

ARCC: Advanced Research Computing Center

Intro to HPC Clusters

Prerequisite:

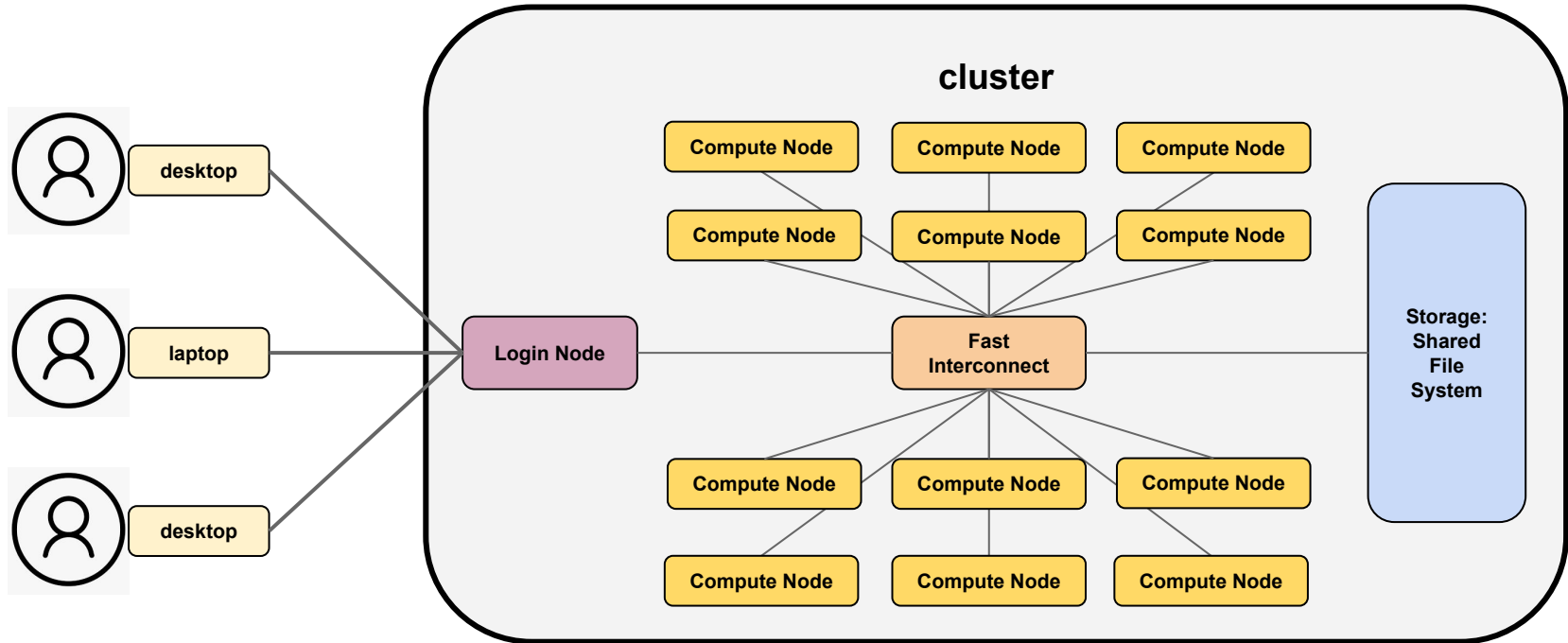
- You've watched the 'Intro to ARCC Services' video.

High Performance Computing: HPC

“High Performance Computing most generally refers to the **practice of aggregating computing power** in a way that delivers much higher performance than one could get out of a typical desktop computer or workstation in order to solve large problems in science, engineering, or business.”

HPC \neq Desktop

Cluster



Compute Nodes

compute node \approx desktop

memory: 64G/128G/512G - 4T

cores: 16/32/40/72

chipset, cache, clock speed

(temporary) local disk

shared file system

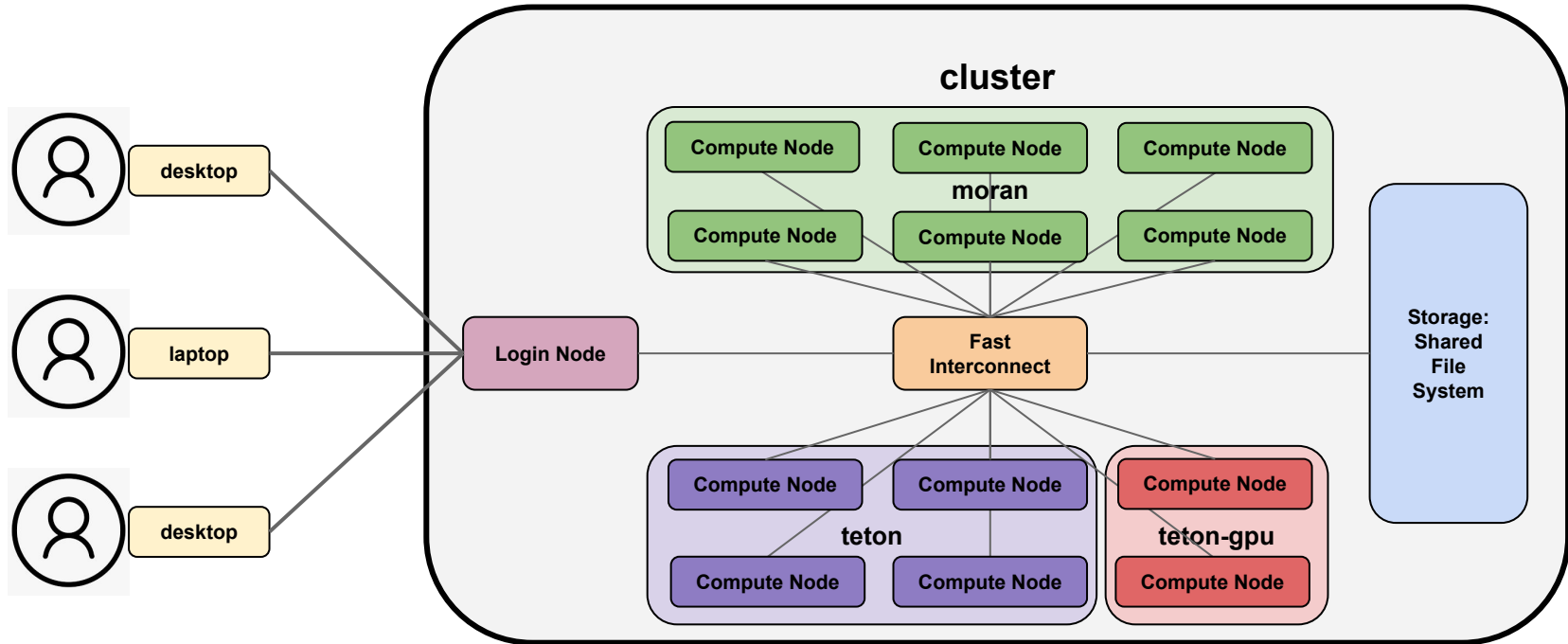
GPU?

Types of HPC systems:

With this in mind, there are generally two type of HPC systems:

1. **Homogenous**: All compute nodes in the system share the same architecture. CPU, memory, and storage are the same across the system.
2. **Heterogenous**: The compute nodes in the system can vary architecturally with respect to CPU, memory, even storage, and whether they have GPUs or not.
 - Typically, similar compute nodes are grouped via **partitions**.

Cluster and Partitions



Condominium Model

The “**condo model**”.

- Allow researchers to **invest into the cluster** - purchasing additional compute nodes that they get **priority to use**.
- ‘**preempt**’ jobs outside of the investor’s project - allow the investor to start their jobs immediately.
- This is managed by defining ‘**investor partitions**’.

Future Videos

- Use the login nodes to access the cluster.
- What your working environment looks like and how it is organized.
- Set up your environment for your specific needs, using LMOD which is our module system.
- How to interactively work, and/or schedule jobs on the clusters using Slurm our Workload Manager.
- Request specific partitions or capabilities on compute nodes.
- Talking in more depth about the types of serial and parallel jobs that can be run across the cluster.

Summary

- A high-level architectural overview of what a HPC cluster looks like.
- How clusters can be divided into partitions that can be defined by compute node type and/or investor purchased nodes.
- The “condo model” that allows a more open and usable cluster.

