Addressing HPC Accessibility in Kenya: The KENET GPU Cluster's Role in Advancing Scientific Research and Collaboration

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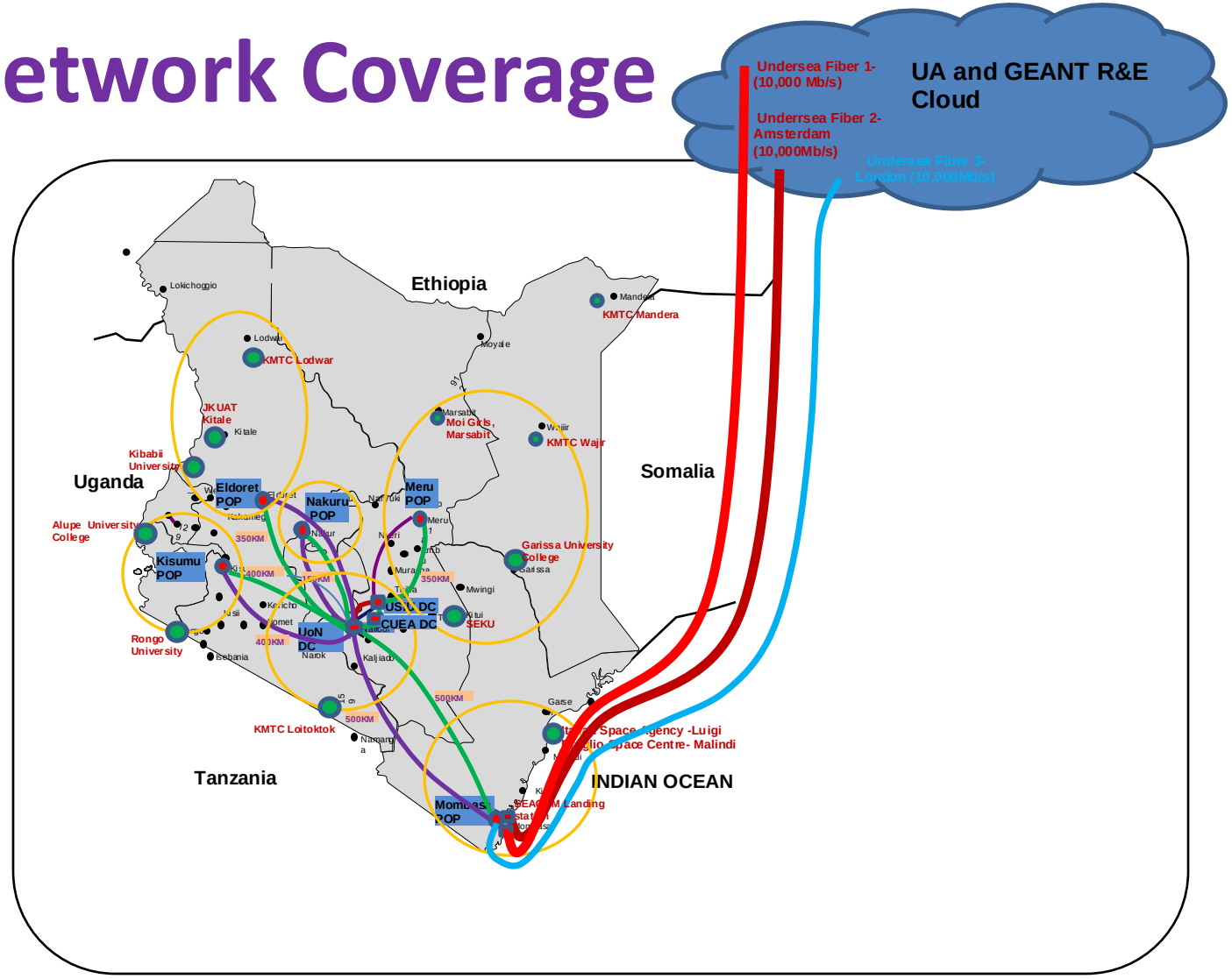
Agenda

- About KENET
- KENET National Broadband Coverage
- KENET Research Computing Infrastructure
- KENET GPU Cluster
- GPU Cluster Utilization
- Research Engagement at KENET
- Q & A

About KENET

- The Kenya Education Network (KENET) serves as the **National Research and Education Network (NREN) of Kenya**.
- KENET was **founded in the year 1999**, by five (5) founder universities
- Membership Organization
- Currently **connects over 500 campuses** of research and education institutions.
- Beyond affordable connectivity, its core mission is to **advance digital transformation** and promote **inclusive research** and education in Kenya.

KENET National Broadband Network Coverage



KENET Research Infrastructure

- Virtual Lab - https://vlab.ac.ke
- KENET GPU Cluster.

KENET GPU Cluster – Technical Specifications

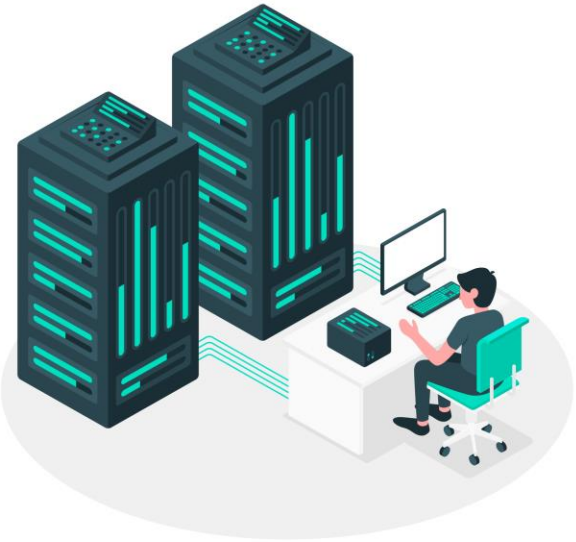
- Consists of four (4) servers each with:

  Two (2) NVIDIA A30 GPU cards.

  HDD – 1.5 TB

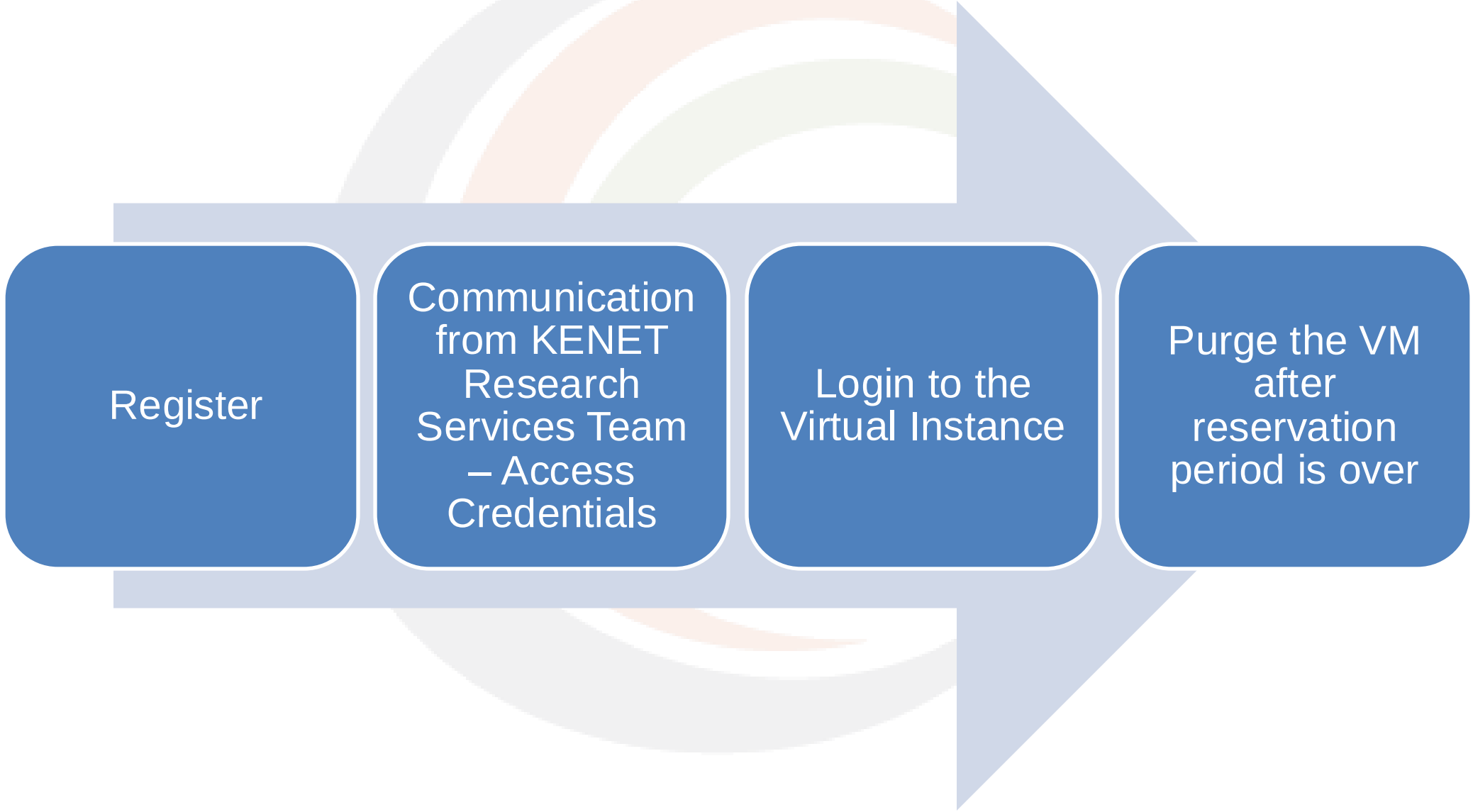
  RAM – 380GB

  VCPUs - 96

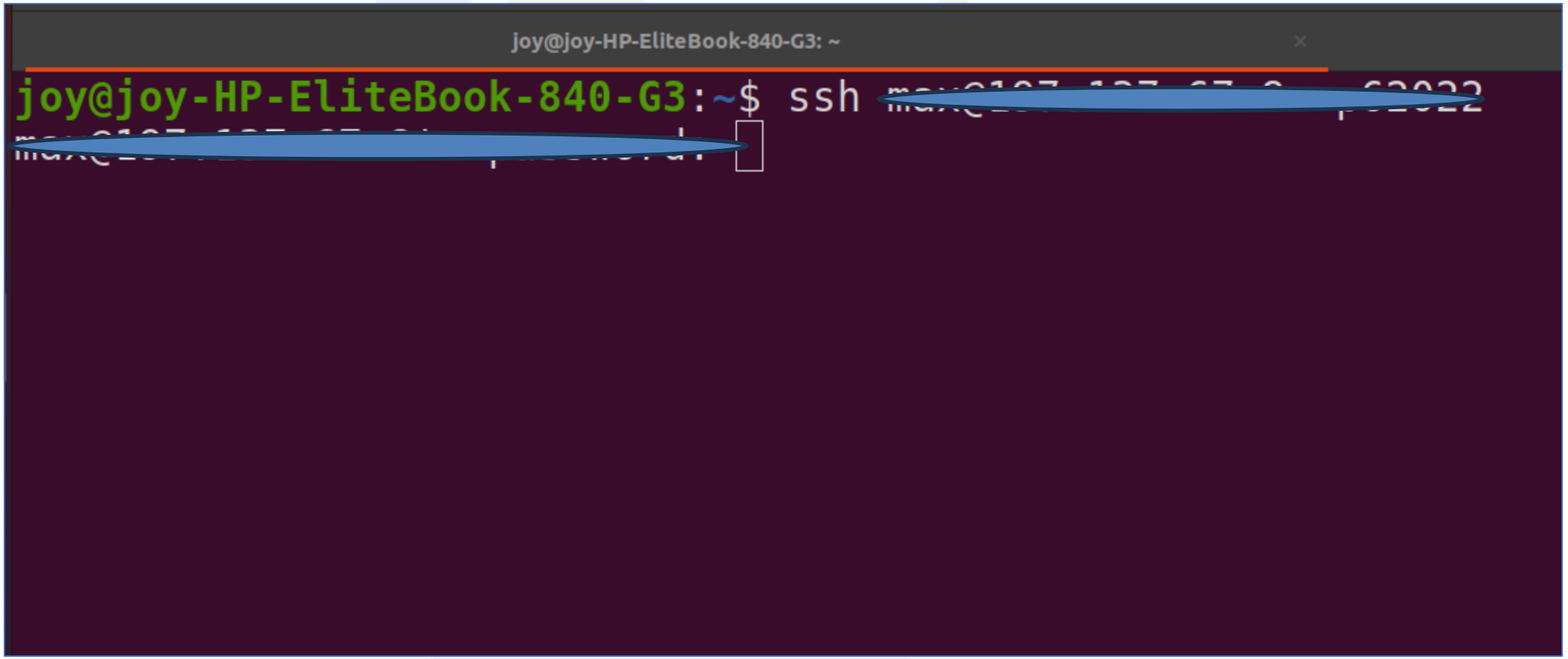


- Hosted at the KENET Data Center
- **Ganeti for Virtualization**.
- **Supported Operating Systems** – Linux and Windows
- **Precompiled GPU codes** – Tensorflow, pyTorch, Jupyter Notebooks, YAMBO, SIESTA, Quantum Espresso and Gromacs

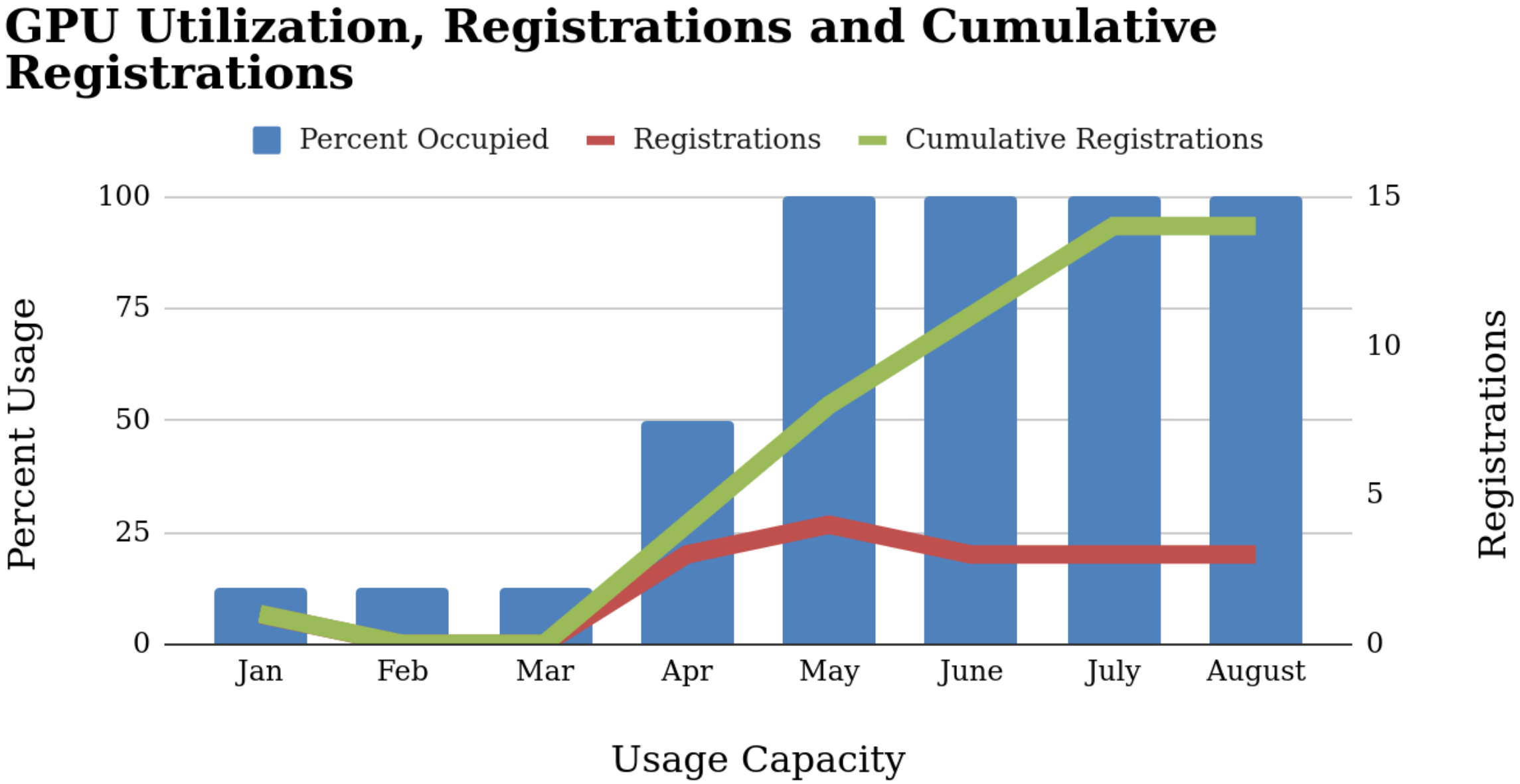
KENET GPU Cluster – How to Access



Accessing the GPU Instance



KENET GPU Cluster Utilization



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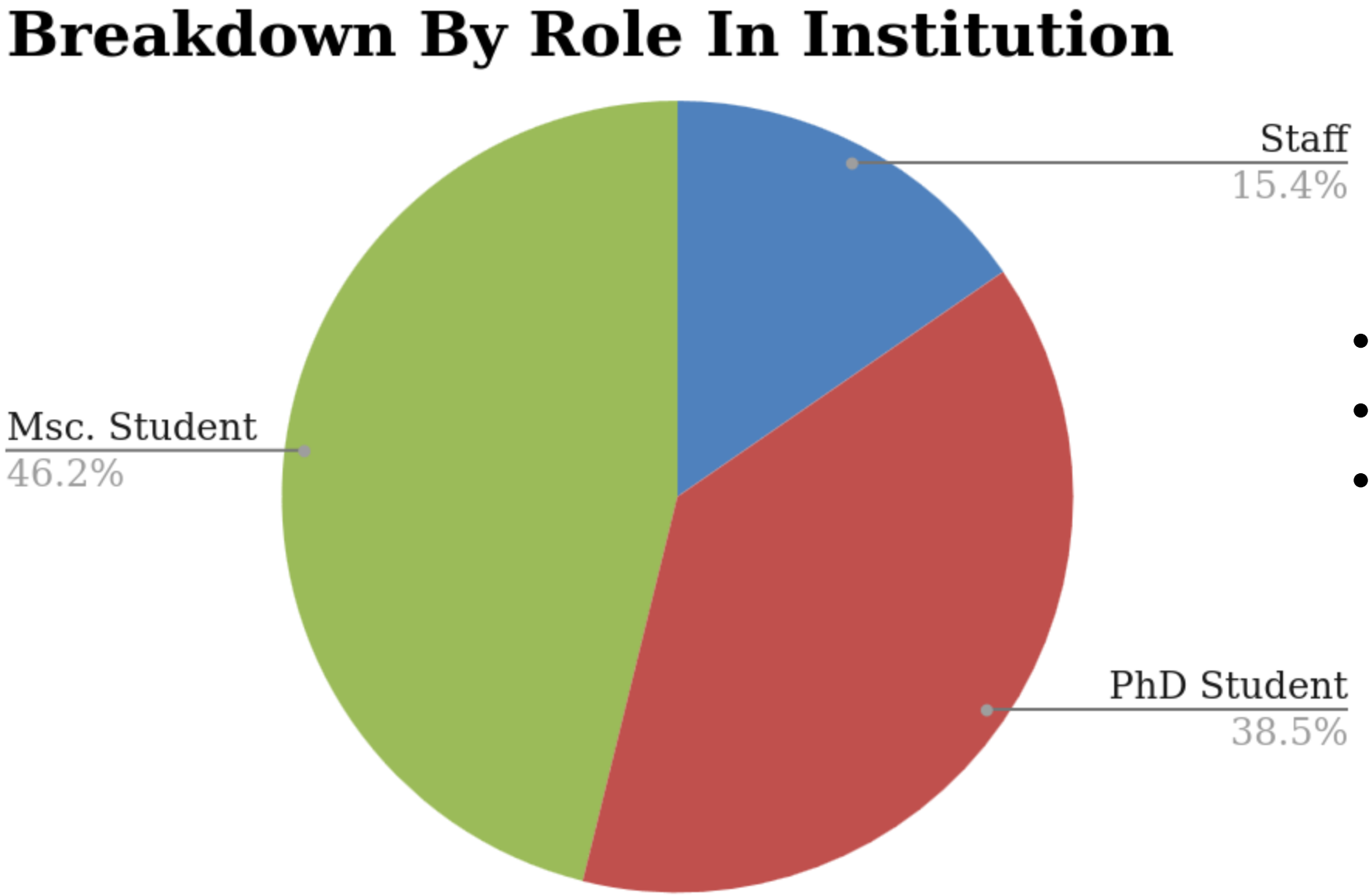

- Staff – 3
- Phd Students – 5
- Msc Students - 6

AIMD Test Results Using Quantum Espresso

	GPU (1 node, 1 MPI)	CHPC (1 node, 24 MPIs on 24 CPUs)
Iteration	Total CPU time (s)	Total CPU time (s)
1	47.9	202.1
2	53.8	222.3
3	65.7	248.2
4	72.2	288.3
5	77.7	321.2
6	83.5	344.2
7	95.0	367.8
8	100.8	397.6
9	106.1	426.4
10	112.7	462.3

Key Challenges

- **Implementation Challenges**

- Licensing issue for GPU virtualization

- **Operational Challenges**.

- Administrative overhead in creating the Virtual Machines

- Idle Resources

- Time Constraints

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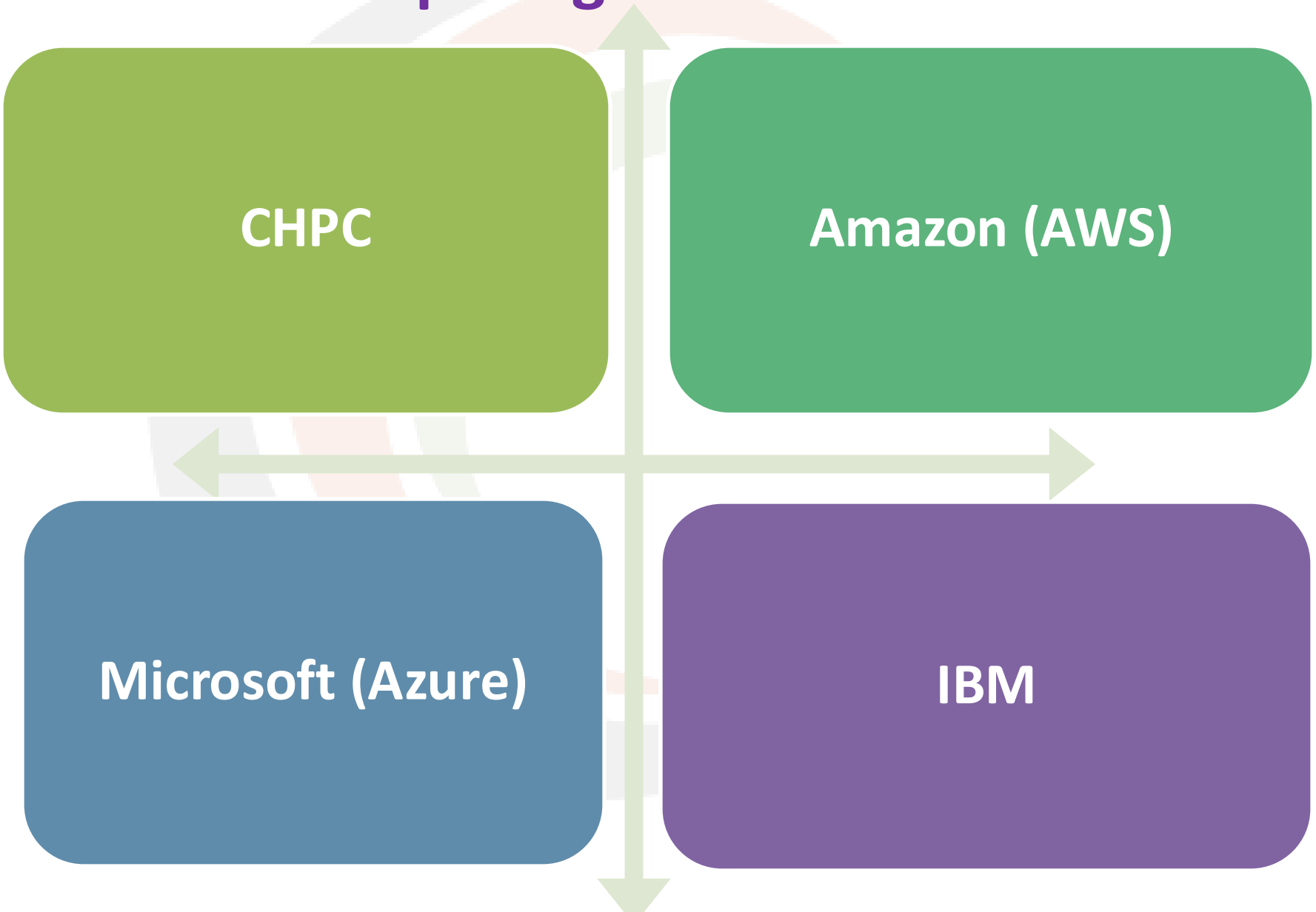
Work In-progress

Implement a Job Scheduler – Automated job submission and Better resource utilization.

Scale up the GPU Cluster

KENET Research Computing Infrastructure Partners



"If you build it, They will come"

Research Engagement

Research Engagement

Researchers Testimonials - BioInformatics

3. Experience and Feedback

a) Please provide a brief paragraph or two describing your overall experience using the computational infrastructure and how it has contributed to your research.

My overall experience is satisfying. First, the infrastructure came in handy, as I had a hard time running especially the MDS. **On my PC, one complex was taking 6-7 days, running non-stop, but with a laptop, it would destroy my PC as it needed to be on 24/7 and on power,** making it impossible to run on PC. **I had 9 complexes**, that would take ages with my resources. I had roughly 1 month to finish my work, therefore with my resources, I would not manage to run all the complexes. With KENET resources, the time was reduced from **6-7 days to an average of 6 hours per complex**. Thus, KENET's resources came in handy and timely.

Researchers Testimonials - Engineering

3. Experience and Feedback

a) Please provide a brief paragraph or two describing your overall experience using the computational infrastructure and how it has contributed to your research.

My overall experience using KENET's computational infrastructure has been highly positive. The reliable server access and computational power were essential to executing complex simulations and optimization routines for my research on the design and optimization of a 4x4 microstrip patch array antenna. This infrastructure allowed me to process large datasets efficiently and complete tasks that would have otherwise been difficult to manage on a local machine. It significantly accelerated my research progress and contributed to the quality of the results, ultimately enabling me to meet my research objectives within the designated timeframe.

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Kenya Education Network

Transforming education using ICT

Asanteni

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