**Overview**

O2 is a platform for Linux-based high performance computing at Harvard Medical School. The name is derived from being the next generation of the HMS "Orchestra" cluster, hence "O"2.

- O2 is managed by the Research Computing Group, part of HMS IT.
- O2 is an HPC cluster built on Linux and the Slurm open source job scheduler.
- Please submit a request for O2 help or feedback.
- Follow us on Twitter for updates and alerts about service outages.

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**Getting Started with O2 and Slurm**

- Basic guide to O2 and the Slurm job scheduler  
  New users, start here!
- Switching workflows from Orchestra to O2  
  Orchestra users, start here!
- How to login to O2
- Frequently Asked Questions about O2
- Security on O2

**O2 Jobs and the Slurm scheduler**

- How to choose a partition (the Slurm equivalent to job queues in LSF)
- Troubleshooting your O2 jobs
- Parallel Jobs in O2
- Using O2 GPU resources
- O2 HPC Cluster and Computing Nodes Hardware Information
- Job Priority
- Examples of O2 commands
- Get information about current and past jobs

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**Software and Programming on O2**

- Using research applications on O2
- Using MATLAB on O2
- Using Mathematica on O2
- Using Conda on O2
- Using Java on O2
- Using Jupyter on O2
- Maintain your own library of software for different languages  
  • Personal Python packages
  • Personal R packages
  • Personal Perl packages
- Installing custom software
- Using Genome Browsers (IGV, UCSC Genome Browser)
- Available Software on O2

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**Cluster Status**

**ONLINE**

Our cluster status page has details of service outages and planned maintenance.

**September 18 - Service Degradation**

O2 has been experiencing intermittent problems with its authentication system on login, transfer, and compute nodes. This issue can potentially result in: slow or failed logins to O2, Missing group membership, Failed job submissions.

**August 9 - Service Degradation**

New jobs are intermittently not starting on the cluster (or the sbatch command has errors) due to an issue with cluster-storage communication. We believe that currently running jobs are still executing normally. Disk read/writes may be slower than usual, which can cause other commands to be slow. We will provide details as we get them.

**July 8: notes after the July OS/Slurm update**

- Jupyter Notebooks users should start a new environment and remove any old runtime directories.
- "sbatch" no longer uses the "--x11" option in the new version of Slurm. Just remove it from your script and X forwarding should work by default.
- "srun" commands still require "--x11" to enable X forwarding, though.
- If you have any custom built software, you may need to recompile or relink it on O2.

**Two Factor Authentication:**

All O2 cluster logins from outside of the HMS network require two-factor authentication. Please see:

- Two Factor Authentication on O2
- Two Factor Authentication FAQ
- How to setup your HMS Duo profile

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**Community Events**

**User Training**

- Classes are offered each semester to the HMS community to help you ramp up your research skills!
- Please check the User Training page for courses, dates, and registration
**General UNIX Information**

- Using X11 applications remotely
- UNIX permissions tutorial
- O2 cron service

**Data Storage**

- There are a number of storage options available for research data.
- Copying files to and from O2 (including downloading from websites)
- If you had an Orchestra account, you will get access to the same home directory and shared network storage from O2.

**Office Hours**

- RC's Office Hours are held every Wednesday, 1 - 3 PM.
  - As part of the HMS response to COVID-19, office hours are being held online, using Zoom.
  - During these hours only, you can join the Zoom meeting room for a consultation.
  - Please contact us first with a support request before joining office hours so we can better help you!

**Intermediate Slurm**

- Research Computing Group custom workflows
- Get more informative slurm email notification
- Report CPU/Mem usage in slurm job standard output
- screen: go back to the same terminal window from anywhere, anytime
- tmux: go back to the same terminal window from anywhere, anytime
- Install and run HiC-Pro-2.10.0
- Install and run salmon-0.10.0 and Trinity-2.6.6
- Aspera and sratoolkit to download NCBI SRA data
- Batch small jobs together as a big job
- sratoolkit/2.10.7 to download dbGAP data

**Grants and Citation Information**

- Text about Research Computing and O2 for grant applications
- Published papers that cite HMS Research Computing resources