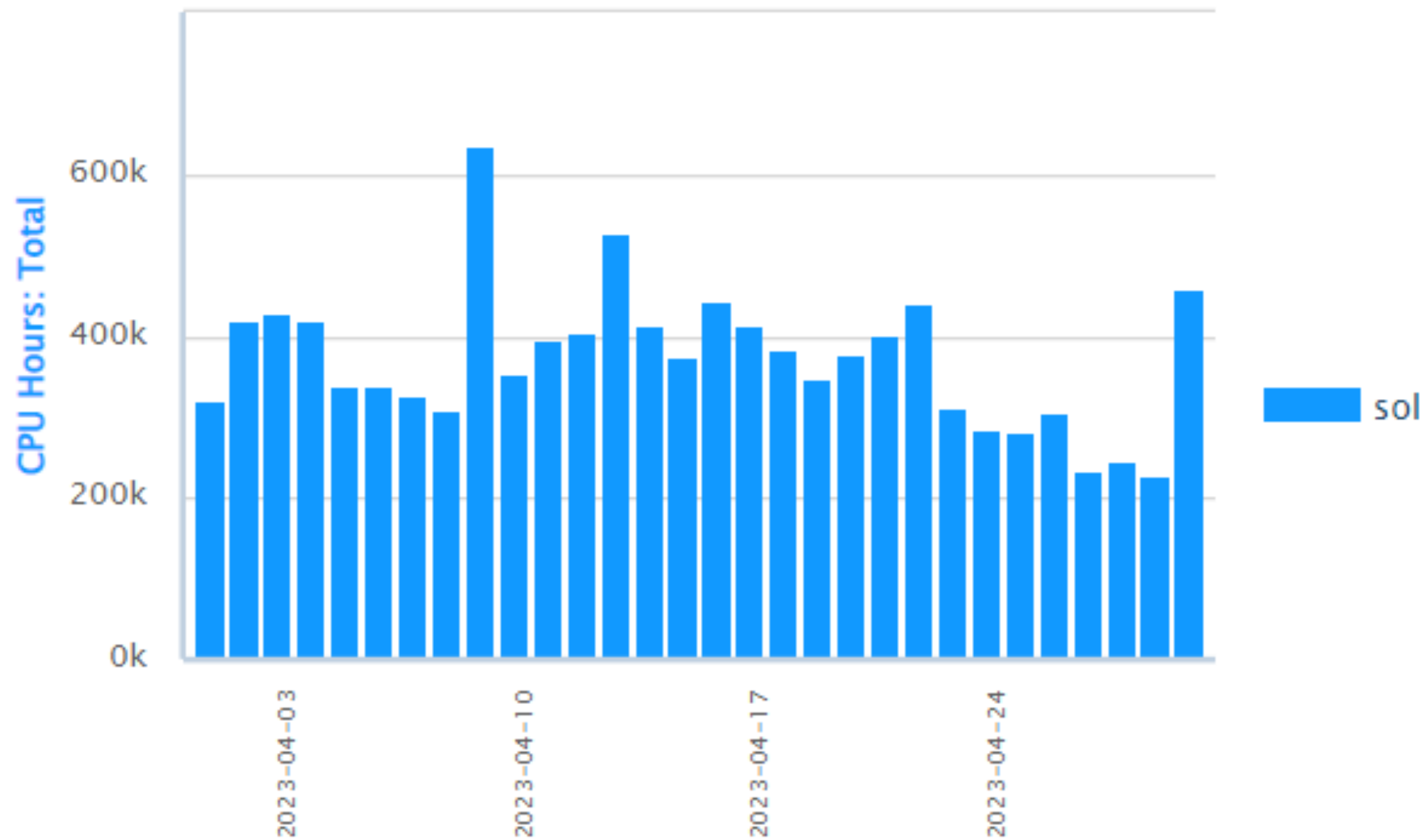


Duration: Previous month Start: End: Refresh

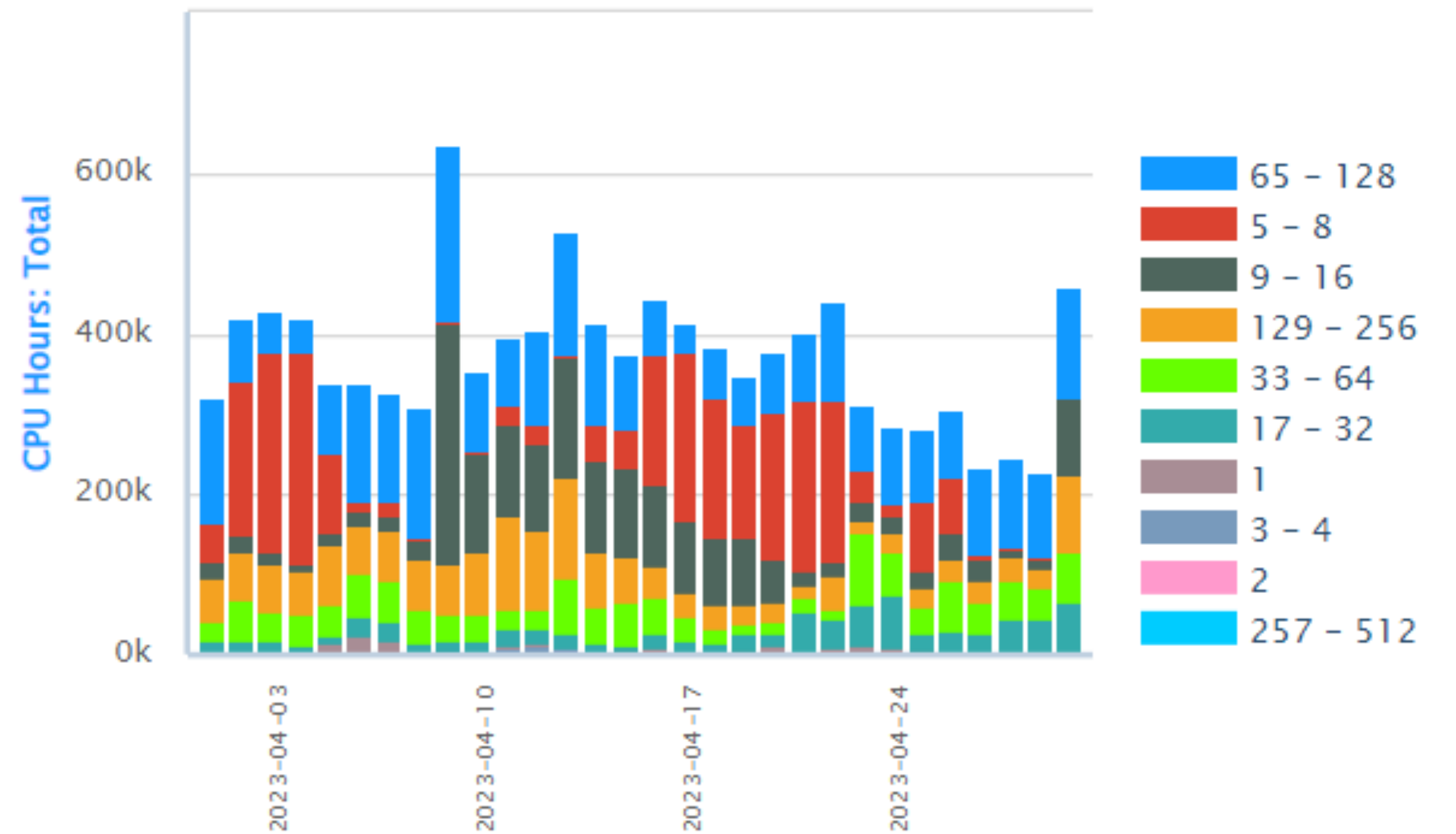
Quick Filters

Activity		Jobs	CPU Time (h)		Wait Time (h)	Wall Time (h)		Processors	
Users:	Pls:	Total:	Total:	Avg (Per Job):	Avg (Per Job):	Total:	Avg (Per Job):	Max:	Avg (Per Job):
231	110	408,703	11,164,871.9	27.29	10.21	666,386.1	1.63	512	11

Total CPU Hours By Resource (Top 10)



Total CPU Hours by Job Size



Datacenter

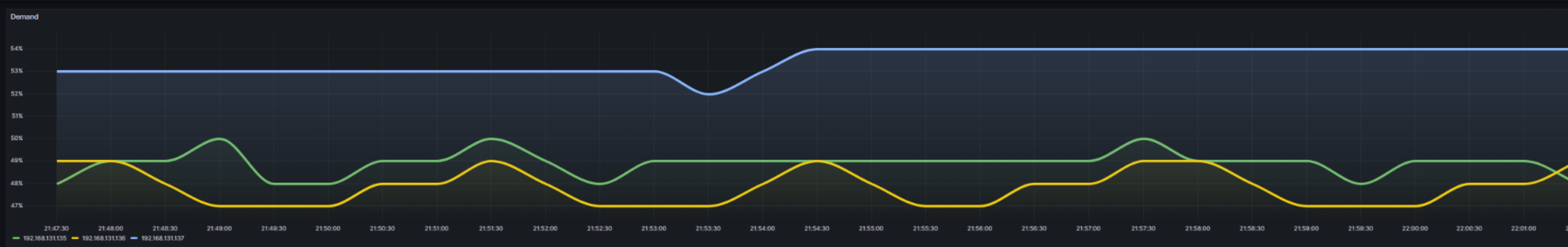


- Iron Mountain Data Center (off-campus). 38 racks pictured (Mar. 2023), currently 41.
- Room for 80 racks.
- ASU has card access to area, and WiFi in the area (providing on-campus feel).

- D2C liquid cooling for the CPU nodes, and each rack has a plumbed rear door heat exchanger.
- Liquid cooling will allow for adoption of latest and greatest as they're released
- Active monitoring of chillers with Grafana



Grafana Chiller Status



Current Alarms

192.168.131.135 0	192.168.131.136 0	192.168.131.137 0
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Status

192.168.131.135 Online	192.168.131.136 Online	192.168.131.137 Online
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Return Temp

12.7 °C 192.168.131.135	12.3 °C 192.168.131.136	13.9 °C 192.168.131.137
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Building Supply Temp

8.10 °C 192.168.131.135	8 °C 192.168.131.136	8.10 °C 192.168.131.137
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Temp From Racks

19.7 °C 192.168.131.135	19.9 °C 192.168.131.136	19.9 °C 192.168.131.137
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Pump1 Speed

69 rpm 192.168.131.135	0 rpm 192.168.131.136	69 rpm 192.168.131.137
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Pump2 Speed

0 rpm 192.168.131.135	69 rpm 192.168.131.136	0 rpm 192.168.131.137
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Room Temp

22.6 °C 192.168.131.135	22.3 °C 192.168.131.136	22.6 °C 192.168.131.137
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Humidity

47.6% 192.168.131.135	48.7% 192.168.131.136	47.5% 192.168.131.137
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Thank you!

please read the paper for more details

github.com/ASU-KE/sol



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