

CApIC-ACE FEDGEN Group Virtual Workshop

CApIC-ACE FEDGEN Group held a virtual workshop on High Performance Computing (HPC) on June 17, 2020. The workshop, which was organized by the Agence Francaise de Development (AFD) ACE Partners on Digital Science and Technology Network (DSTN) featured experts in the field such as:



Professor E. F. Adebisi



Professor E. Adetiba



Dr. J. A. Badejo



Engr. Boladele Akanle



Engr. Oladipo Olaleye



Engr. Abayomi Mosaku

These experts looked at the following critical issues:

ICT Based Research @ CApIC-ACE

17th June, 2020 A Presentation at the DSTN ACEPartners Online Seminar Series

CApIC-ACE Team Members

CApIC-ACE Team Members: Prof. Ezekiel Adebisi, Prof. Emeka Iweala, Prof. Emmanuel Adeliba, Prof. Olubanke Ogunlana, Prof. Victor Osamor, A/Prof. Jelilli Oyelade, Dr. Solomon Rotimi, Dr. Merion Adebisi, Dr. Itunuoluwa Isuwon, Prof. Olayinka Ajani, Prof. Abiodun Adebayo, A/Prof. Grace Olasehinde, Dr. Joke A. Badejo, Dr. Titilope Dakunmu, Dr. Yvonne Ajamma, Engr. Boladele Akanle, Mr. Seun Adeyemi, Engr. Oladipo Olaleye, Mr. Babajide Ayodele, Ms. Thelma Ekanem, Ms. Cynthia Adjekukor, Ms. Deborah Ugbenu, Ms. Helen Jewwega, Mr. David Obaoye

Presenters:
Emmanuel ADETIBA, Ph.D, R.Engr.(COREN),
Joke A. BADEJO, Ph.D, R.Engr.(COREN),

**CApIC-ACE,
Covenant University, Ota, Nigeria**

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PRESENTATION OUTLINE

- 1.0 Introduction
- 2.0 Ongoing ICT Based Research @ CApIC-ACE
 - 2.1 Federated Genomic (FEDGEN) Cloud Infrastructure
 - 2.2 Anomaly Detection in a Private Cloud
 - 2.3 Federated Cloud Resource Management
- 3.0 Research Infrastructure @ CApIC-ACE
- 4.0 Conclusion

1.0 INTRODUCTION

- ❖ CApIC-ACE Research Projects – Specific Aim 5 (FEDGEN):
- ❖ Expand our existing High Performance Computing (HPC) facility to implement a federated cloud computing platform.
- ❖ This is to bring home genomic research to populations in Africa, customized to address specific issues of Health in Africa, namely *research capacity, health education, medication efficiency and enhancement of early disease diagnosis.*

Fig 1.0: CApIC-ACE Components and Interactions

2.0 ONGOING ICT BASED RESEARCH @ CApIC-ACE

2.1 Federated Genomic (FEDGEN) Cloud Infrastructure

Cloud Computing

The fundamental idea of cloud computing is to deliver computational resources as services over the Internet (Habibi et al., 2019).

Federated Cloud

It is the deployment and management of multiple (external and internal) cloud platforms to share computing resources among collaborating institutions (Varghese & Buyya, 2018).

3.2 High Performance Computer (HPC)

- ❖ The center currently has an installed HPC from an existing NIH grant.
- ❖ Some of the software applications currently running on the HPC are FASTQC, STAR, Trimmomatic, Trim_galore, Picard and R Studio.
- ❖ This infrastructure will be upgraded with additional HPCs to evolve a FEDGEN Cloud Datacenter.

Model: Dell PowerEdge C6145
CPU: 64 CPUs x AMD Opteron™ Processor 6386SE, 2.8GHz
Memory: 512 GB RAM
Storage: 101TB

Fig 3.2: FEDGEN Testbed in the Lab

Introduction to High Performance Computing

Presenters:
Olaleye Oladipo
Akanle Boladele
 CApIC-ACE, Covenant University, Ota, Nigeria




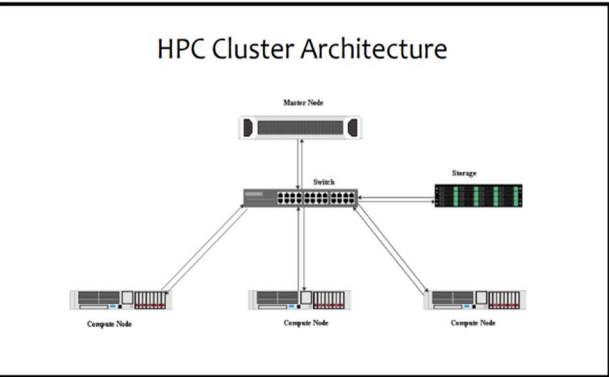
Types of High Performance Computing Systems

- Dedicated Supercomputer
- Commodity HPC Cluster
- HPC in Cloud
 - **Public Clouds** (Amazon Web Services (AWS), Microsoft Azure, Google Compute, Rack Space)
 - **Private Clouds** (Openstack, VMware vCloud)
 - **Hybrid Clouds**



What is HPC?

High Performance Computing most generally refers to the practice of aggregating computing power in a way that delivers much higher performance

Network Requirement for Building HPC & Challenges

Presenters:
Olaleye Oladipo
Akanle Boladele
 CApIC-ACE, Covenant University, Ota, Nigeria

General high level overview of the FEDGEN and HPC Software and Apps Development

Prof Ezekiel Adebisi and Engr Abayomi Mosaku
 CApIC-ACE
 Covenant University, Ota, Nigeria

Network Traffic Generated by a Cluster

- Computation traffic between compute nodes.
- File system traffic — often from an NFS (Network File System) server
- Administration traffic that provides node monitoring and job control across the cluster.



- Overview of research area.
- Impact of our research to Africa & beyond
- Challenges in our research area
- What is HPC ?
- Software and Apps Development for HPC
- Comparing Methods of Running HPC Analyses
- Why Software Development for HPC ?
- HPC Software & Apps Development History
- Pipeline for developing HPC Software & Apps

...The workshop was a success!