

# Summary

Josh Bendavid

Basic Computing Services (subMIT) Review

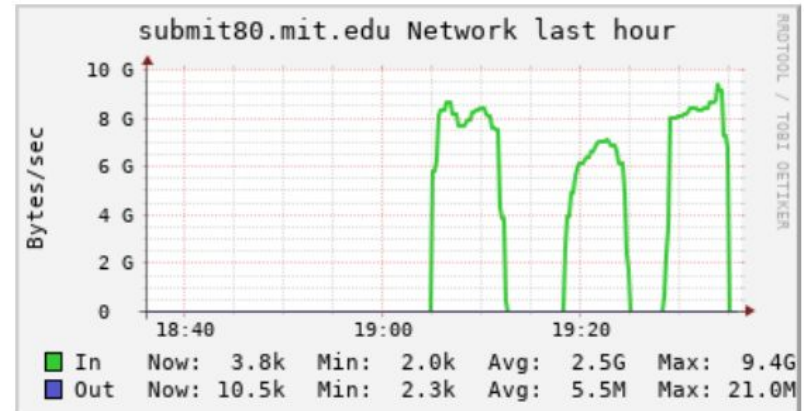
July 18, 2023

# Introduction

- subMIT system provides an interactive login pool + scale-out to batch resources
  - Home directories
  - Convenient software environment (CentOS7 native, docker/singularity images, conda)
  - SSH or Jupyterhub access
  - Local batch system with  $O(1000)$  cores, >50 GPU's
  - Additional storage for software installation/development, large datasets
  - Convenient access to larger external resources (OSG, CMS Tier-2 and Tier-3, LQCD Cluster, EAPS)
- User support is a key feature of the system
  - Beyond basic troubleshooting
    - Help users make optimal use of the available resources
    - Expert advice on designing/improving workflows
    - Customize and evolve system configuration to accommodate user needs as appropriate

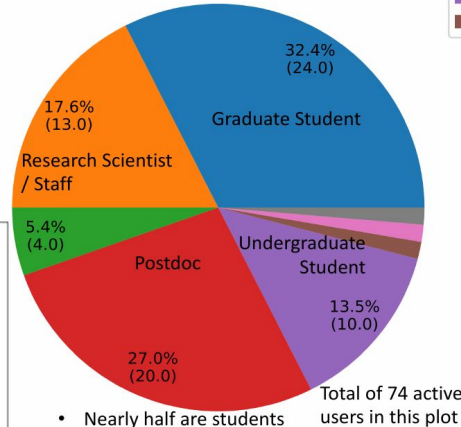
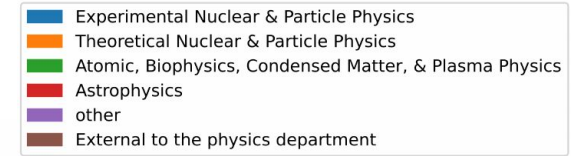
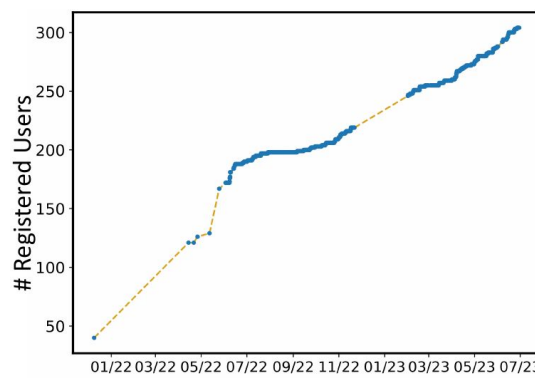
# Highlights: Recent/Ongoing Development and Upgrades

- 100 Gbps uplink installed in B24
- Two new high density compute nodes (192 core / 384 thread) installed
- Ultra-high performance data analysis commissioned with NVMe storage: 75 Gbps over nfs
- System is fully ipv6 enabled
- Alma Linux 9 upgrade in progress with test instances available for users imminently

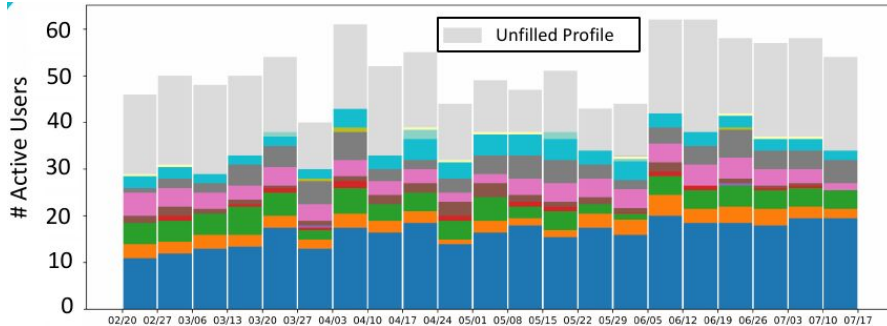
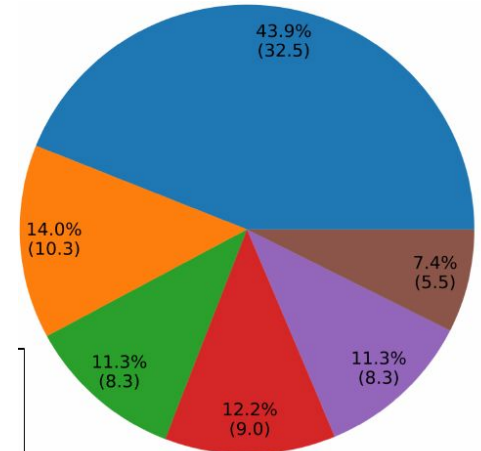


# Usage Statistics

- >300 total users
- 40-60 active users in any given week
- Detailed usage statistics are available
- Broad representation of users across the department



- Nearly half are students
- Reasonable breakdown



# Introduction: subMIT Website



**subMIT**

Getting physics things done at MIT

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

## 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

## Resources

- >1 TB of free storage per user
- 100s of cores and GPUs available interactively and through Slurm
- Access to OSG, CMS T3 and T2, LOCD Cluster, and EAPS

## Software

- Python, anaconda, Julia, Matlab, singularity, and much more!

- Website (with User's Guide/Instructions):  
<https://submit.mit.edu/>
  - Overview and general information
  - Direct JupyterHub access
  - User's Guide:  
<https://submit.mit.edu/submit-users-guide/>
- Experimental large language model application under development
  - For interactive use from website + augmented support ticket handling
  - Joint project with College of Computing, with dedicated funding
  - Dedicated talk at LLM workshop on Friday  
<https://indico.mit.edu/event/759/>

# Interactive Use: Terminal or JupyterHub

**Select a job profile:**

Slurm - Submit - 1 CPU, 500 MB

Start

Quick introduction:

- **Spawn server menu:**
  - Slurm - Submit - 1 CPU, 500 MB: spawns a server on submit slurm partition.
  - Slurm - Submit - 2 CPUs, 1000MB: similar as above, with more resources allocated.
  - Slurm - SubmitGPU - 1 GPU: spawns a server on submit-gpu slurm partition, requesting 1 GPU.
  - Slurm - SubmitGPU1080 - 1 GPU: spawns a server on submit-gpu1080 slurm partition, requesting 1 GPU.
  - Local server - Submit01 - 1 CPU, 500 MB, /home/submit/{username}/directory: spawns on submit01, in your /home/submit/{username}/directory.
  - Local server - Submit01 - 1 CPU, 500 MB, /work/submit/{username}: spawns on submit01, in your /work/submit/{username}/directory.
- **GPUs:** you can use GPU resources in your notebooks or Jupyterhub's terminal if you spawn a server on submit-gpu or submit-gpu1080, 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-jupyter](mailto:submit-jupyter).

JupyterLab — Mozilla Firefox

subMIT - Getting physics: x JupyterLab x +

https://submit.mit.edu/jupyter/user/jbendavi/lab?

File Edit View Run Kernel Git Tabs Settings Help

Filter files by name

Name	Last Modified
condasetup	8 months ago
distrdtest	a year ago
hpcutlis	a month ago
iperf-2.0.9	4 months ago
iperf-3.1.3	4 months ago
miniforge3	8 months ago
nuttcp-8.2.2	4 months ago
rdftest	8 months ago
singularityconfigs	8 months ago
wmassdev31a	a month ago
bashrcondabak	8 months ago
iperf-2.0.9-source.tar.gz	5 years ago
iperf-3.1.3-source.tar.gz	5 years ago
nuttcp-8.2.2.tar.bz2	3 years ago
test.txt	10 months ago
test2.txt	2 months ago
test3.txt	2 months ago
test4.txt	2 months ago
test5.txt	2 months ago

Launcher

Notebook

Python 3 802 802cvmfs distest python3.6

Console

Python 3 802 802cvmfs distest python3.6

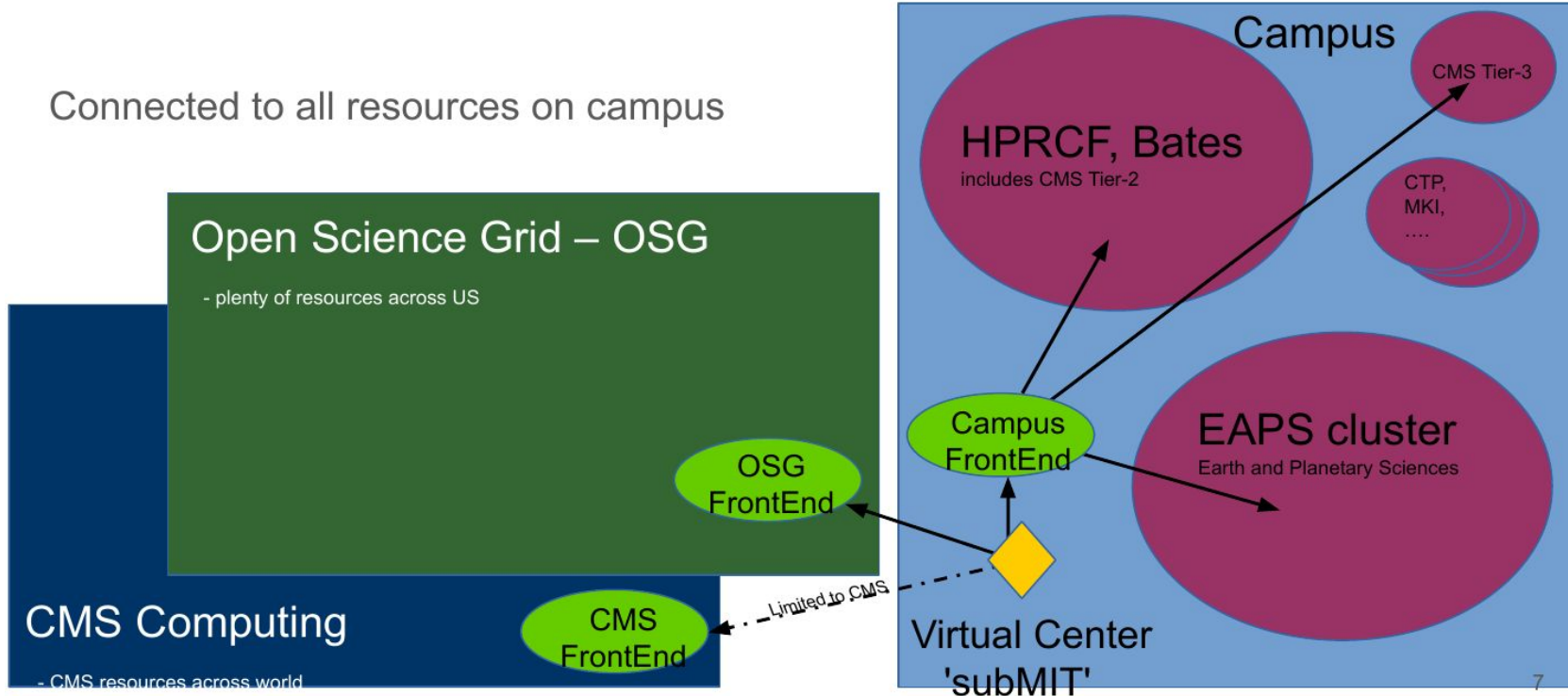
Other

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

- Interactive Jupyter session available directly from website with touchstone authentication (subMIT account still required)
- SLURM is used to efficiently share resources between interactive and batch use
- Primary usage is research, but education applications also possible
  - Limited trial has been conducted for 802 exercises

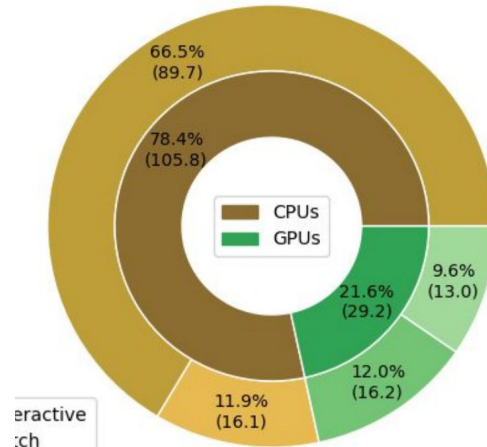
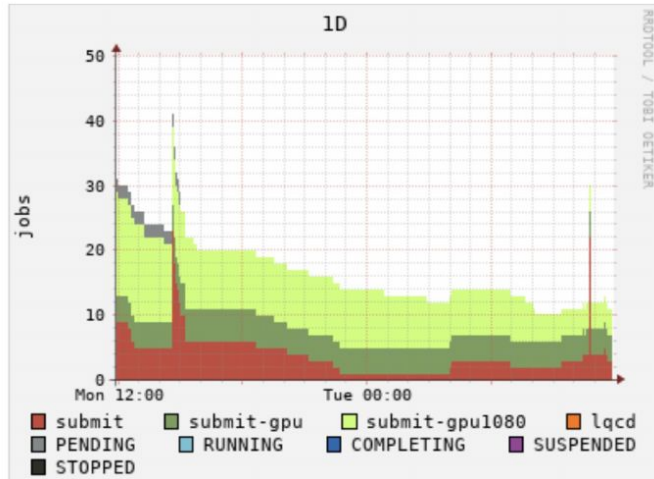
# Access to external resources

Connected to all resources on campus



# Resource Availability and Monitoring

- Both CPU and GPU resources are available, with access shared between interactive (terminal or Jupyter) and batch usage
- Robust monitoring of batch system usage, network, machine load, etc





# User Outreach and Education

- IAP Seminar in February on usage of computing resources
- Tutorials as part of the User's Guide, including hands-on session in January Users Workshop
- Next tutorial session planned for Users Group meeting in September (synchronized with new arrivals in the department)
- Dedicated user survey of MKI community

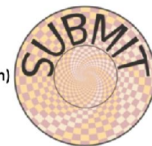
## From Laptops to High Performance Computing: Low-Hanging Fruit in Parallelization

Matt Heine

mheine@mit.edu

37-410: Wednesdays (all day), Thursdays (afternoon)

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



### MKI Computing Questionnaire

This questionnaire is designed to find out how you currently use computing resources, what resources would help you with your work, and how we (subMIT and other MKI computing professionals) can assist you going forward.

If you have any questions, please reach out to Josh Borrow ([borrowj@mit.edu](mailto:borrowj@mit.edu)).

This survey should take you 5-10 minutes to complete.

[Sign in to Google](#) to save your progress. [Learn more](#)

What is your name?

Your answer \_\_\_\_\_

What is your e-mail?

Your answer \_\_\_\_\_

What is your current position/role at MKI (e.g. PhD student)

Your answer \_\_\_\_\_

User's Guide - subMIT

- Contents:
- [User's guide - subMIT sign pool](#)
- [Getting started](#)
- [Things that work and things that do not](#)
- [Available software](#)
- [Running interactively and batch jobs](#)
- [User quotas and storage at subMIT](#)
- [Monitoring at subMIT](#)
- [GPU resources](#)
- [Data backup](#)

Tutorials - subMIT

Tutorials:

- [Tutorial 1: Native System \(python, Julia, matlab\)](#)
- [Tutorial 2: Batch jobs \(HPCorder and Slurm\)](#)
- [Tutorial 3: Containers \(Docker and Singularity\)](#)
- [Tutorial 4: Package Manager \(Conda and JupyterHub\)](#)
- [Tutorial 5: GPU Examples \(submit gpu and GPU batch options\)](#)

Future Work - subMIT

Planned Upgrades:

- [Move to AlmaLinux](#)

Indices and tables

- [Index](#)
- [Module Index](#)
- [Search Page](#)

© Copyright 2021, The subMIT Project Team. Created using Sphinx 4.5.0.

# Conclusions

- subMIT system is already up and running and successfully supporting research across the department
- Strong focus on user support by project team with direct connection and expertise in the physics department
- Ongoing upgrades/consolidation/evolution of infrastructure and services in consultation with users
- Longer term relationship of subMIT with ORCD and balance between institute-wide and department-level services to be defined in coming year(s)