THE FLUX CLUSTER

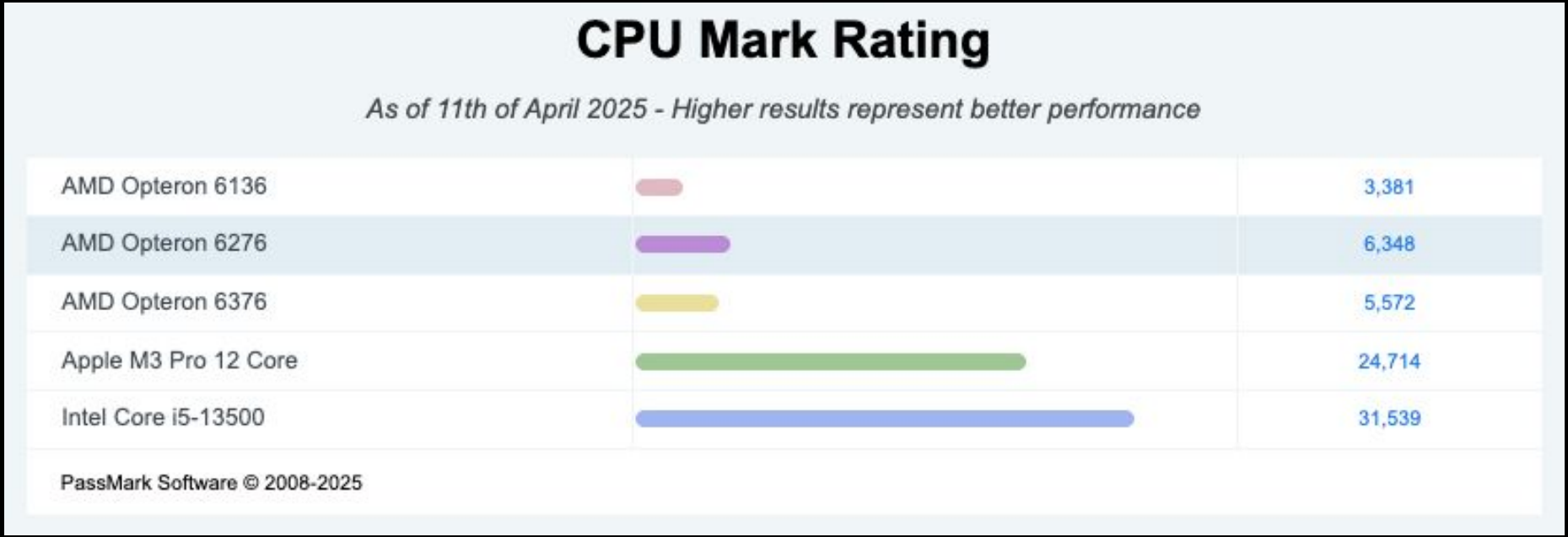
An Overview

April 2025

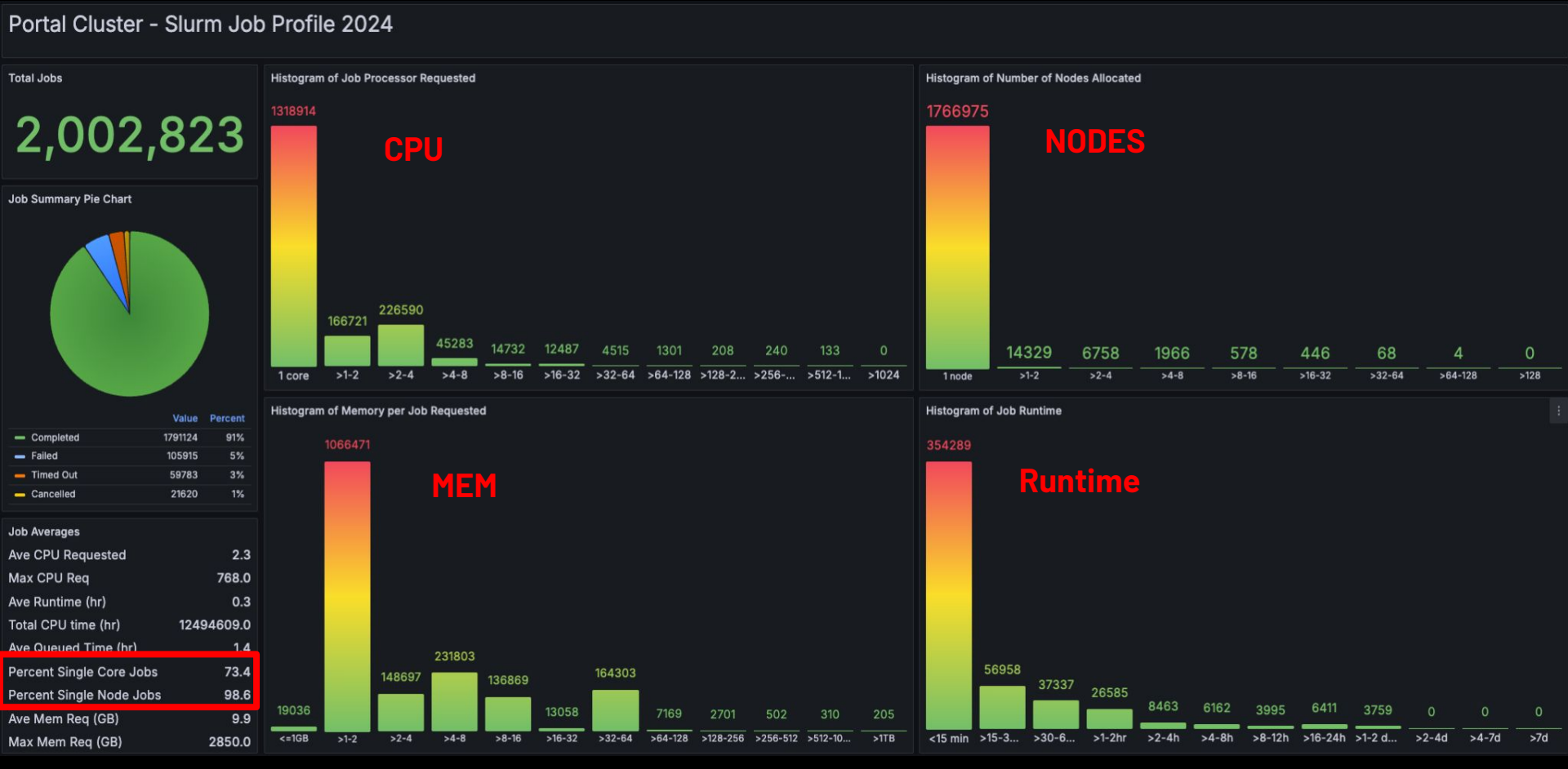
Background

- Portal cluster
  - Old hardware (10-15 years old)
  - Unsupported OS (CentOS 7)
- Need a replacement
- Plans?

Portal CPU vs Common Laptop CPU



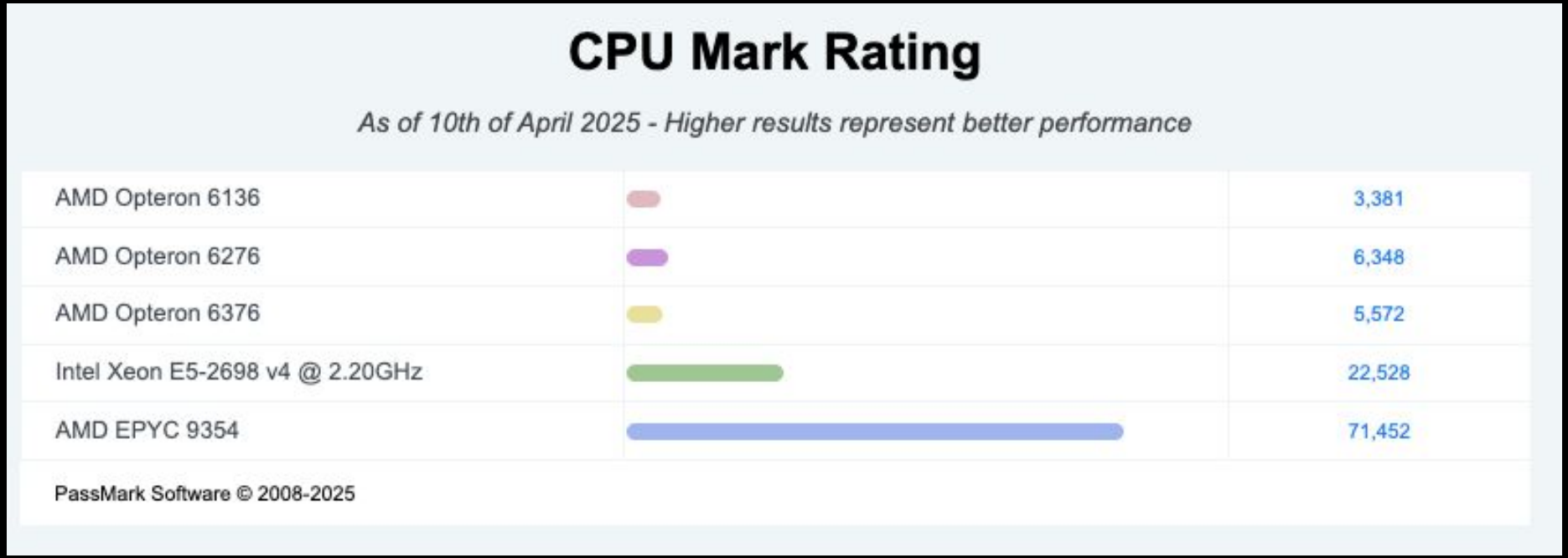
Portal Job Profile 2024



Flux - Overview

- 2 login node
- 20 compute nodes
  - 2x AMD EPYC 9354 32-Core
    - 64 physical cores/node
  - 512GB RAM
  - 2x 25Gbps Ethernet networks

Portal CPU vs Flux CPU



Speed up on Flux

	SPIRAL (gkramer)	fftw_mpi	mafot ORNL DIII-D (smunaret)	Ave speed up
AMD Opteron 6100	2.48	3.5	7.29	4.42
AMD Opteron 6200	3.69	4.75	10.69	6.38
AMD Opteron 6300	2.84	4.57	8.69	5.37
Intel Xeon E5-2600	1.66	2.7	3.13	2.50

Spack and Modules

- Spack - package manager for HPC systems
- Modules
  - Spack installed packages
  - Manually compile/installed packages
- Set environment variable

Spack - a motivation

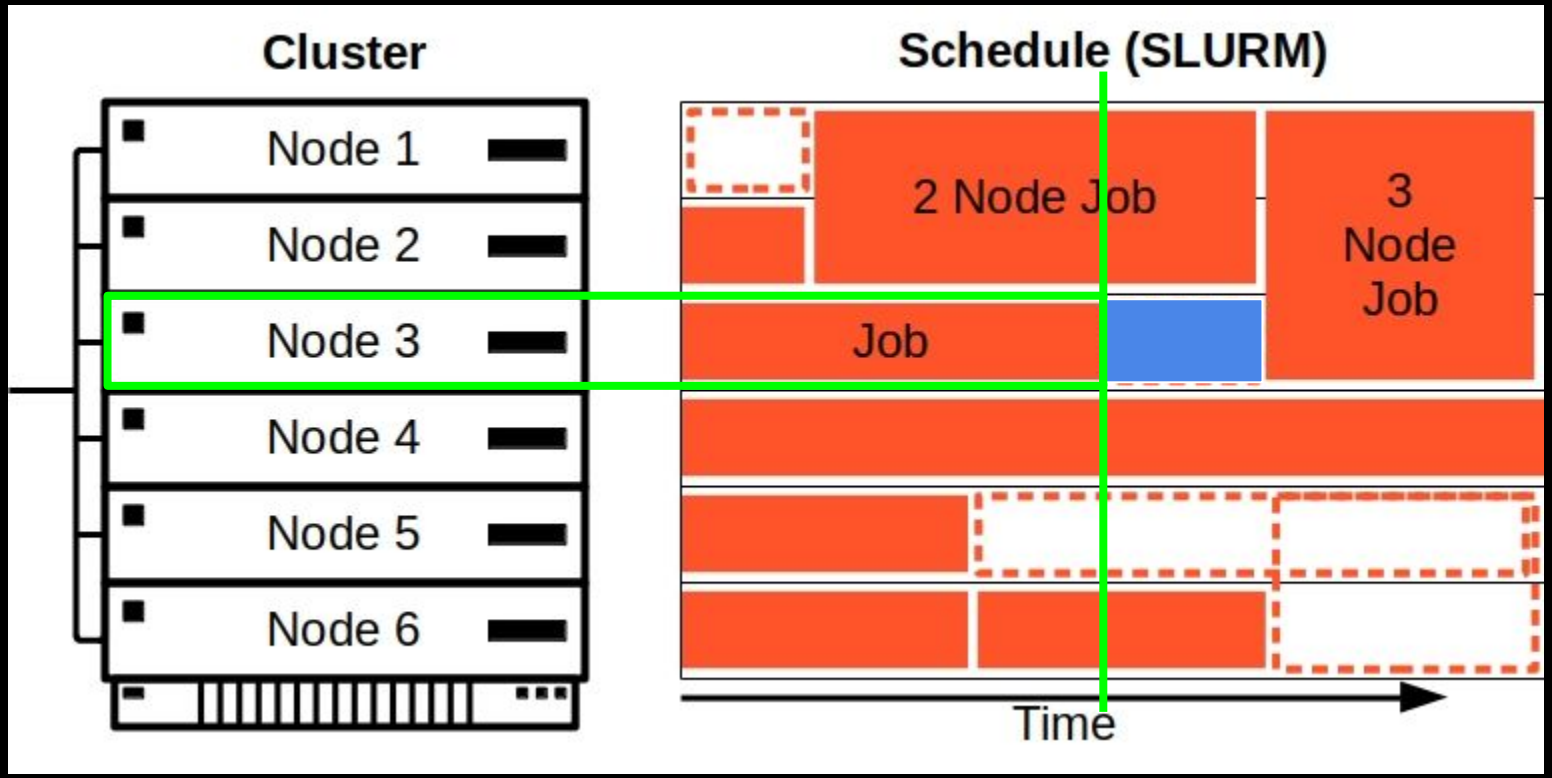
```
spack find netcdf-c@4.9.2%intel@2023.2.0

spack find %intel@2023

spack find hdf5+mpi ^openmpi%gcc

spack load …
```

Slurm

- See documentation page
- Limits
  - per user
  - per job
  - Partition
- Batch jobs submission form (flux,nx)
- Interactive jobs - only from login nodes

Slurm - options

- Must specify
  `--mem= or --mem-per-cpu=`
- Should specify
  `--time=0-00:10:00 (D-HH:MM:SS)`
  `--partition=all`
  `--nodes=1`
  `--ntasks=1 or --ntasks-per-node=1`
- Should consider
  `--exclusive=user`
  `--cpu-per-task=2`


Cluster
Node 1
Node 2
Node 3
Node 4
Node 5
Node 6
Schedule (SLURM)
2 Node Job
3
Node
Job
Job
Time

Optimal Use - Batch Jobs

- Use least number of nodes that is required
  - Fastest interprocess communications
  - Cache reuse
- Use Exclusive sbatch option

  `--exclusive=user`
- Specify time accurately
- Use scratch space
  - `$TMP $TMPDIR $TMPDIR_LOCAL`
  - `$TMPDIR_SHARED`

Reporting Issues

- Summary
- Connection
- Host
- Modules
- Commands
- Errors

Documentation Page

https://hpc.git.pppl.gov/hpc-user-docs

- Ongoing effort
- Suggestions
- Contributions*

Testing Flux

- Modules
  - Login scripts
- Compile Code
- Batch jobs
  - Run code interactively
  - Test for optimal resource allocation
  - Submit batch jobs

Future Work

- User training
- Build a better relationship with users
- Promote a strong user community