

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

CPU Mark Rating

As of 11th of April 2025 - Higher results represent better performance

AMD Opteron 6136		3,381
AMD Opteron 6276		6,348
AMD Opteron 6376		5,572
Apple M3 Pro 12 Core		24,714
Intel Core i5-13500		31,539

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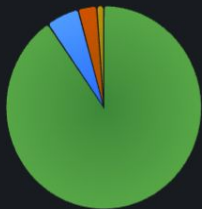
Portal Job Profile 2024

Portal Cluster - Slurm Job Profile 2024

Total Jobs

2,002,823

Job Summary Pie Chart



Value Percent

Completed	1791124	91%
Failed	105915	5%
Timed Out	59783	3%
Cancelled	21620	1%

Job Averages

Ave CPU Requested	2.3
Max CPU Req	768.0
Ave Runtime (hr)	0.3
Total CPU time (hr)	12494609.0
Ave Queued Time (hr)	1.4
Percent Single Core Jobs	73.4
Percent Single Node Jobs	98.6
Ave Mem Req (GB)	9.9
Max Mem Req (GB)	2850.0

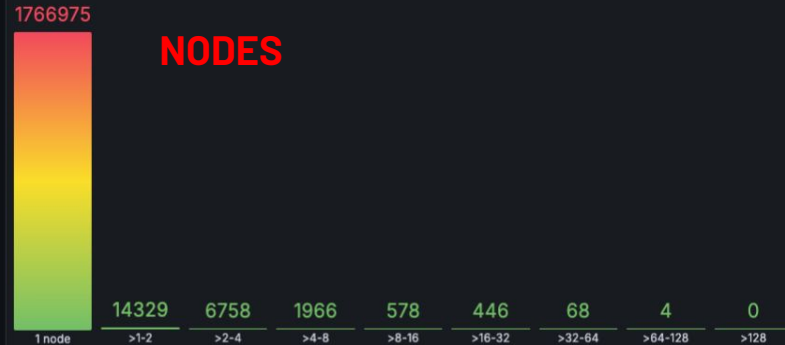
Histogram of Job Processor Requested



Histogram of Memory per Job Requested



Histogram of Number of Nodes Allocated



Histogram of Job Runtime



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

CPU Mark Rating

As of 10th of April 2025 - Higher results represent better performance

AMD Opteron 6136		3,381
AMD Opteron 6276		6,348
AMD Opteron 6376		5,572
Intel Xeon E5-2698 v4 @ 2.20GHz		22,528
AMD EPYC 9354		71,452

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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
```

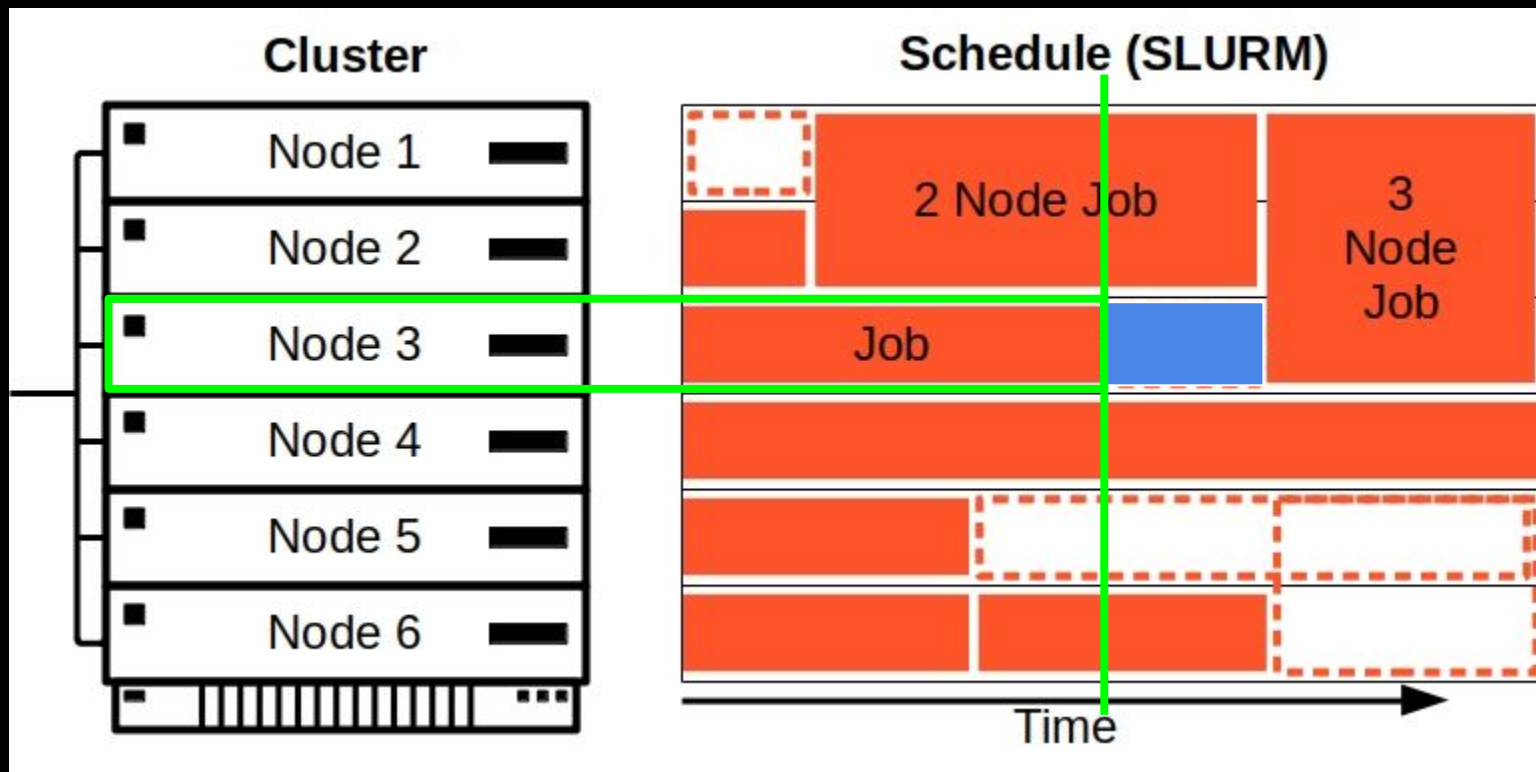
```
spack load ...
```

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`



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