Getting started on subMIT: How to Interact with subMIT

subMIT Annual Workshop 2025

https://indico.mit.edu/event/1276/

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Outline

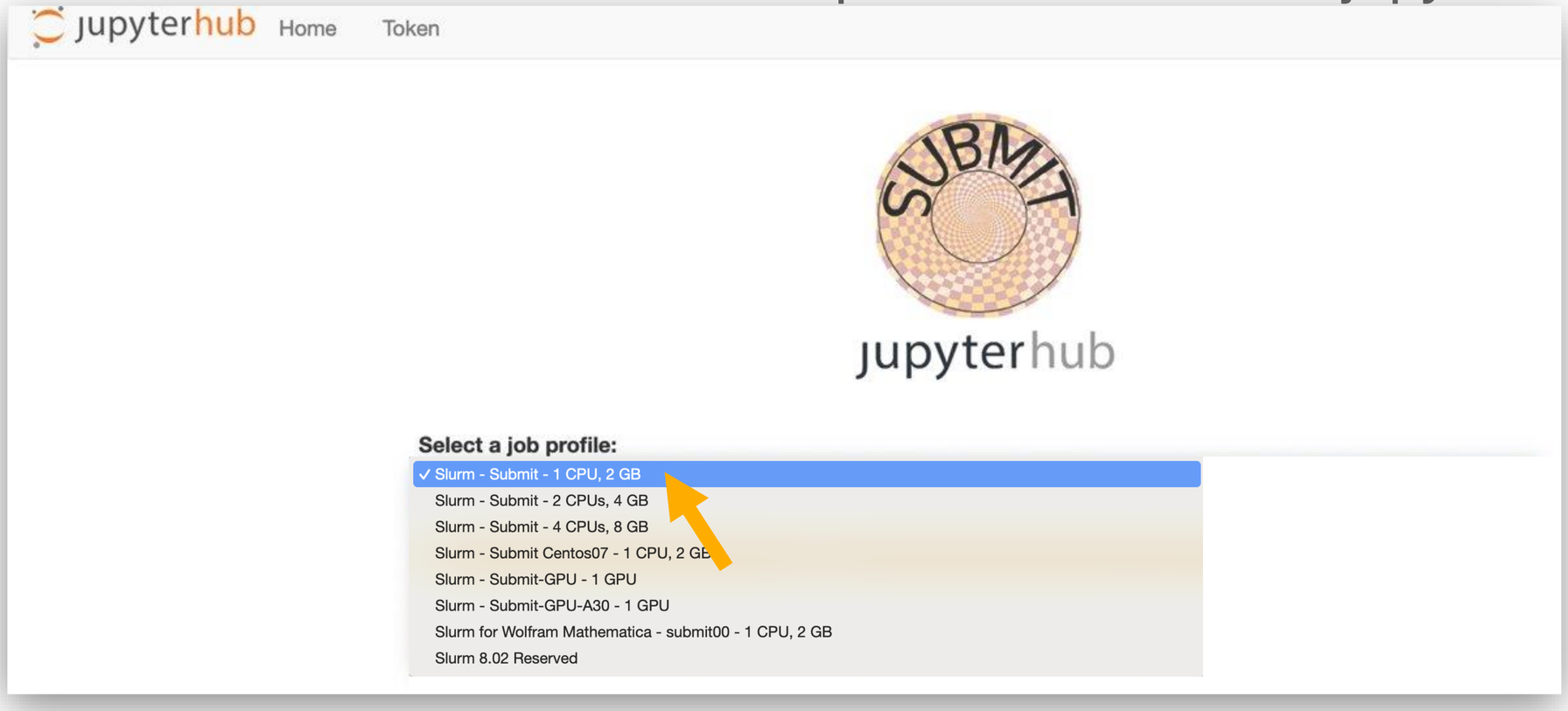
- JupyterHub
- Visual Studio Code (VSCode)
- terminal / ssh
- X2Go

JupyterHUB

- Access subMIT from a web browser
- Create/Run Juptyer Notebooks
- Graphical Interface + built-in terminal (in web browser)
- Easy interactive access to compute node resources, including GPUs

  (Not just login nodes)

https://submit.mit.edu/jupyter/



JupyterHUB

- File Browser

- Jupyter Notebooks: Self-Contained
  - Code
  - Results / Visualization
  - Documentation (Markdown, LaTEX)
  - Easily shared

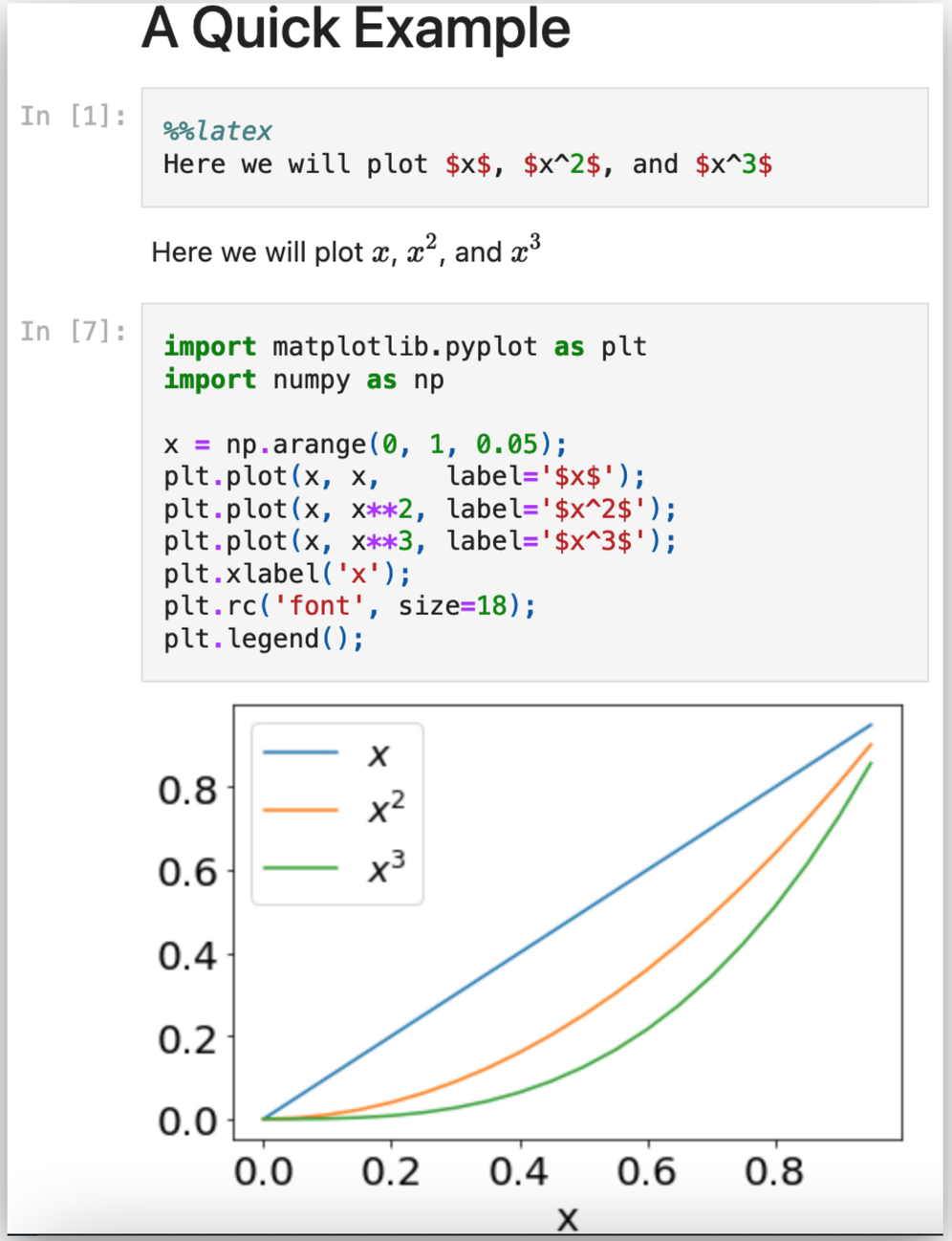
- Kernels = sets of software / packages used to run code in your notebook
  - Use your conda environments as kernels (automatic setup)
  - Use singularity images (containers) as kernels
  - Change kernels w/ a click

- Mathematica accessible via JupyterHub

- Many languages (even w/in same notebook)

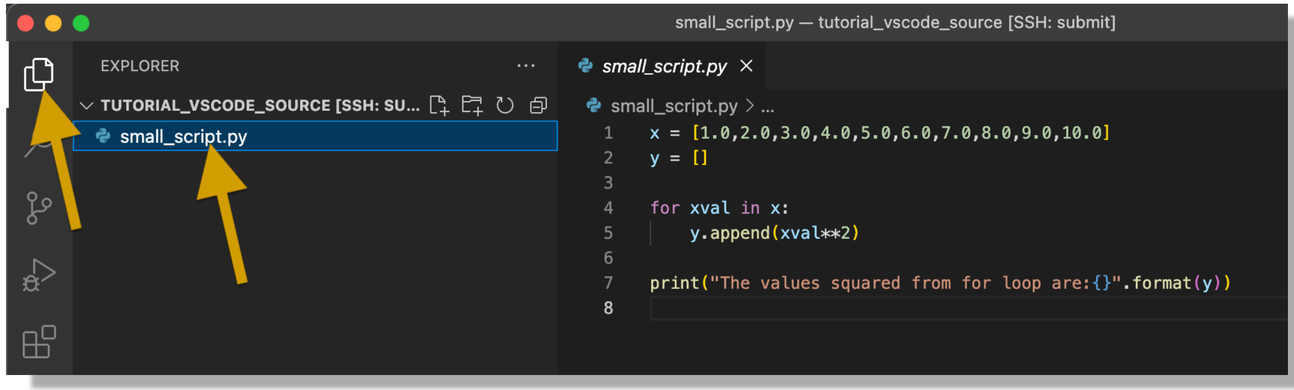
- Many extensions
  - Debugging
  - Source Control (git / GitHub)

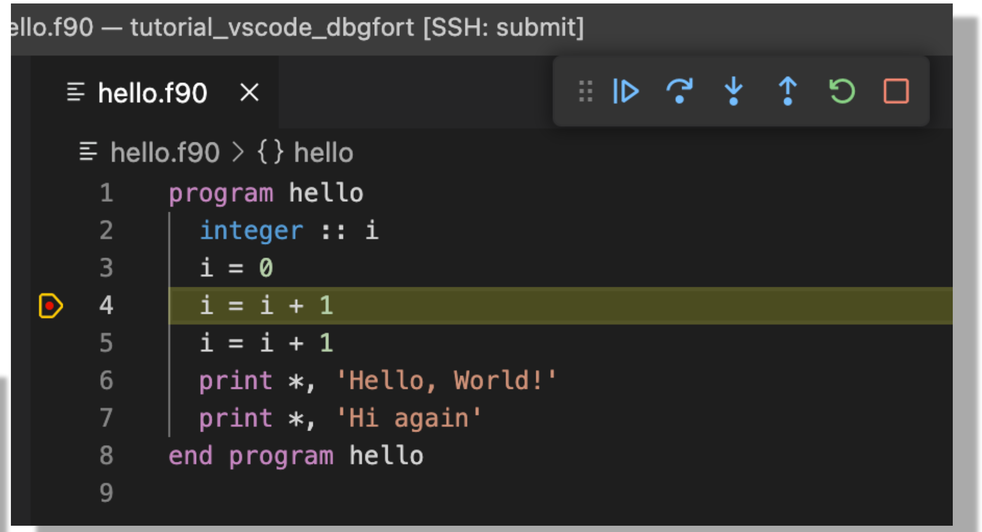
subMIT User's Guide:
https://submit.mit.edu/submit-users-guide/program.html#jupyterhub
https://submit.mit.edu/submit-users-guide/program.html#jupyterhub-for-mathematica

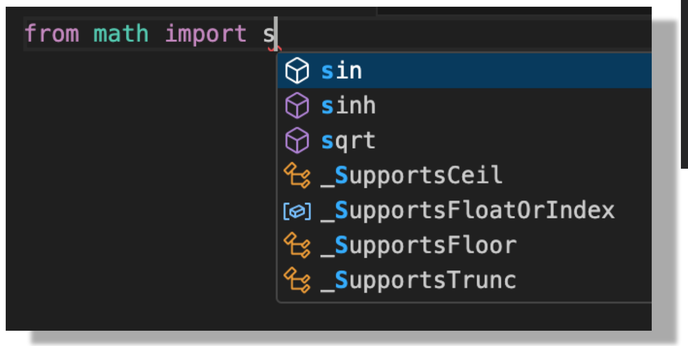


Visual Studio Code: Remote Development

- code runs on subMIT, GUI runs on your laptop
- File Browser
  - GUI to navigate/view your subMIT files/directories
- Many languages / extensions
  - Python, C/C++, Java, Julia, Fortran, …
  - LaTeX, HTML/CSS, Markdown, rst, …
- Code navigation
- Debugging (code runs on subMIT cluster)
  - breakpoints, variable inspection/watch, stack navigation
- Source Control (Integrated / GUI)
- Automatic Code Completion
  - Intellisense
  - Snippets, AI-assisted development
- subMIT User's Guide:
  - https://submit.mit.edu/submit-users-guide/program.html#vscode
  - Tutorials: https://submit.mit.edu/submit-users-guide/#tutorials-submit





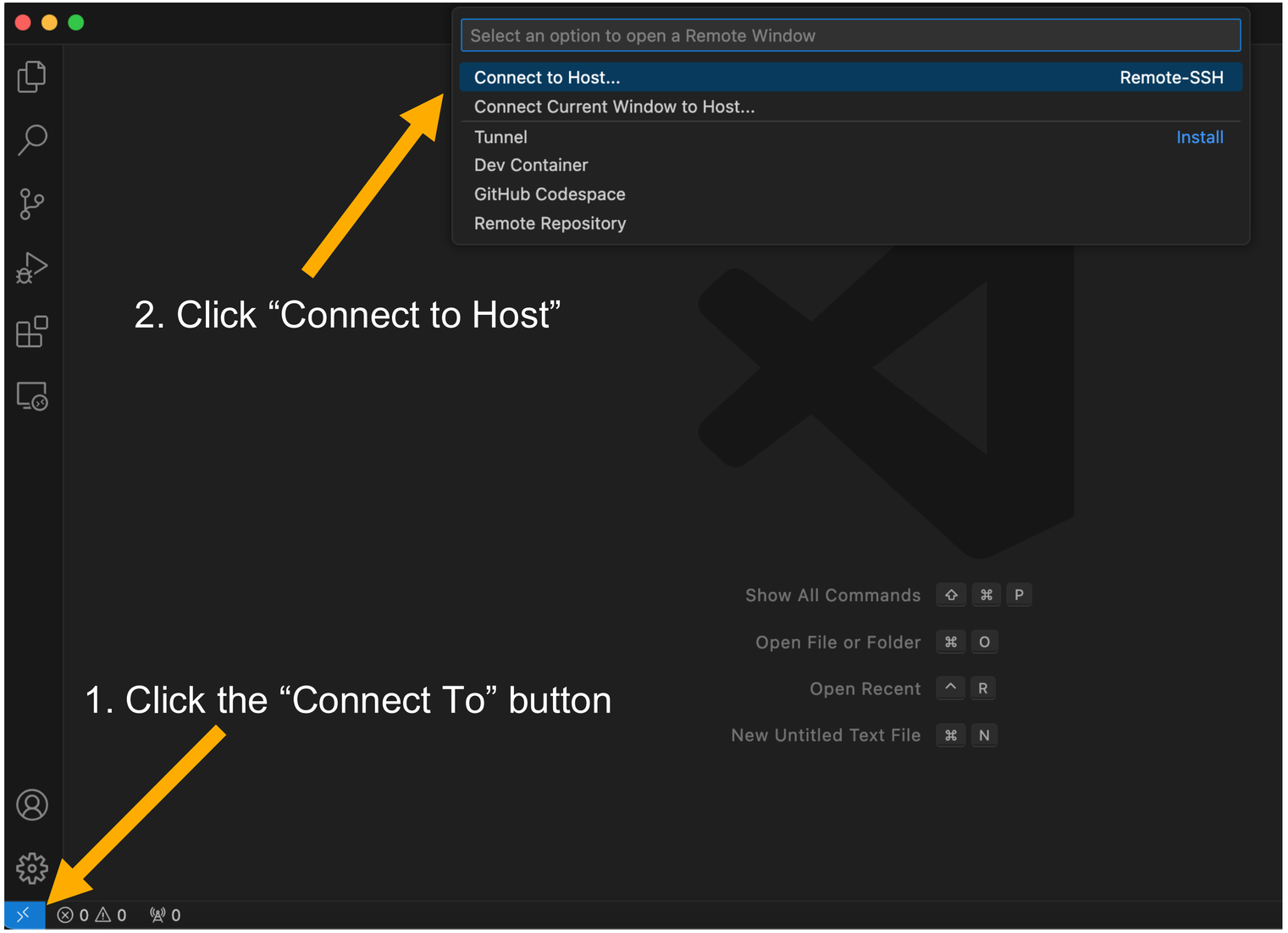


Change conda environments (on subMIT) for python code w/ a click

Visual Studio Code: How to Connect

Note: **This puts you on a login node**
Only for relatively light computation use (debugging)

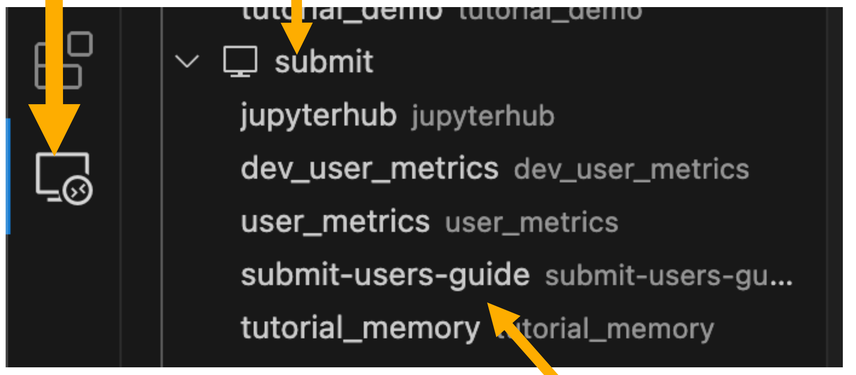
subMIT User's Guide:
https://submit.mit.edu/submit-users-guide/program.html#getting-started-with-vscode-on-submit



Click "Remote Explorer"

Then remote hosts in your ssh config file appear

OR



… along with previously-opened folders on each host

Terminal / SSH

- Classic method of interaction

```
ssh <username>@submit.mit.edu
```

Note: **This puts you on a login node**
Only for relatively light computation use (debugging)

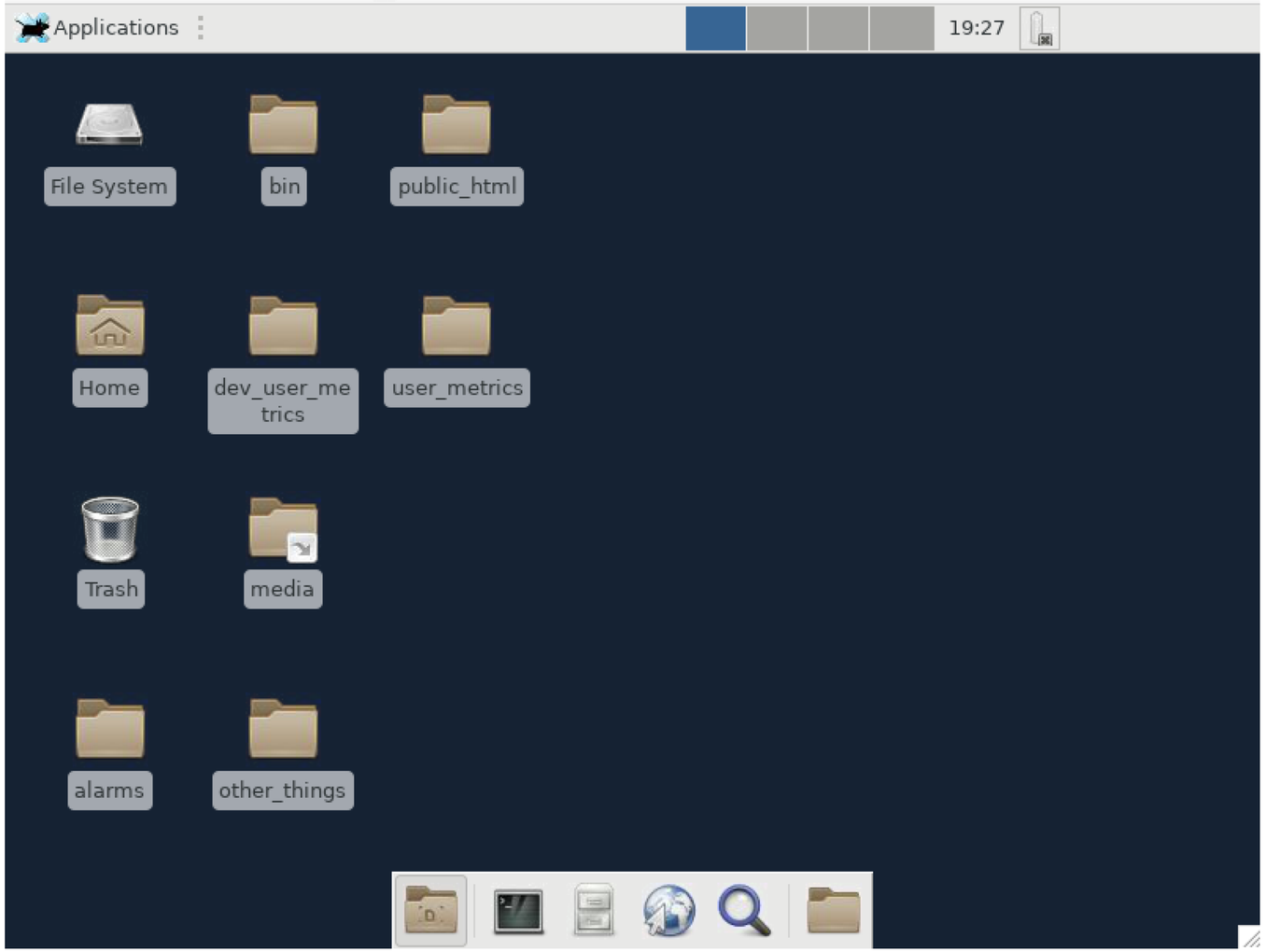
Use salloc to get interactive session on compute nodes for heavy use

- MacOS / Linux : built-in. Windows : Windows Subsystem for Linux (WSL)

- Handy tip: set up ssh config file:
  - https://submit.mit.edu/submit-users-guide/starting.html#common-issues-with-keys

- subMIT User's Guide
  - Intro to terminal: https://submit.mit.edu/submit-users-guide/tutorials/tutorial_0.html

X2Go



Note: **This puts you on a login node**
Only for relatively light computation use (debugging)

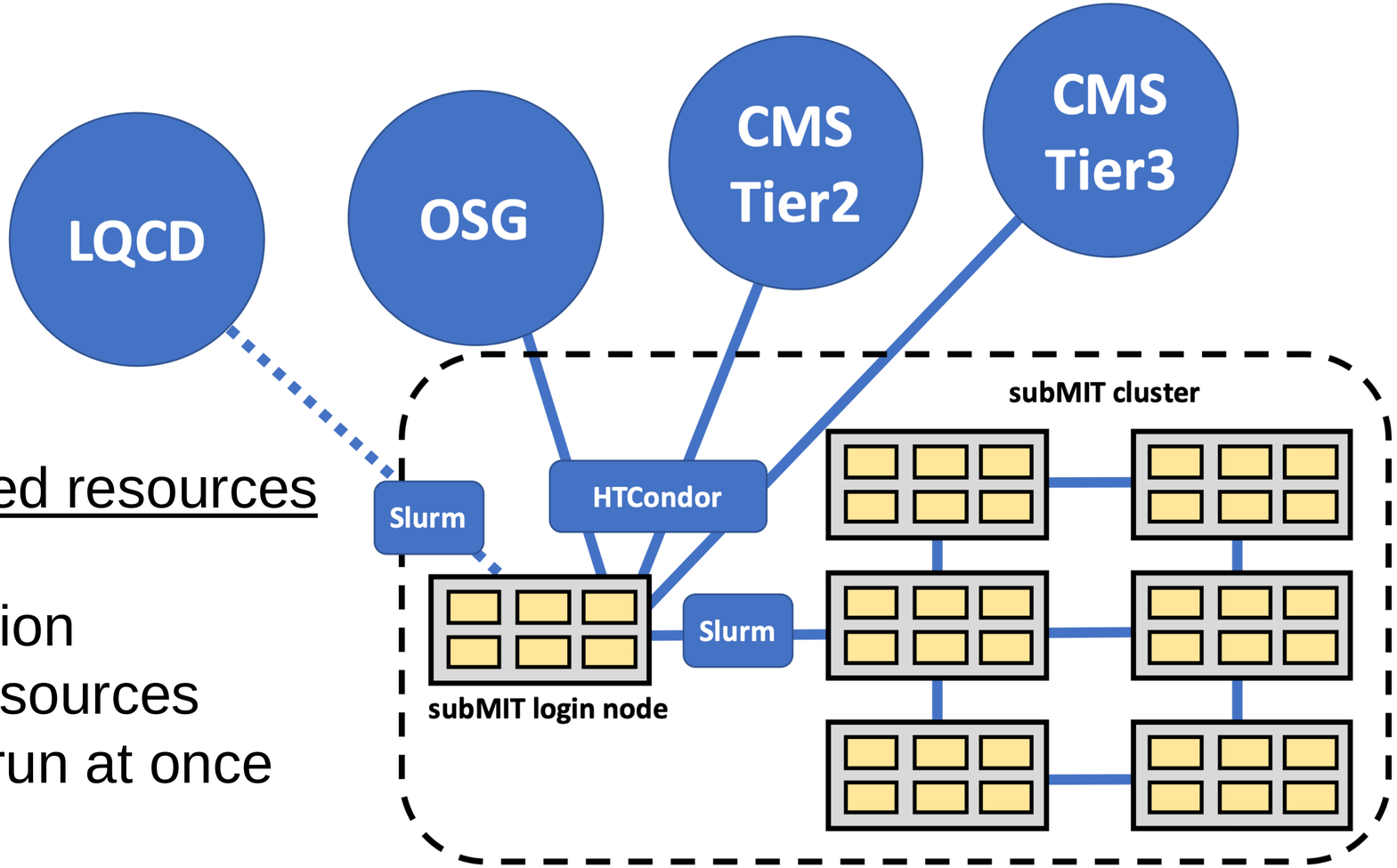
- Reserved for GUI-heavy needs where the other options do not suffice

  (Otherwise, the other options are preferred)

- Familiar GUI interaction w/ the cluster
- Easy alternative to manual X11 Forwarding
- Run GUI applications with little/no setup
- subMIT User's Guide: https://submit.mit.edu/submit-users-guide/program.html#x2go

Batch Jobs (overview)

- See the tutorial later this morning for more info!



- What are Batch jobs?
  - request/reserve dedicated resources (nodes, cores, memory)
  - run without user interaction
  - may wait in queue for resources
  - one or many submitted/run at once
- Login nodes are only for light usage
- “Heavy lifting” (significant usage of resources) should be done via batch jobs