High Performance Computing (HPC) on Cluster

Georgia Advanced Computing Resource Center

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Outline

- GACRC

- What is High Performance Computing (HPC)?

- What is a Cluster?

- How to Work on Cluster?

GACRC

Who Are We?

- **G**eorgia **A**dvanced **C**omputing **R**esource **C**enter
- Collaboration between the Office of Vice President for Research (**OVPR**) and the Office of the Vice President for Information Technology (**OVPIT**)
- Guided by a faculty advisory committee (GACRC-AC)

Why Are We Here?

- To provide computing hardware and network infrastructure in support of high-performance computing (**HPC**) at UGA
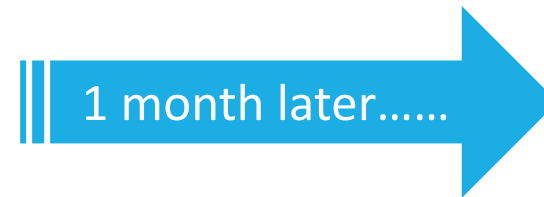
Where Are We?

- http://gacrc.uga.edu (Web)   http://wiki.gacrc.uga.edu (Wiki)
- http://gacrc.uga.edu/help/ (Web Help)
- https://wiki.gacrc.uga.edu/wiki/Getting_Help (Wiki Help)

What is High Performance Computing?

1 worker

Task Mountain

10 years later……

What is High Performance Computing?

Task Mountain

JOB DONE

1 month later……
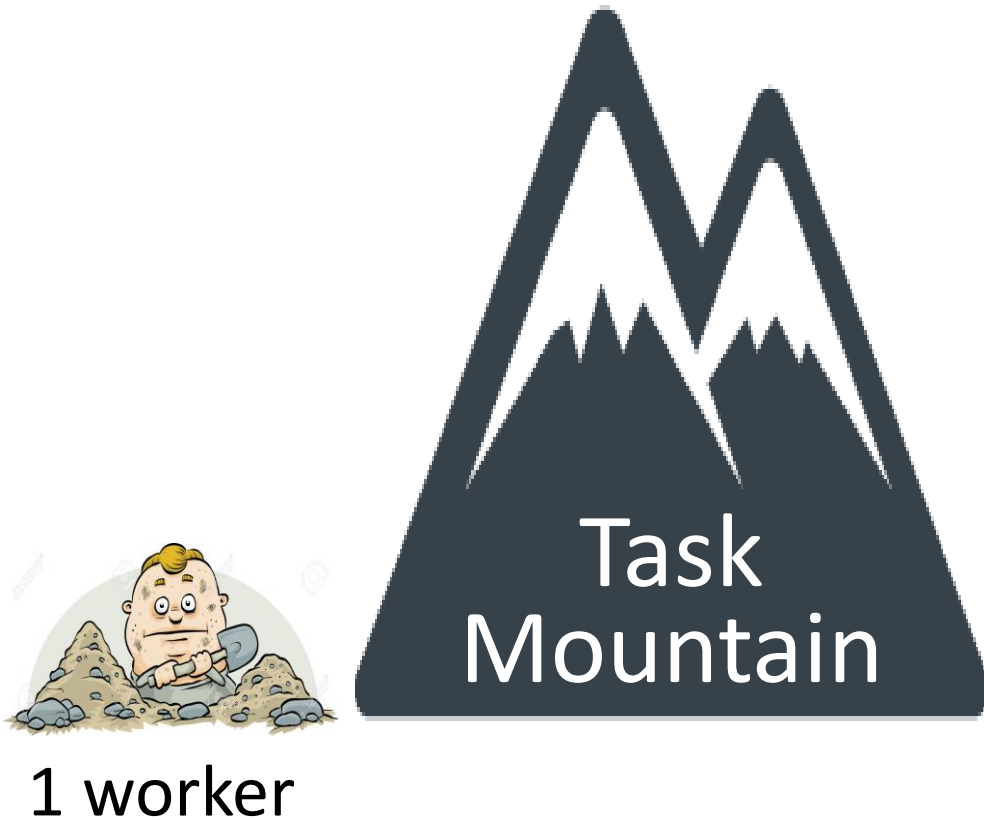
What is High Performance Computing?

Serial Job with 1 worker

Problem → instructions → Processor

tN ... t3 t2 t1

✓ Only 1 instruction executed at any time point on a single processor

Parallel Job with 6 workers

Problem → instructions → Processor (×6)

tN ... t3 t2 t1
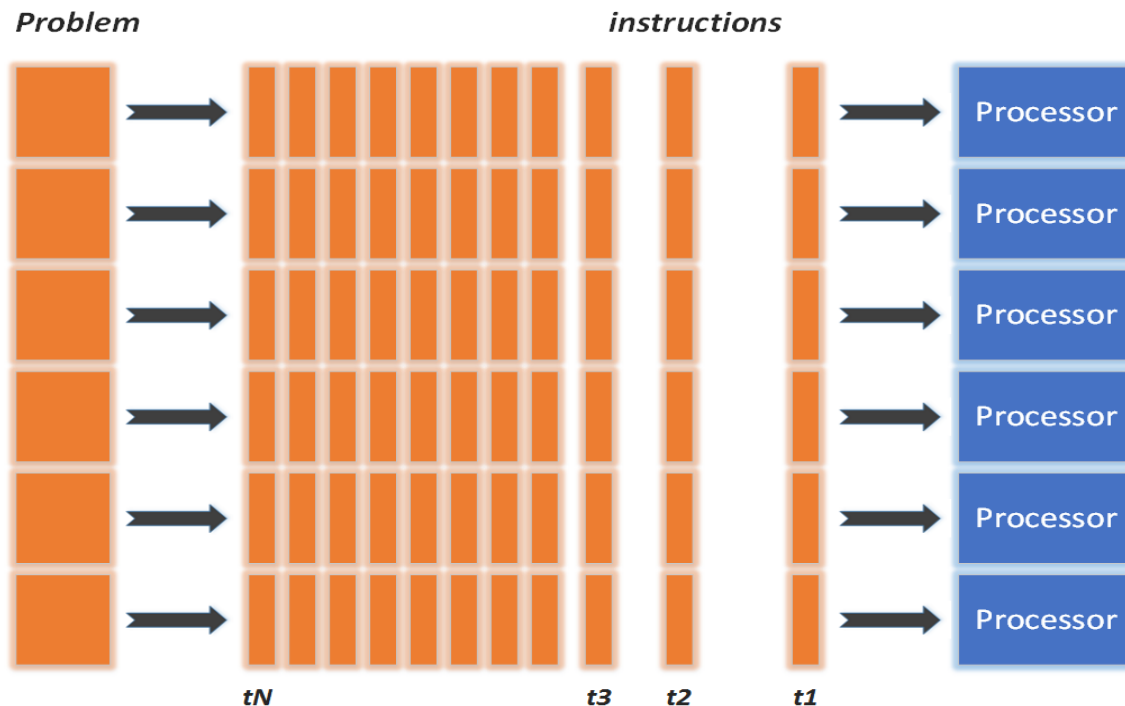
✓ 6 instructions executed *simultaneously* on *6* processors

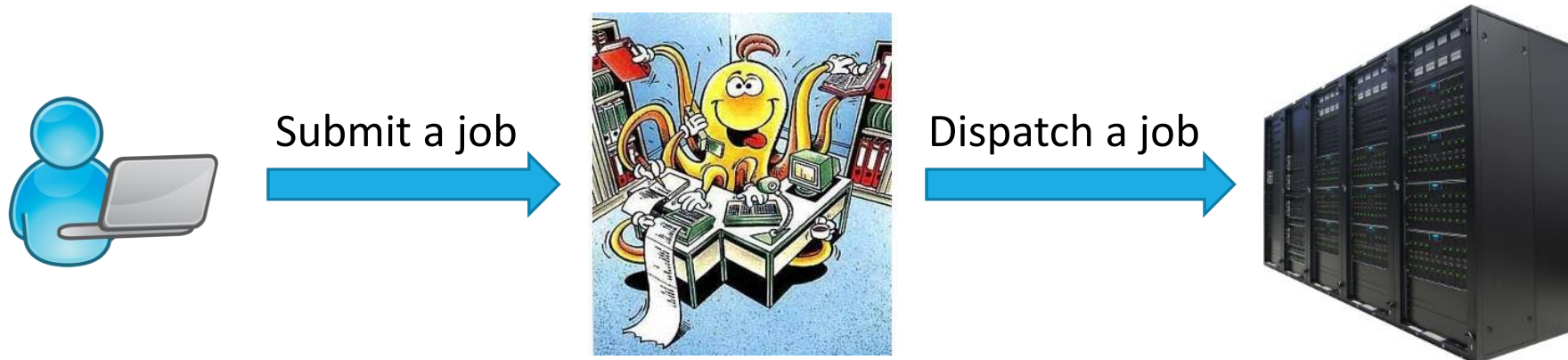✓ Shared-memory threaded job or MPI job (Message Passing Interface)

What is a Cluster?

➢ Sapelo Cluster Diagram

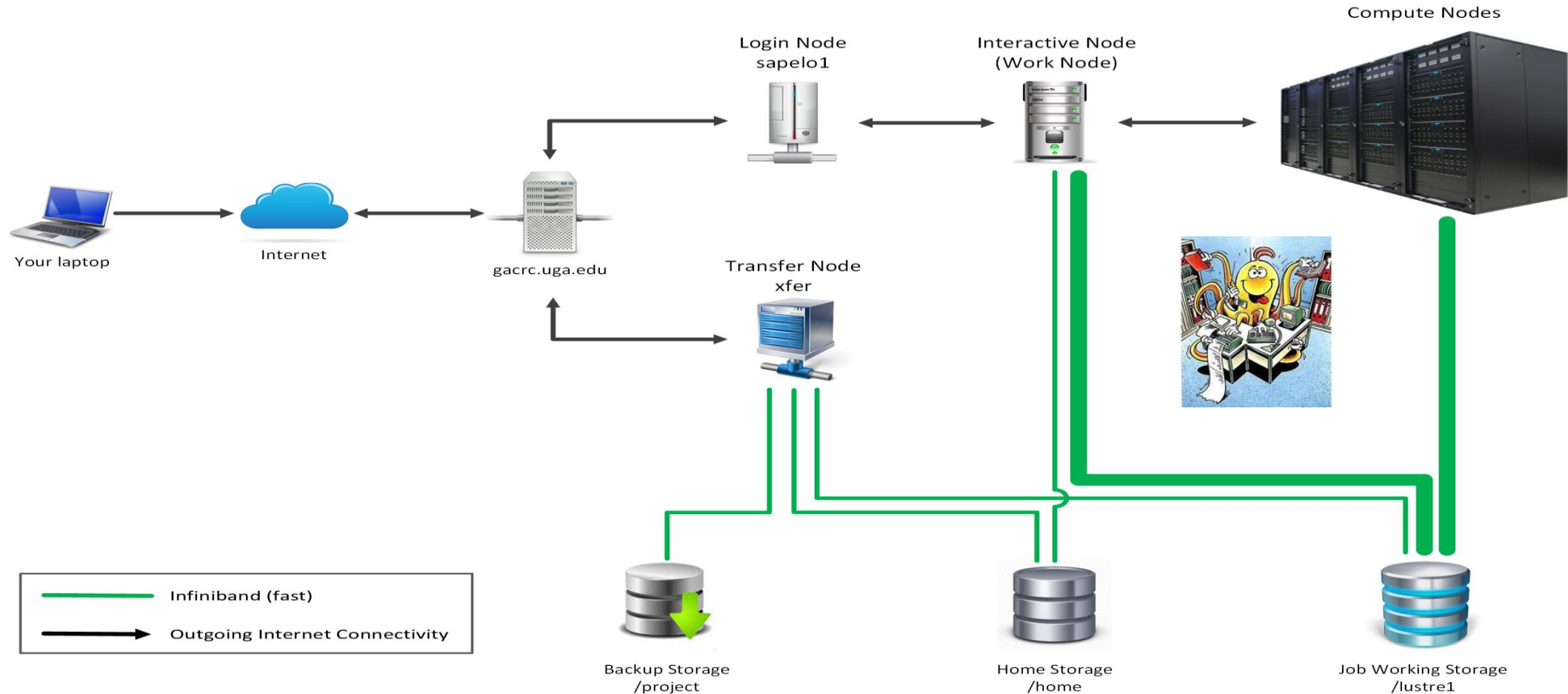➢ Sapelo Cluster Structural Diagram

➢ Sapelo Cluster Overview

What is a Cluster?

When you work on cluster, 3 roles are working:

➢ You: Who submit a job

➢ Queueing System: Who dispatch your job to run on cluster

➢ Cluster: Who run your job

Submit a job

Dispatch a job

Sapelo Cluster Diagram

The New GACRC Linux HPC Cluster Structural Diagram
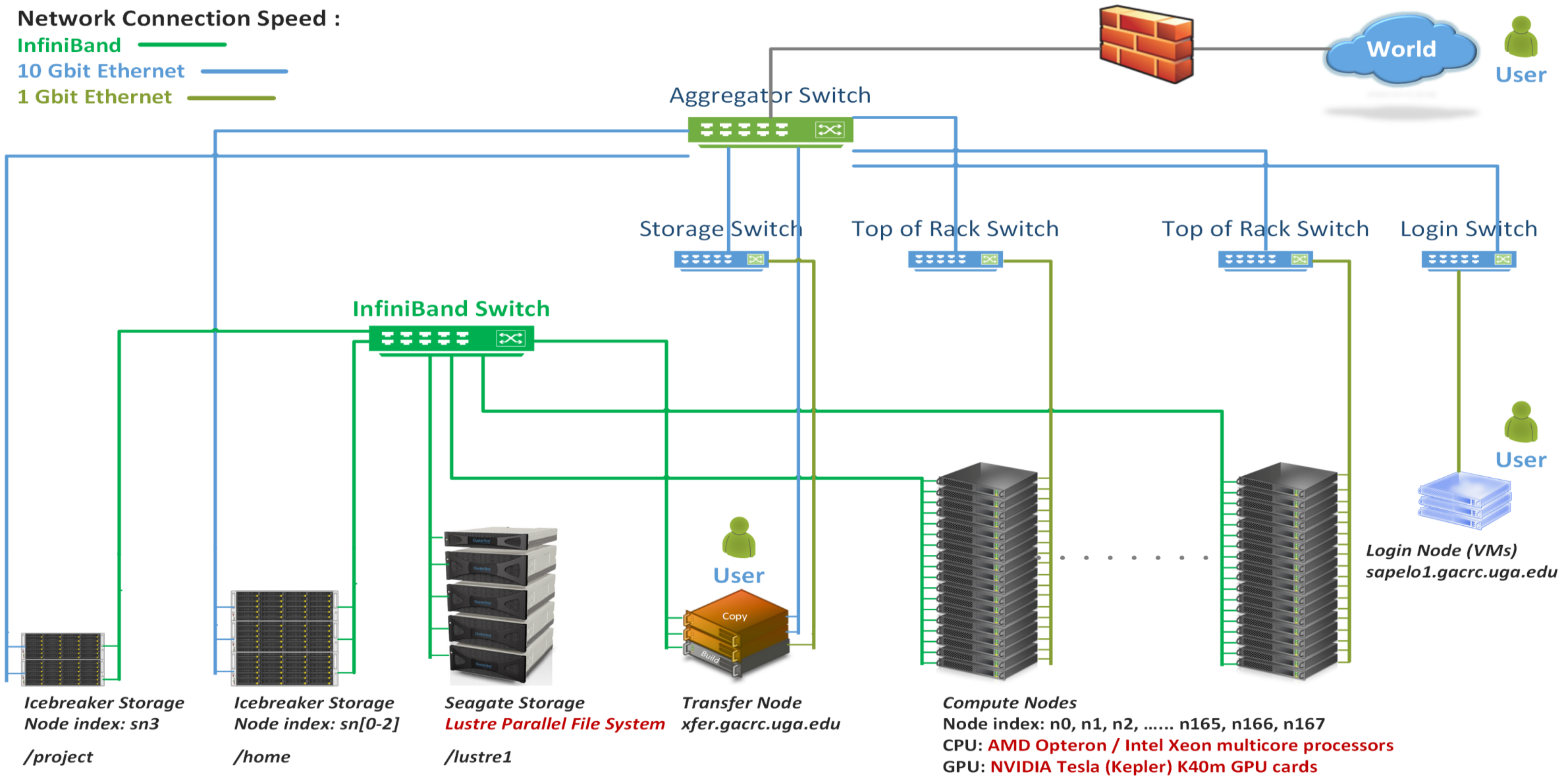
Sapelo Cluster Overview

Sapelo 3 Nodes:

1. Login Node: <u>edit script, submit batch job</u>

2. Interactive Node (Work Node): <u>edit script, submit batch job</u>, run task interactively

3. Transfer Node: transfer and compress/package data

Sapelo Cluster Overview

➢ To connect to cluster, you need to apply a user account:

1. User Account Request: http://help.gacrc.uga.edu/userAcct.php (for PI of a group)

2. New User Training: http://gacrc.uga.edu/help/training/

3. Welcome letter with whole package of information about your Sapelo user account

➢ Once your account is provisioned, use SSH Secure Shell program to open connection: http://eits.uga.edu/hardware_and_software/software/

How to work on cluster?

Your Job Working Directory is /lustre1/MyID/

- **Why?**

  The fastest I/O filesystem!

lustre1

- **How to access?**

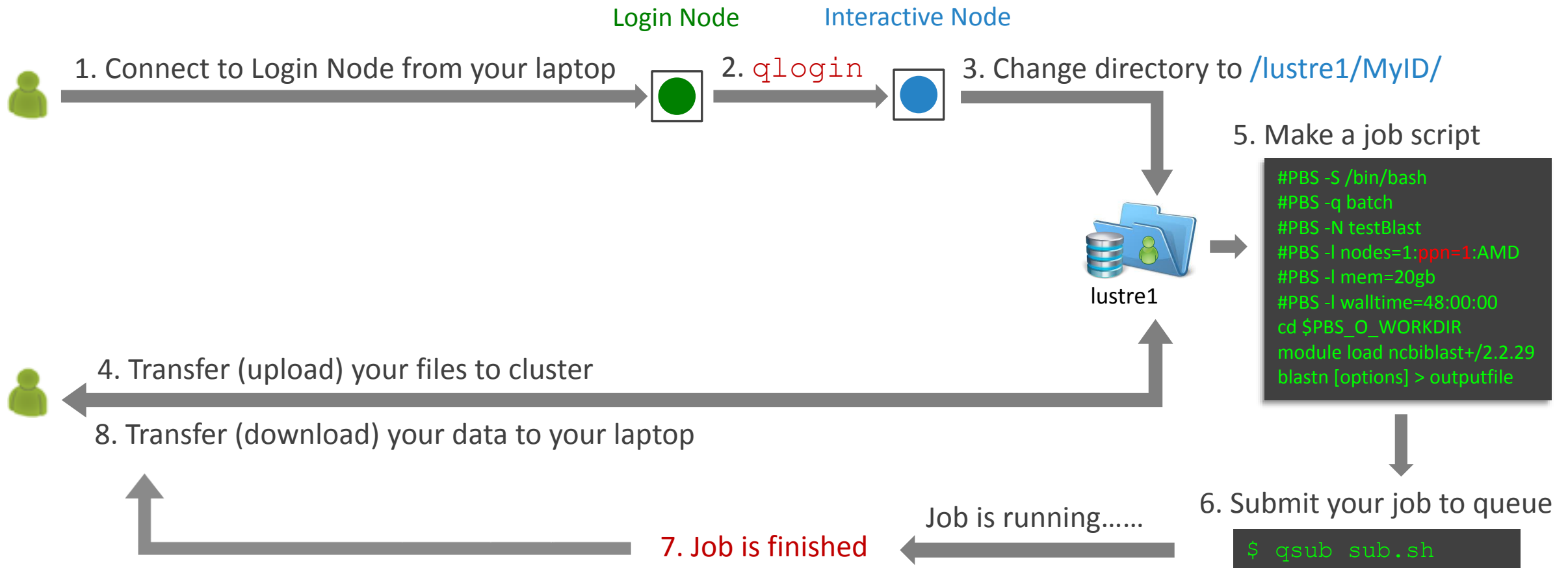 From Interactive Node (Work Node), change directory (cd) to /lustre1/MyID/

- **What do you need?**

  Software! We installed ~300 software on cluster for users to use. Check if the

  application you want to run is already installed!

  https://wiki.gacrc.uga.edu/wiki/Software

How to work on cluster?

Login Node   Interactive Node

1. Connect to Login Node from your laptop   2. `qlogin`   3. Change directory to /lustre1/MyID/

🟢   🔵

5. Make a job script

lustre1

```
#PBS -S /bin/bash
#PBS -q batch
#PBS -N testBlast
#PBS -l nodes=1:ppn=1:AMD
#PBS -l mem=20gb
#PBS -l walltime=48:00:00
cd $PBS_O_WORKDIR
module load ncbiblast+/2.2.29
blastn [options] > outputfile
```

4. Transfer (upload) your files to cluster

8. Transfer (download) your data to your laptop

6. Submit your job to queue

Job is running......

7. Job is finished

```
$ qsub sub.sh
```

Useful Links

- GACRC Web: http://gacrc.uga.edu/

- GACRC Wiki: https://wiki.gacrc.uga.edu/wiki/Main_Page

- GACRC Help: http://gacrc.uga.edu/help/

- GACRC Training: https://wiki.gacrc.uga.edu/wiki/Training

- GACRC User Account: https://wiki.gacrc.uga.edu/wiki/User_Accounts

- GACRC Software: https://wiki.gacrc.uga.edu/wiki/Software

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SATURDAY – SUNDAY: 1PM – 7PM

Thank You!