

INTRODUCTION TO HYDRA

CODE OF CONDUCT

We are operating under the Carpentries [Code of Conduct](#).

If you feel that someone has violated this Code of Conduct, please email si-hpc@si.edu.

INTRODUCTIONS

INTENDED OUTCOMES

After attending this workshop, we hope users come away with these skills:

- How to successfully log in
- How to submit a job
- What to do if something doesn't work
- How to work responsibly on a shared computing resource

HYDRA (SI/HPC)

PEOPLE

- Rebecca Dikow (OCIO Data Science Lab), Vanessa González (NMNH GGI), Matt Kweskin (NMNH LAB), and Mike Trizna (OCIO Data Science Lab) provide support for non-CfA users.
- DJ Ding (OCIO) is the full-time Hydra system administrator.
- Sylvain Korzennik (SAO) is the HPC Analyst and provides support for CfA users.

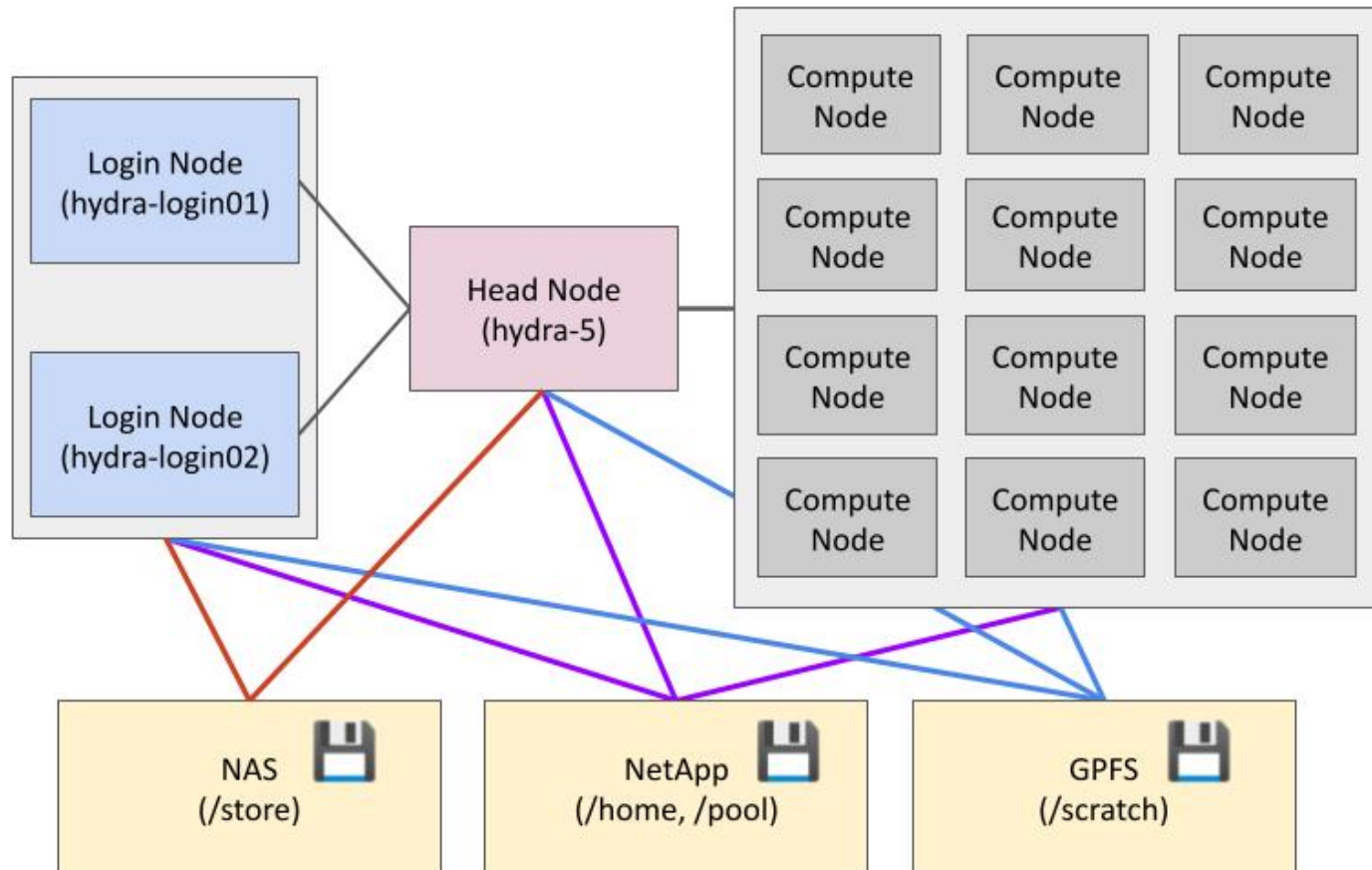
GETTING HELP

- The [Wiki](#) contains detailed documentation
- Email `si-hpc-admin@si.edu` for system-level issues
- For non-CfA users:
 - Bioinformatics Brown Bag (Wednesdays, 12-1pm ET, on Zoom)
 - Email `si-hpc@si.edu` (monitored by Rebecca, Vanessa, Matt, and Mike)
- CfA users:
 - email Sylvain or sign up for his office hours

BEING A GOOD HYDRA CITIZEN

- We strive to provide support for users that is inclusive, welcoming, and helps you get your science done.
- We request that users be respectful when asking for help. While we attempt to answer questions rapidly, user support is no one's full-time duties.

HOW IS A CLUSTER DIFFERENT THAN A SINGLE-USER SYSTEM?



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- Hydra has 93 compute nodes with between 20 and 128 CPUs each, for a total of 5,088 CPUs
- Compute nodes have a range of 128GB to 2TB RAM each

IMPORTANT TAKEAWAYS

- Users never need to connect to the Head Node
- Log in to either `hydra-login01` or `hydra-login02`
- Do not run commands that use substantial CPU on the login nodes, that's what the compute nodes are for

DISK STORAGE

- When you log in, you go to your /home directory
- /home is for your own installed programs and scripts, not for data storage
- Data belong on /pool or /scratch and users should run their jobs from here
- /pool and /scratch are scrubbed - files older than 180 days are removed

CONNECTING TO HYDRA

- telework.si.edu (web terminal)
- Mac direct connect (onsite or VPN)
- Windows direct connect (onsite, remote desktop, VPN)
- CfA (telework.si.edu, login.cfa.harvard.edu, SAO VPN)
- If you don't have an SI VPN but would like to, there is a request form in the SI ServiceDesk

THE JOB SCHEDULER - UGE

- We use UGE (Univa Grid Engine) to schedule resources on Hydra
- When you submit a job, UGE adds it to the queue and sends it to a compute node with the resources you request
- Each job is assigned a JOB ID, which you can use to check on progress and look at how it used resources when it is complete

SUBMITTING JOBS

- The most common way to run analysis on Hydra is by submitting a job file using the command `qsub`
- We will show you how to build a job file in just a bit
- Users can also start an interactive session using `qrsh`

QUEUES

Hydra has different queues to accommodate different resource requests:

- High CPU queues: sThC . q, mThC . q, lThC . q, uThC . q
- High Memory queues: sThM . q, mThM . q, lThM . q, uThM . q

There are other more specialized queues, check the wiki for more information

PARALLELIZATION

- Depending on the software, you may be able to run a job in **parallel**, which can speed up your analysis.
- Some software uses **threaded** parallelization, where the job is divided across CPUs on a single compute node
- Some software can be compiled to use **MPI** parallelization, where the job is divided across multiple compute nodes

PARALLELIZATION HINTS

- Some (bioinformatics) software will grab all the CPUs on a compute node unless you tell it otherwise
- Best practice is to use `$NSLOTS` in place of a number of threads in your command. We will demo this in a bit

WARNINGS

- Users that are:
 - Running a job that is inefficient (using $<30\%$ of the requested CPU resources), or
 - Running a high-memory job that is using much less than the requested amount of RAM,

will receive an automated warning email. We request that you monitor these jobs closely and contact us if you receive repeated warnings

LET'S CONNECT

