Cross-Border HPC Consolidation in the Arab Region – ASREN

Cross-Border Consolidation

- **Goal:** Federate HPC clusters across multiple Arab countries for shared computing power.

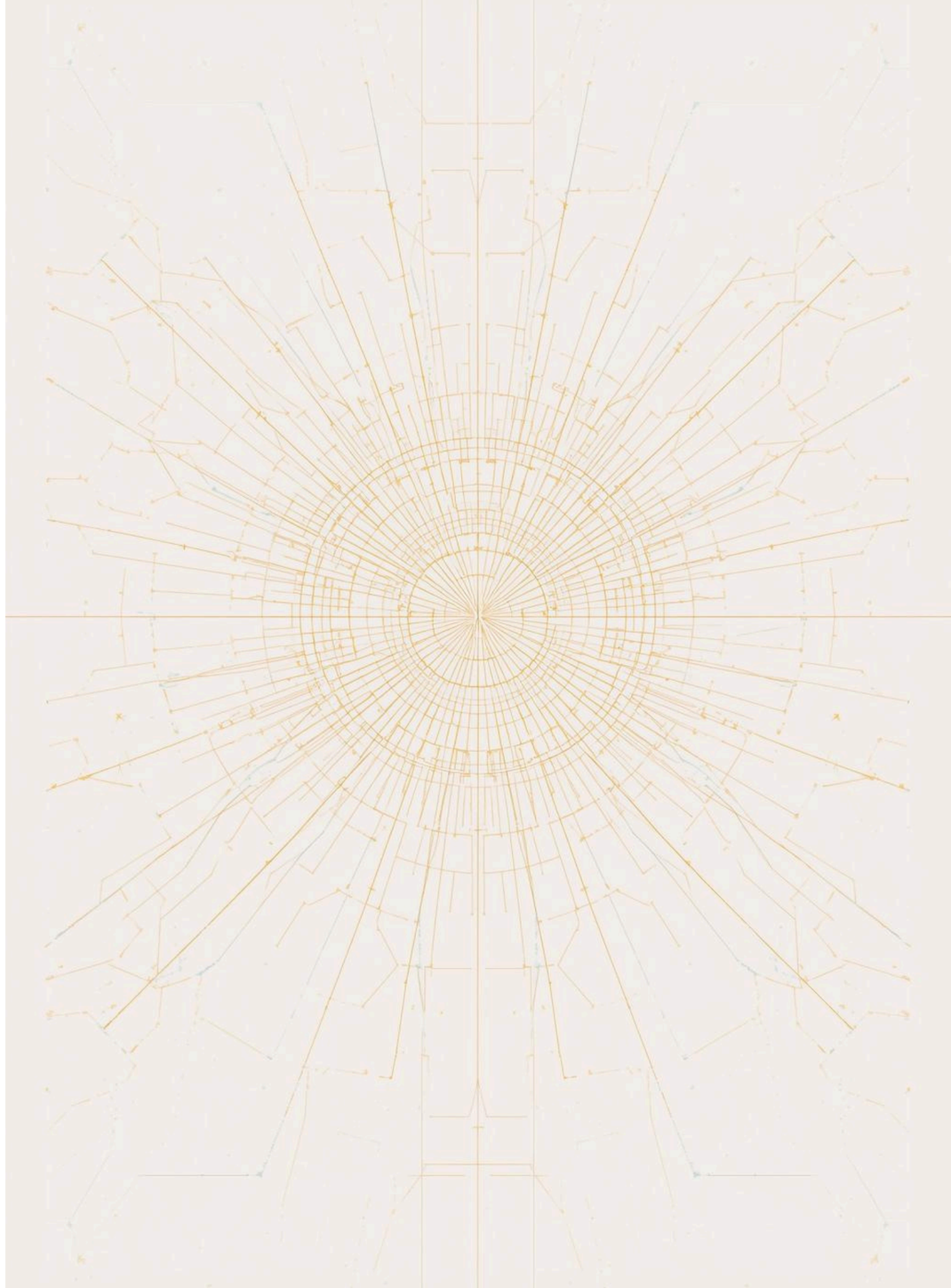
- **Key Challenges:**
  - Distributed architectures & hardware diversity
  - Network, authentication, and resource management across borders
  - Building end users capacities to use HPC resources.
- **Future Directions:**
  - Strengthen cross-border HPC collaboration
  - Exploring federated access solutions
  - Promote training & skill-building for regional researchers

Lighting Presentation

By Yahia Mizyed,
about Yahia Mizyed.

Who I Am

My name isYahia Mizyed,
Electrical engineering student at Hashemite University.
Trainee at SESAME with the control group.
My interests include machine learning, IoT, and research and experimental physics facilitieas.



What I've Worked On

IOT SYSTEMS

I have developed an IoT system integrating temperature and humidity sensing with GPS-based location tracking. The system leverages open-source platforms such as Node-RED for workflow orchestration and Grafana for real-time data visualization and dashboarding.

CAPSTONE PROJECT

My graduation project focuses on **edge systems**, integrating large language models, computer vision, and distributed computing to enhance performance and efficiency in real-time data processing applications.

EPICS CONTROL SYSTEM

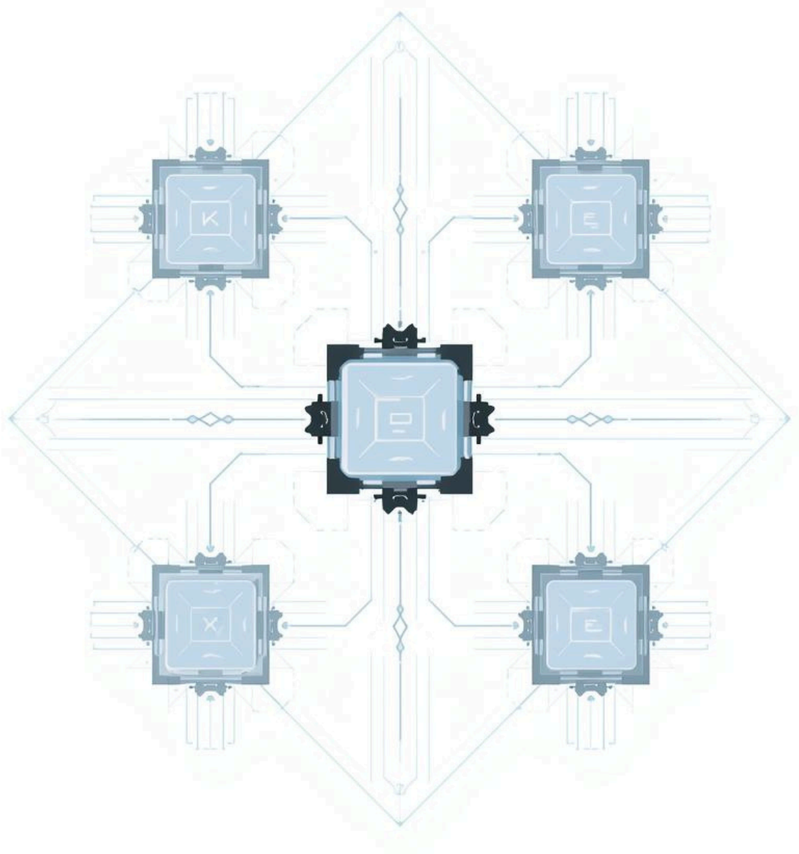
I have experience developing the **EPICS control system**, which provides essential tools for managing data acquisition and control processes in experimental physics environments, ensuring seamless operation and reliability.

QT GUI DESIGN

Additionally, my work includes **Qt GUI design**, where I create user-friendly interfaces for scientific applications, facilitating effective interactions and visualizations that support researchers in their analytical tasks.

Why Efficient Computing

Efficient computing is crucial as it maximizes developers' ability to leverage available processing resources, enhancing performance and productivity in scientific and technical environments.

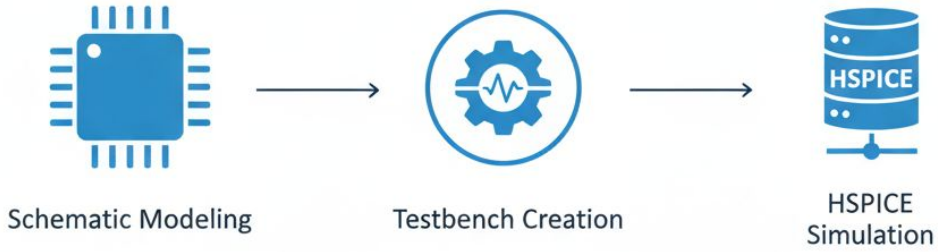


VLSI Design Automation

Eng.Khaled Odeh

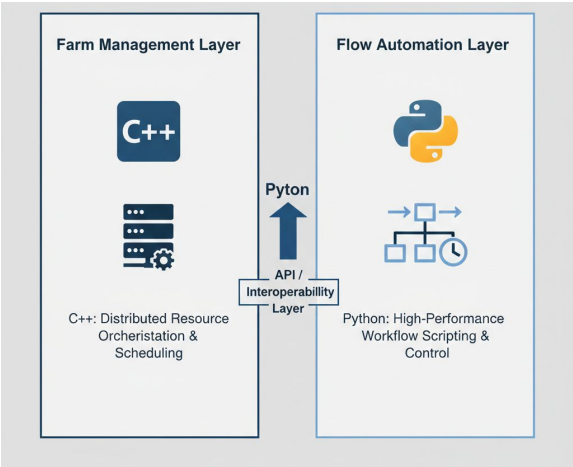
Automating VLSI Simulation Workflows

- Bridging Schematic Modeling & HSPICE
- Customized Test bench Orchestration

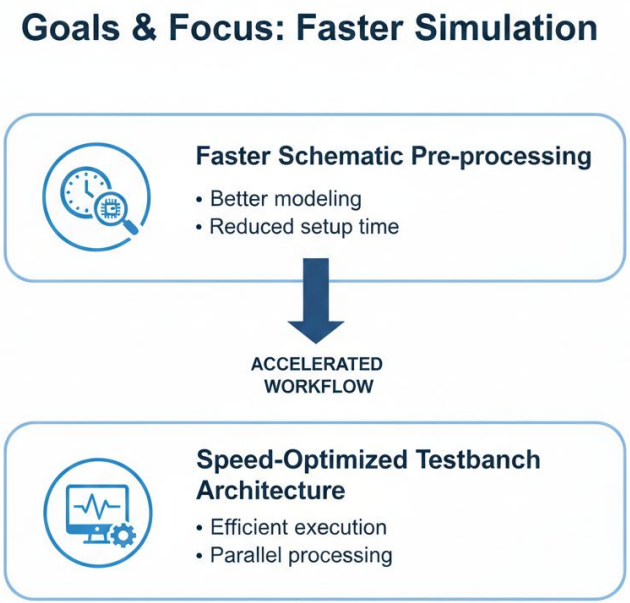


Hybrid Scientific Computing Stack

- Python & CPython: High-performance automation
- C++: Distributed farm resource management



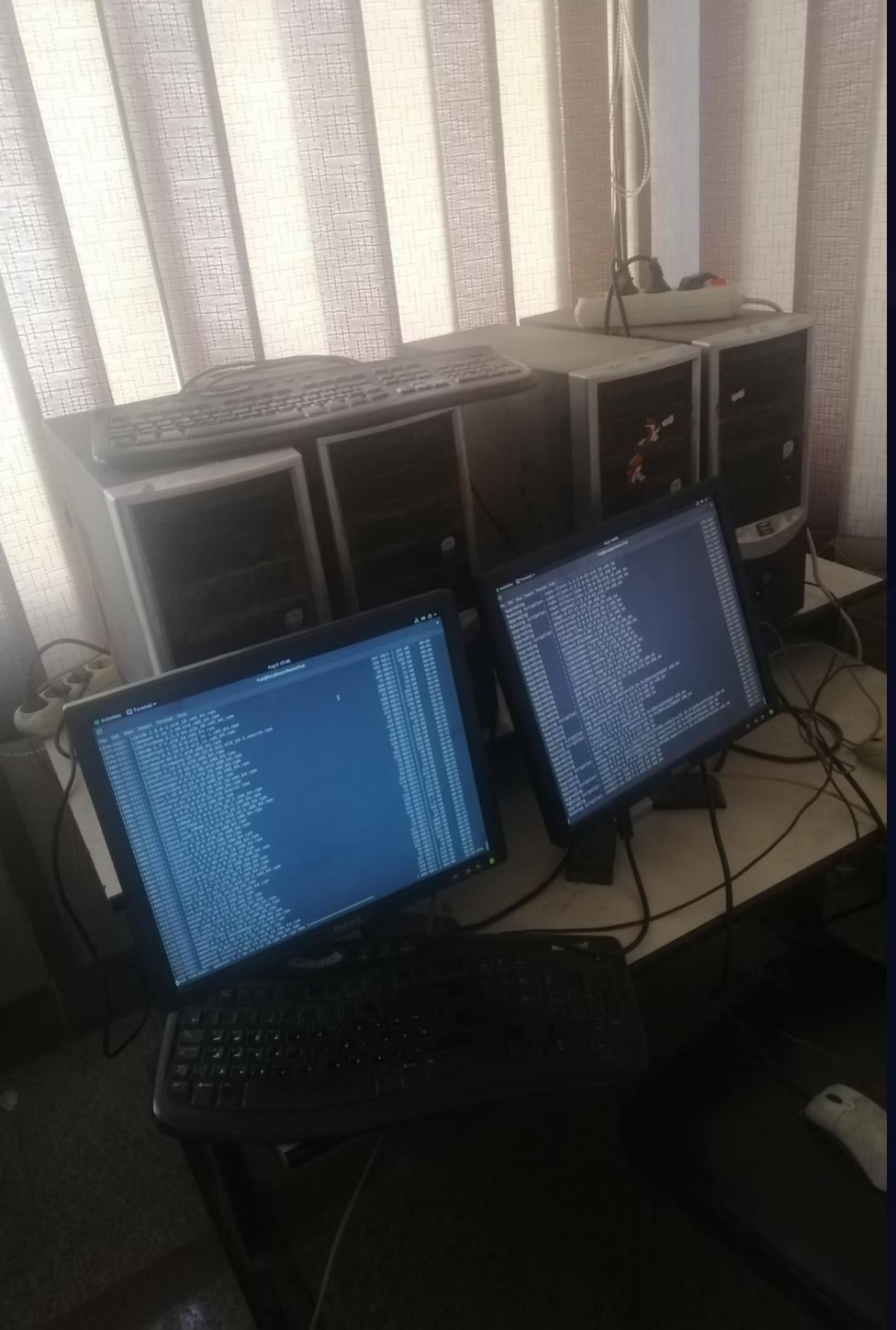
Optimizing the Simulation Lifecycle



Muhammad Hasan Farouk
Computer Science Student, Cairo University

Final year undergraduate at Cairo University's Faculty of Computers and Artificial Intelligence. Achieved top honors (A+) in Computer Architecture and High-Performance Computing courses under Dr. Ahmed Shawky Moussa, demonstrating exceptional technical aptitude and dedication to distributed systems.

This academic excellence sparked a passion for parallel computing, leading to a research internship at the HPC R&D Laboratory where I bridge theoretical knowledge with practical implementation of scalable computing solutions.



Implementation of the HiPer-FC Beowulf Cluster

Designed and implemented HiPer-FC, a Beowulf cluster constructed entirely from commodity hardware, demonstrating hands-on expertise in distributed systems architecture and deployment.

01

Network Topology & Node Setup

Integrated commodity workstations into a unified cluster via a high-speed network backbone.

02

System Configuration

Deployed Rocky Linux and configured SSH for automated, password-less node management.

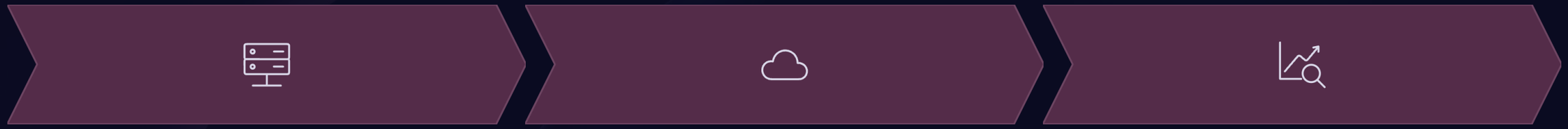
03

Functional System

Transformed isolated hardware into a fully operational distributed system for experimental and research applications, utilizing MPI and OpenMP to execute high-performance parallel applications.

The Roadmap: Scaling Up

From Lab Prototype to University Cloud



Faculty-Level Cluster

Collaborating with R&D team to transition from commodity hardware to enterprise-grade servers hosted within the Faculty infrastructure.

Centralized University Hub

Establishing a centralized HPC node for Cairo University, democratizing access to high-performance computing resources for all students and researchers.

Enable Advanced Research

Providing robust infrastructure to support student-led research initiatives and advanced computational development across diverse academic disciplines.

INFN - SESAME International School on EFFICIENT SCIENTIFIC COMPUTING - ESC@SESAME

Dr. Hassan OUKHOUYA, PhD
oukhouya.hassan@ump.ac.ma
Laboratory of Stochastic and Deterministic Modeling (LaMSD)
MSASE, FSJES, Mohammed First University of Oujda, Morocco

31 janvier 2026
31st - 06th February 2026 | SESAME - Allan, Jordan

Research Interests

Statistical learning & time series modeling

- Financial markets, energy systems, climate-related data
- Nonlinear models, regime-switching, hybrid ML models

Research at the intersection of :

- Statistical modeling
- Scientific computing
- Machine learning for complex systems

Scientific computing challenges

- Large-scale simulations
- Numerical optimization
- Performance-aware ML workflows

Tools & environments

- C++, Python, R, MATLAB, CUDA (basic), HPC environments
- Parallel computing and memory efficiency (in progress)

Why ESC@SESAME

- Strengthen skills in :
  - Efficient C++ programming
  - Memory management
  - Parallel and GPU computing
- Apply these techniques to :
  - Scientific simulations
  - High-performance ML pipelines
  - Real-world data-intensive problems
- Open to :
  - Scientific collaborations
  - Joint research projects
  - Methodological exchanges

Motivation : bridging rigorous mathematics with efficient computational implementations.

Looking forward to learning and collaborating within the ESC@SESAME community.

Thank You SESAME

RPubs https://rpubs.com/HassanOUKHOUYA

https://github.com/oukhouya62

kaggle https://www.kaggle.com/hassanoukhouya

in https://www.linkedin.com/in/hassan-oukhouya-3901b816b/

R^G https://www.researchgate.net/profile/Hassan-Oukhouya

Introduction

Name: Noura Salah Mohamed

Affiliation: Mansoura University,
Faculty of Science,
Mathematics Department.

Title : Lecturer of Computer Science.

Field of Study: Computer Science

Nationality: Egyptian

Phone Number: +01006194634

Email: noura_math@mans.edu.eg

Technical skills

- My technical skills include Big Data Analytics ,machine learning, deep learning, data mining, cloud analytics, and large-scale data architectures.

- I am driven by turning complex data into actionable insights, and I am open to continuous learning, new challenges and international teamwork. I look forward to contributing to innovative projects that deliver measurable impact in industry settings.

Professional Interests: Continuous learning, new challenges, international teamwork

Current Research

- Applying computer science like Machine Learning and Deep Learning in the **medical field** to predict **renal recovery** and **short-term reversibility of AKI** using **ICU patient data**.

- Demonstrated that **ML models outperform traditional regression methods**.

About Me:

- Yousef Showman
- Senior Computer Science Student
- Faculty of Computers and Artificial Intelligence (FCAI), Cairo University

How My Interest in HPC Started

- Introduced to HPC through an undergraduate faculty course
- Internship under the supervision of Dr. Ahmed
- Built a small Beowulf cluster

Goals and Next Steps:

- Deepen knowledge in HPC systems and performance optimization

- Use opportunities like this school to build strong foundations and to explore the variaty application of HPC

- Next goal: build a professional cluster for the faculty under Dr. Ahmed’s supervision

Université Ibn Tofaïl

MY RESEARCH BACKGROUND AND MOTIVATION FOR THE INFN–SESAME SCHOOL

Oumaima Taibi

BACKGROUND

Oumaima Taibi
PhD Student in Nuclear Engineering
Ibn Tofail University – Morocco

Education

- PhD in Nuclear Engineering (ongoing, started 2024)
- MSc in Nuclear Science and Technology (2021–2024)
- BSc in Mechanics and Energy (2017–2020)

Main interests

- Nuclear reactor modeling
- Scientific computing & HPC
- Coupled multi-physics simulations

CURRENT RESEARCH ACTIVITIES

PhD Research Focus

- Neutronic and thermal-hydraulic modeling of a small PWR-type nuclear reactor
- Multi-physics coupling under normal and transient conditions
- Safety-oriented numerical modeling

Methods & Tools

- Neutronics: Monte Carlo methods (OpenMC, MCNP)
- Thermal-hydraulics & CFD:
- OpenFOAM (C++-based open-source CFD framework)
- Coupled neutronic / thermal-hydraulic simulations
- Programming: C++, Python
- Linux-based HPC environments

SCIENTIFIC COMPUTING, HPC & AI

HPC & C++ Focus

- High-performance C++ for large-scale reactor simulations
- Optimization of Monte Carlo and CFD workflows
- Development and customization of C++-based solvers

AI / Deep Learning (Complementary)

- Data-driven and machine-learning methods coupled with physics-based models
- Surrogate models to accelerate computationally expensive simulations
- Integration of AI tools with C++ simulation codes

Motivation for this School

- Strengthen modern C++ and HPC skills
- Learn performance-oriented programming practices
- Apply these techniques to nuclear reactor modeling and safety studies

THANK YOU

Supporting NREN and Research Communities Through R&E Network and Services

ESC@SESAME
01-Feb-2026

ASREN

EUMEDplus
Bridging the Mediterranean

Who We Are and What We Provide

- High-performance and reliable research network
- Support for NREN connectivity and operations
- eduroam service for research and academic users
- Identity and access management services
- GPU resources for research activities on our cloud

Objectives and Future Work

- Provide GPU and CPU resources through our cloud platform
- Expand on-demand computing services for researchers
- Enhance network performance to support growing workloads
- Strengthen support for NREN and research communities