

# SubMIT News: Status, & Updates

David Walter

11<sup>th</sup> February 2025

Physics Basic Computing Services (subMIT)

Users Meeting





# Introduction

## **Our mission**

- Provide basic computing services in the MIT physics department
- Enable easy access for newcomers to start their physics analysis
- Support advanced customization for experienced users
- Ensure sufficient and efficient computing resources through fair sharing

## **We do the maintenance such that you don't have to care about**

- System configuration, upgrades, security
- Software installation and management
- Integration with external resources and services

## **So you can focus on doing great physics**



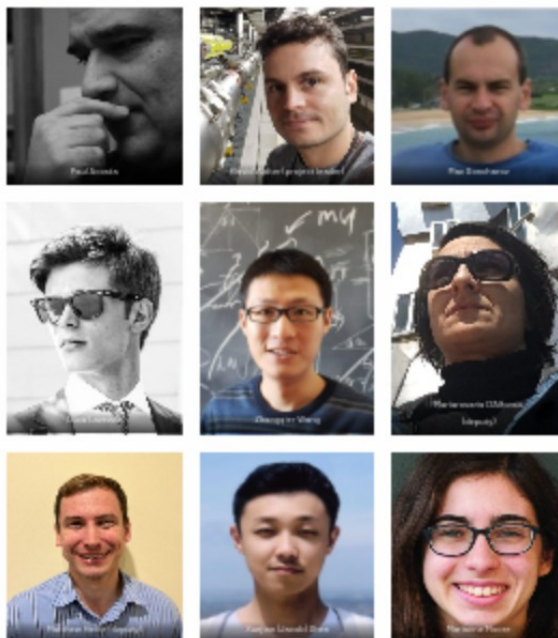
# Project organization

## Steering committee

- Oversight
- Funding

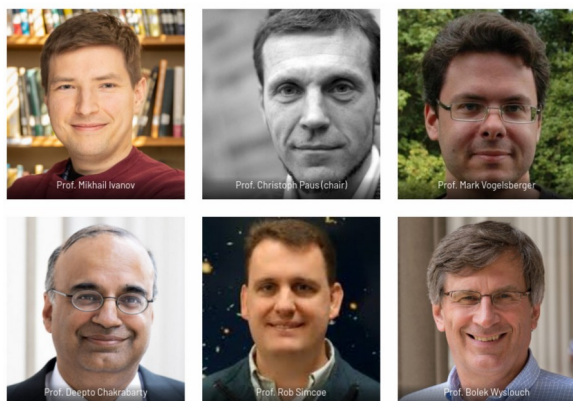
## Project team

- Implementation
- Operation
- Maintenance
- Support



## Users group

- Information flow between user community and project team
- Feedback
- Requests





# Resources

## Local batch system

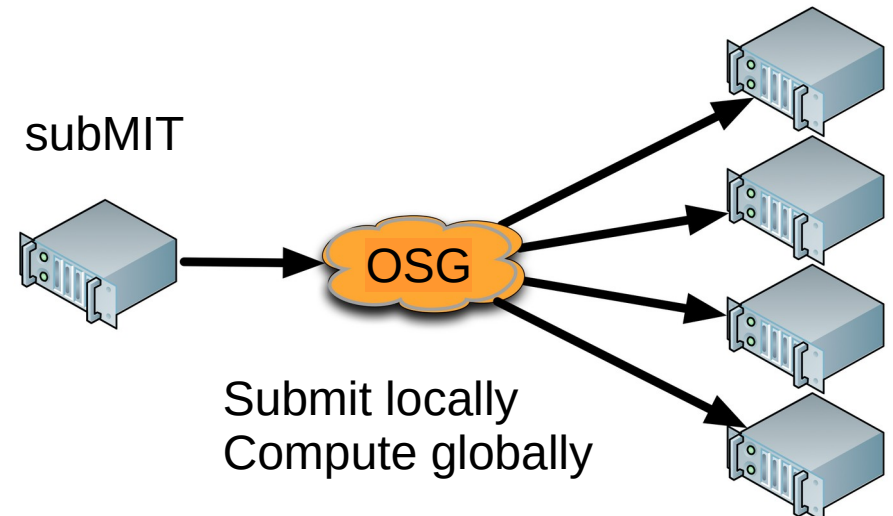
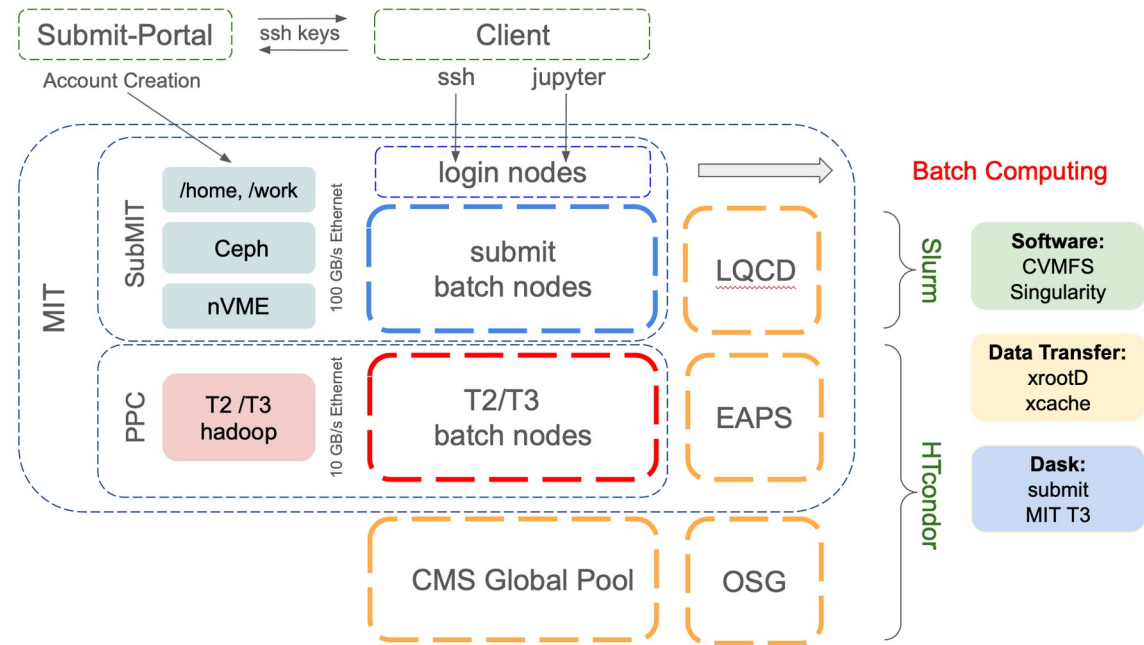
- O(1000 cores); ~30GPUs
- Interactive SSH login pool
- Jupyterhub access

## Convenient software environment

- Alma Linux 9 native
- Python, C++, Java, ...
- Containers (singularity/ podman)
- Virtual environments (Conda)

## Access to larger external resources

- Open Science Grid (OSG)
- CMS Tier-2 and Tier-3
- LQCD Cluster
- Earth, Atmospheric & Planetary Sciences (EAPS)



# SubMIT overview



## Website

- Overview and general information
- Account creation
- Documentation: User guide
- A2rchi (chatbot)
- Monitoring systems
- Direct JupyterHub access



**subMIT**

Getting physics things done at MIT

[Overview](#) [News](#) [People](#) [Contact](#) [About](#) [Users Guide](#) [A2rchi](#) [Jupyter](#)

## Overview

The subMIT login pool is designed to let users login safely, prepare and test their research, and submit their jobs to the large computing resource of their choice. There are for now a limited number of resources connected but we are working on quickly expanding them.

[Get your account on SubMIT Portal](#)

## Access

ssh <user>@submit.mit.edu

jupyterhub

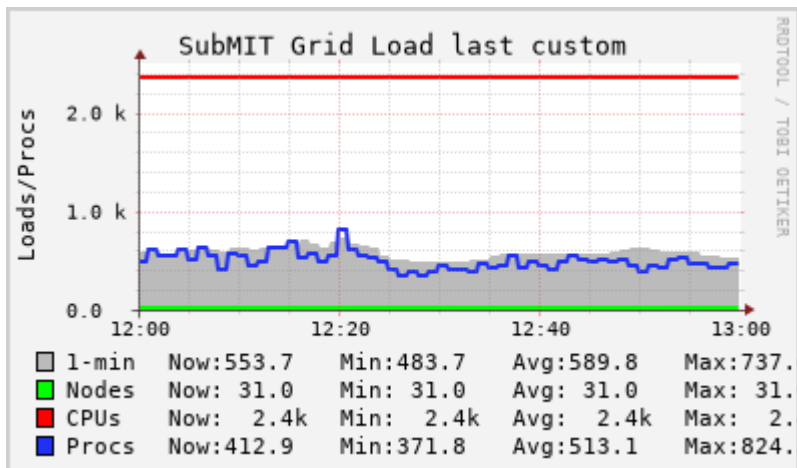
## Status

Servers

Slurm queue

Condor queue

Expert





# User support

## User support is a key feature of the system

- Contact: [submit-help@mit.edu](mailto:submit-help@mit.edu)
- Slack workspace: <https://mit-submit.slack.com/>
  - “help-desk” channel

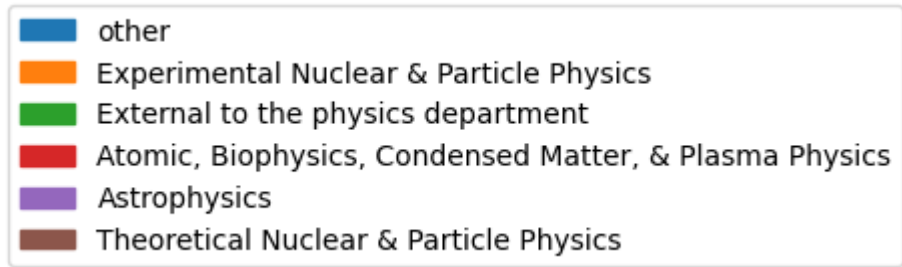
## Beyond basic troubleshooting

- Help users make optimal use of the available resources
- Expert advice on designing/improving workflows
- Customize and evolve system configuration, accommodate user needs as appropriate

## Voluntary (anonymous) **survey**

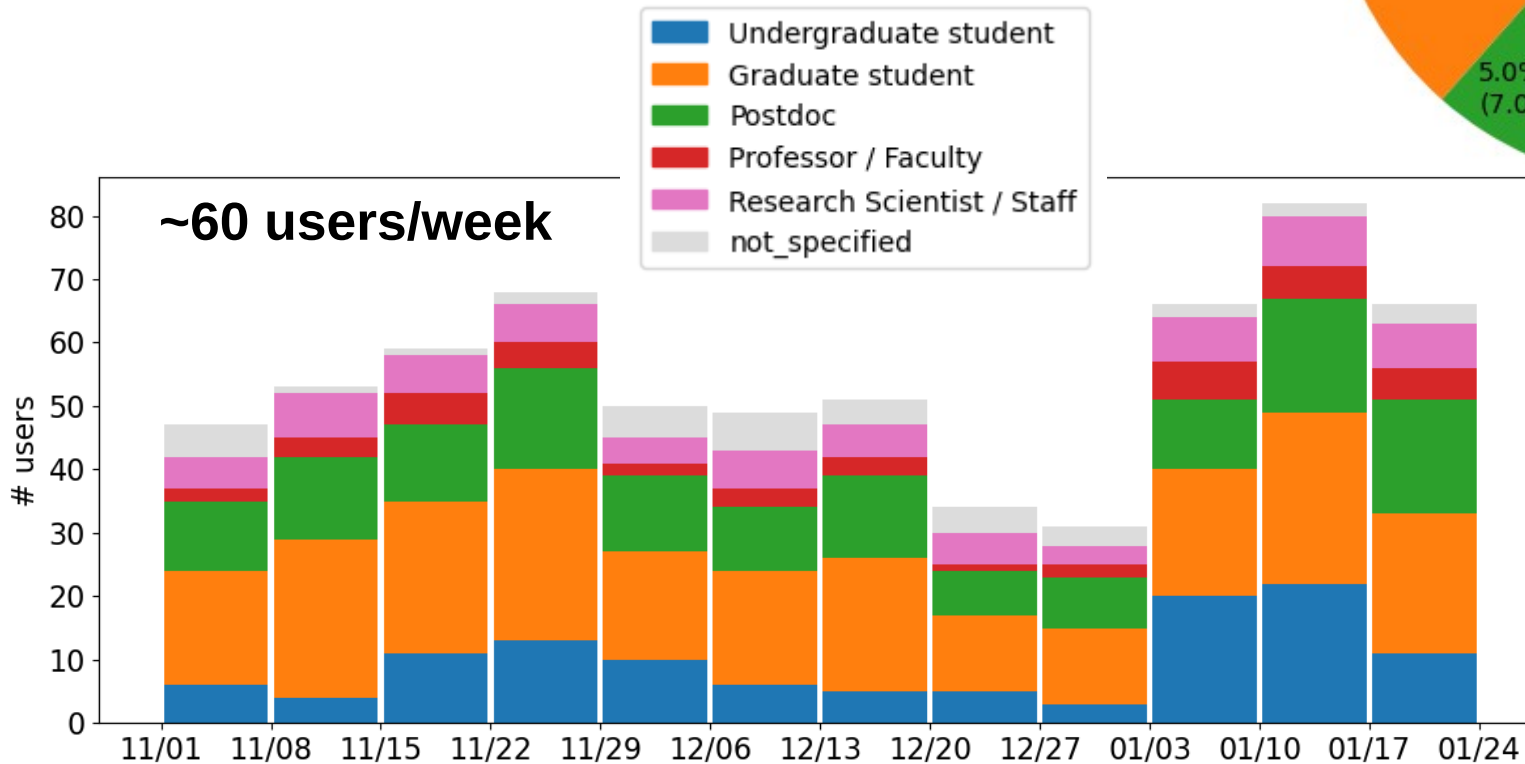
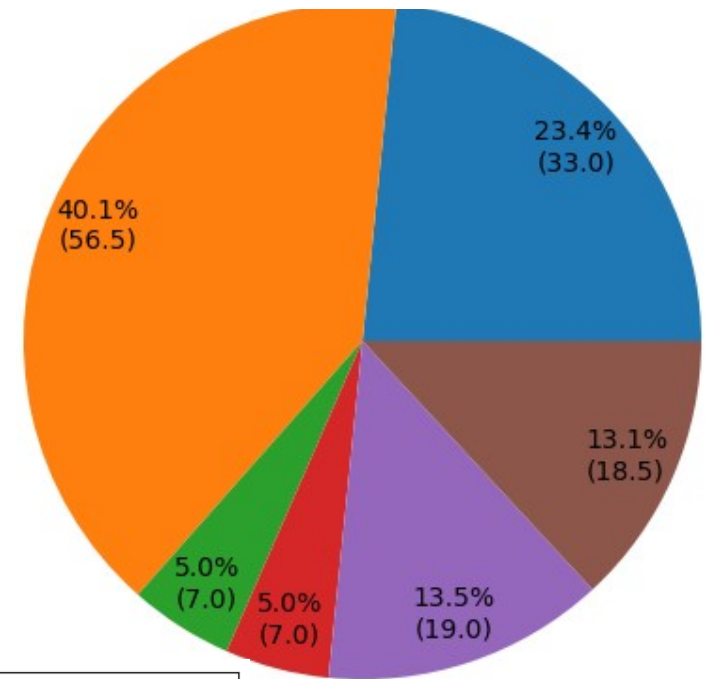
- Please tell us what you like or don't like

# Status



## Diverse user base

- From different departments
- From undergrad to professors







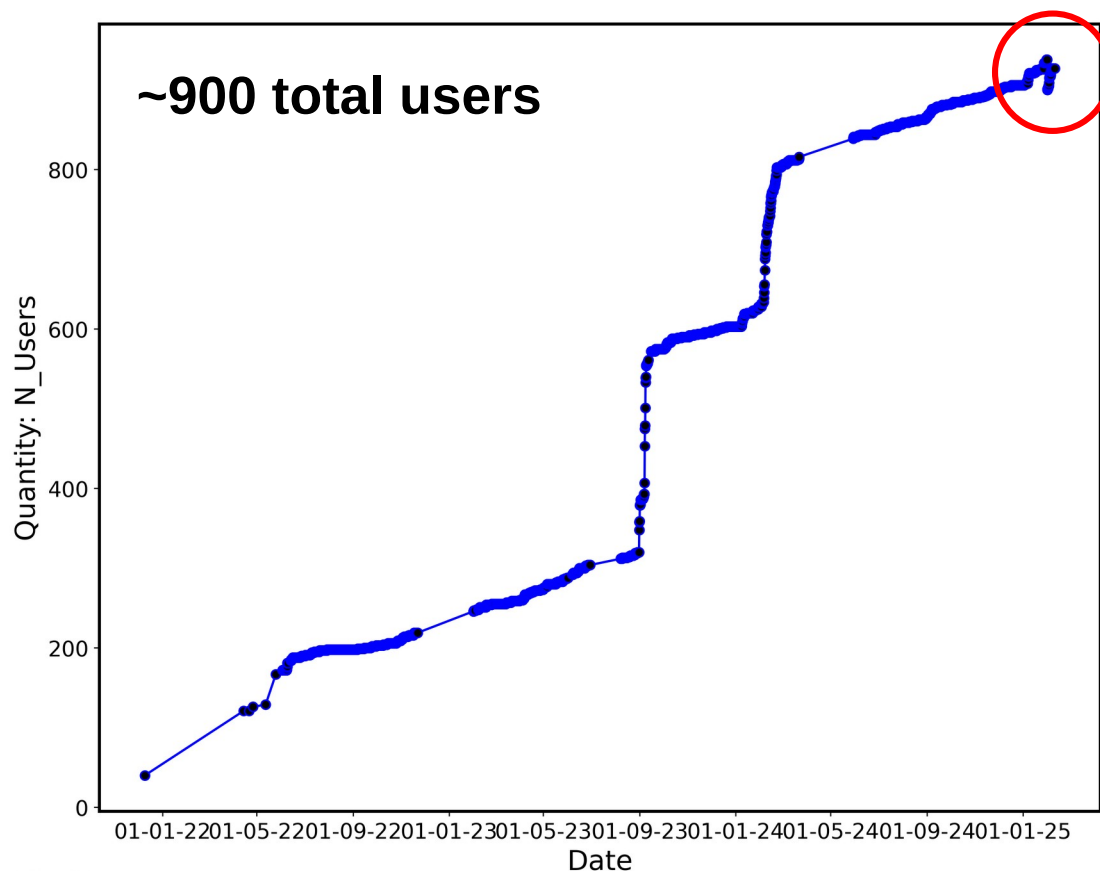
# News: Deactivating login for old users

## Established practice to deactivate and remove old users

- Periodically deactivate login for old users in January each year
- Remove SSH keys for users w/o MIT touchstone
- First time this year: 28 users

Old users can restore access through sponsors

If we don't get contacted, data of deactivated users is removed after 6 month







# News: Website

Added list of publications that used significant resources for subMIT

- [submit.mit.edu](https://submit.mit.edu)

Please let us know if your publication is missing

## Publications

### Using significant subMIT resources

#### 2024

- **A. Belley, J. Pitcher, T. Miyagi et al.,**  
*Correlation of neutrinoless double-beta decay nuclear matrix elements with nucleon-nucleon phase shifts,*  
2024. [arXiv](#).  
**Division:** Theoretical Nuclear & Particle Physics | **Center:** LNS
- **S. Abe, T. Araki, K. Chiba et al.,**  
*Search for Majorana Neutrinos with the Complete KamLAND-Zen Dataset,*  
2024. [arXiv](#).  
**Division:** Experimental Nuclear & Particle Physics | **Center:** LNS
- **J. Du Plessis, Z. Janelidze, B. Wessels,**  
*A Primer on Chainmails: Structures for Point-free Connectivity,*  
2024. [arXiv](#).  
**Division:** Theoretical Nuclear & Particle Physics | **Center:** CTP
- **B. Binks, H. Guenther,**  
*TESSILATOR: a one-stop shop for measuring TESS rotation periods,*  
MNRAS, 533, 2024. [DOI](#).  
**Division:** Astrophysics | **Center:** MKI
- **H. Guenther, P. Cheimetz, C. DeRoo et al.,**  
*Arcus X-ray telescope performance predictions and alignment requirements,*  
JATIS, 11, 2024. [DOI](#).  
**Division:** Astrophysics | **Center:** MKI

# Today's agenda



## Physics Basic Computing Services (subMIT) Users Meeting

Tuesday Feb 11, 2025, 10:00 AM → 11:00 AM America/New\_York

Kolker Room (26-414) (MIT)

Description <https://mit.zoom.us/j/96743699673?pwd=b3h2Q3c3cVQwYW12blhMUG5SWXZCZz09>

**10:00 AM** → 10:15 AM **subMIT Overview, Status, & Updates**

Speaker: David Walter

⌚ 15m



**10:15 AM** → 10:20 AM **Workshop Summary & Overview**

Speaker: Matthew Heine (Massachusetts Institute of Technology)

⌚ 5m



**10:20 AM** → 10:40 AM **Solving Einstein's Equations on the computer**

Speaker: Josu Aurrekoetxea (Massachusetts Institute of Technology)

⌚ 20m



**10:40 AM** → 10:50 AM **Roundtable**

Speakers: Amer Al-Hiyasat (MIT), Hans Moritz Guenther (Massachusetts Institute of Technology), Molly Park (Massachusetts Institute of Technology), Prajwal Mohan Murthy (MIT LNS), Yin Lin (Massachusetts Institute of Technology)

⌚ 10m



**10:50 AM** → 11:00 AM **Discussion**

⌚ 10m





Backup

# Interactive use



Accessible through website:

- [jupyterhub](https://jupyterhub.com)

Select a job profile:

Slurm - Submit - 1 CPU, 2 GB

Start

Quick introduction:

- **Spawn server menu:**
  - Slurm - Submit - 1 CPU, 2 GB: spawns a server on the "submit" Slurm partition, with 1 CPU, 2GB of memory.
  - Slurm - Submit - 2 CPUs, 4 GB: spawns a server on the "submit" Slurm partition, with 2 CPUs, 4GB of memory.
  - Slurm - Submit - 4 CPUs, 8 GB: spawns a server on the "submit" Slurm partition, with 4 CPUs, 8GB of memory.
  - Slurm - Submit-GPU - 1 GPU: spawns a server on "submit-gpu" Slurm partition, with 1 GPU.
  - Slurm - Submit-GPU-A30 - 1 GPU: spawns a server on "submit-gpu-a30" Slurm partition, with 1 GPU.
  - Slurm for Wolfram Mathematica: spans a server on the submit00 node, which has Mathematica enabled.
- **GPUs:** you can use GPU resources in your notebooks or Jupyterhub's terminal if you spawn a server on submit-gpu or submit-gpu-a30, supported through Slurm.
- **Conda:** your conda environments should be automatically loaded as kernels by Jupyterhub, and can be used in notebooks. See User Guide for more info.
- **Singularity:** you can manually set up a kernel based on a singularity environment's python. See User Guide for more info.

For more information about Submit, conda, GPUs, Jupyterhub, etc., see:

User Guide

For any questions, comments, or feedback, please send an email to [submit-help](mailto:submit-help).

```
Untitled3.ipynb x
[1]: 2+2
[1]: 4
[ ]:
```

```
 david_w@submit04:~ x
[ david_w@submit04 ~]$ python
Python 3.9.18 (main, Jul 3 2024, 00:00:00)
[GCC 11.4.1 20231218 (Red Hat 11.4.1-3)] on linux
Type "help", "copyright", "credits" or "license" for more
>>> 2+2
4
>>>
```

Launcher

Notebook

- Python 3 (pykernel)
- 8.802
- 8.811
- 8.FCC
- 802cmfs
- FCC-ee
- Python 3.6 common
- Python 3.9 common

Console

- Python 3 (pykernel)
- 8.802
- 8.811
- 8.FCC
- 802cmfs
- FCC-ee
- Python 3.6 common
- Python 3.9 common

Other

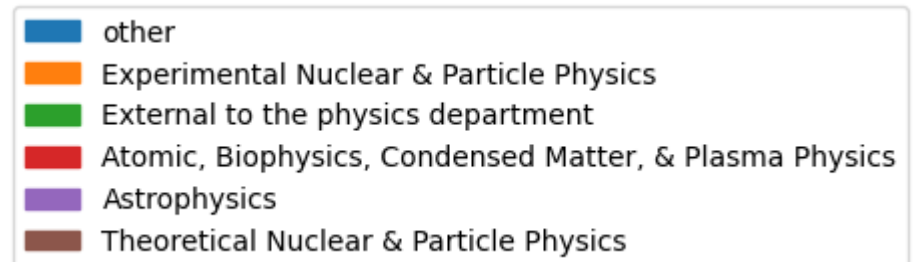
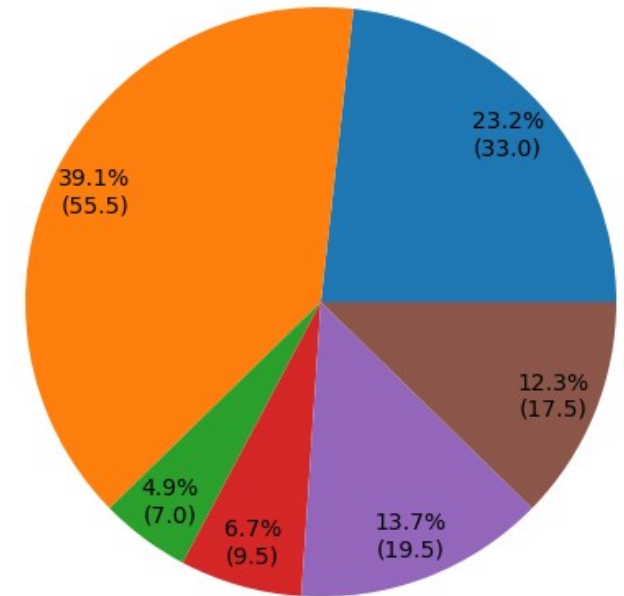
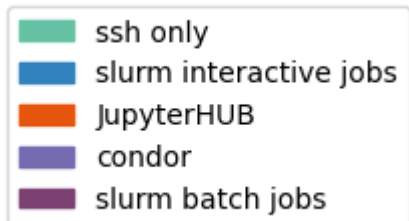
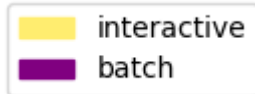
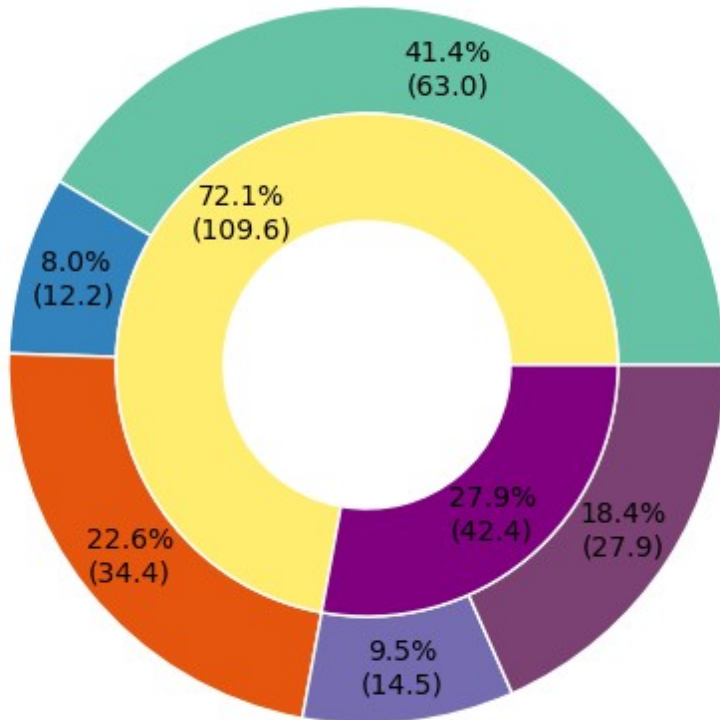
- Terminal
- LaTeX File
- Text File
- Markdown File
- Python File
- Show Contextual Help



# User base

## Active users of last 90 days (153)

- from different physics departments
- using subMIT in different ways







# Classroom usage

Introductory undergraduate courses: 8.01, 8.02

- Technology-Enabled Active Learning (TEAL)

Advanced courses, junior lab: 8.13, 8.14

Workshops/ Hackathons

- FCC month, Gaia Hackathon, ...

Resource reservation via slurm



Software distribution and robust usage for  $O(100)$  students

- Kernel with customized python environment accessible through JupyterHub
- CVMFS for specialized programs or environments



# Previous work

Moved to server room in B24

Migrated operating system of all machines

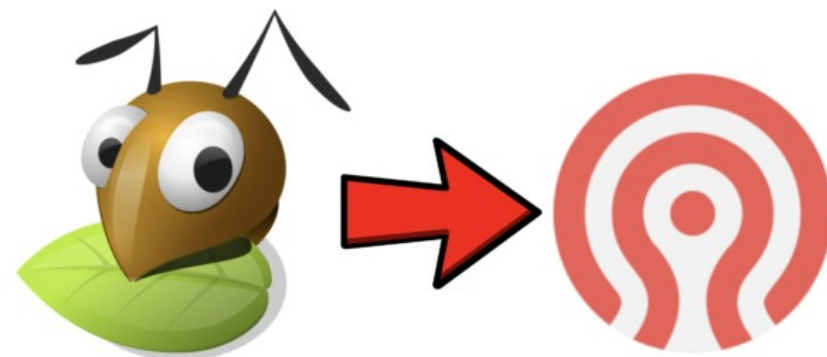
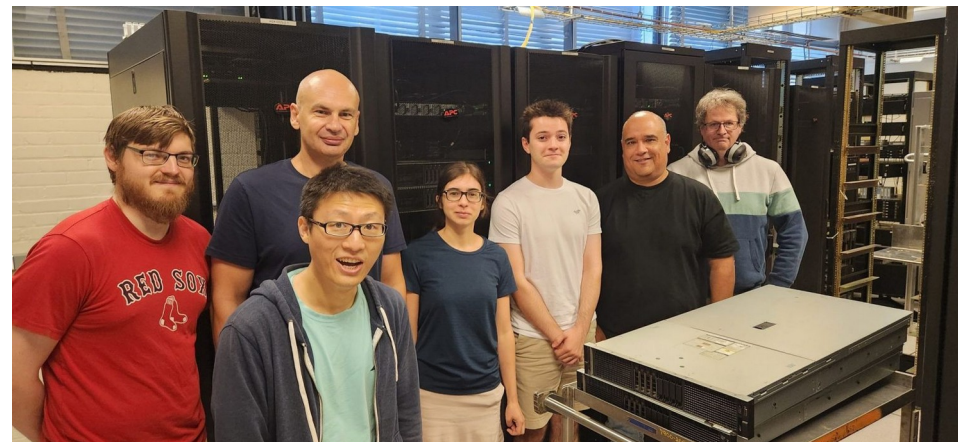
- CentOS7 (end of life) → Alma Linux 9

Migrated distributed file system

- GlusterFS (end of life) → CephFS
- Upgraded ceph to most recent stable release: 19.2.0 squid

Migrated from Docker to Podman

New hardware: ~500TB hdd for file storage







# Whats next

Ensure stable long term operations

Streamline account creation

Add O(500) CPU cores to slurm

Add software support for

- Dask gateway, OpenMPI, Globus, ...

Analyze user experience

- Understand frequent causes why jobs/ jupyterhub sessions/ ... fail
- Find cases of inefficient use of resources

→ Dedicated actions: Give recommendations, adapt system configuration, ...

Please let us know what you need

