

Advancing Innovation and Research in Malawi

The Role of High-Performance Computing (HPC) and Cloud Infrastructure

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DEFINITIONS

- ▶ High Performance Computing refers to the use of **powerful computers (supercomputers)** and **parallel processing techniques** to solve **complex computational problems** that are too large or time-consuming for ordinary computers.
- ▶ **Cloud infrastructure** refers to technology that allows users to access computing resources over the internet on-demand, without owning the hardware

INTRODUCTION

- When combined, HPC and cloud computing transform research and education.
- Enable advanced data analysis, complex simulations, and AI/ML innovation.
- Challenge in Malawi: Limited access hinders data-driven research and innovation.
- Proposal goal: Explore the role, benefits, challenges, and solutions for adoption in Malawi.

BACKGROUND AND CONTEXT

- ▶ **Malawi Research and Education Network (MAREN)** promotes HPC for research in Malawi.
- ▶ Partnership with Lilongwe University of Agriculture and Natural Resources to enhance Agricultural research capacity.
- ▶ **Challenge:** Other research institutions lack integration due to financial constraints.

Why HPC And Cloud Infrastructure?

- ▶ Enable processing of **Big Data** and **complex models**.
- ▶ Offer scalable and shared computing resources.
- ▶ Foster innovation through access to large datasets.
- ▶ Provide remote access, connecting underserved regions to global research networks.

Challenges in adoption

- ▶ **High costs** of setup and maintenance.
- ▶ **Unreliable internet** connectivity in many areas.
- ▶ Limited awareness and technical capacity.
- ▶ **Policy and infrastructure gaps** in digital transformation.

Aim of the Proposal

- ▶ To **highlight the importance** of HPC and cloud infrastructure for Malawi's research and education sectors.
- ▶ To **recommend sustainable strategies** that enhance accessibility and use of HPC and cloud resources.

Proposed Strategies for Bridging the Gap

1. Establish Shared Infrastructure Hubs

- ❖ Make LUANAR's HPC a shared resource.
- ❖ Partner with other universities through MAREN's high-speed network.
- ❖ Provide remote login and managed access for researchers and students.

Proposed Strategies cont...

2. Foster Academic Collaborative Projects

- ❖ Encourage institutions to co-develop shared research projects using the same HPC cluster.
- ❖ Pool financial and technical resources, reducing duplication and costs.

Proposed Strategies cont...

3. Incorporate HPC/Cloud Modules in Curricula

- ❖ Integrate HPC and cloud computing into ICT and data science programs
- ❖ Build future expertise at NACIT, MUST, LUANAR, and other universities.

Expected Outcomes

- ▶ Improved access to scalable computing resources.
- ▶ Enhanced quality and scope of research projects.
- ▶ Increased collaboration across institutions.
- ▶ Development of local expertise in HPC and cloud technologies.

Conclusion

- ▶ HPC and cloud infrastructure are critical for driving innovation and research.
- ▶ Invest in shared digital infrastructure, partnerships, and capacity building.
- ▶ Through collaboration, we can create inclusive, technology-driven academic ecosystems.