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40th anniversary
1964
2004

ICTP School on LINUX Clusters for High Performance Computing (GHANA)

Organizer(s): Co-organized with Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
Ghana, 17 - 28 January 2005

Programme

Day 1: Introduction to HPC and Linux OS

17 January 2005

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|---------------|--|
| 09:00 - 10:00 | --- Registration --- |
| 10:00 - 10:10 | K. Andam / VC, KNUST
Welcome address |
| 10:10 - 10:20 | F.K.A. Allotey
Address by Chairman |
| 10:20 - 10:30 | Address by ICTP representative |
| 10:30 - 10:40 | Keynote address by Regional Minister |
| 10:40 - 10:50 | Chairman's remarks |
| 10:50 - 11:30 | --- Refreshments --- |
| 11:30 - 12:30 | Lectures |
| 12:30 - 14:00 | --- Lunch Break --- |
| 14:00 - 14:15 | Stefano Cozzini / Democritos/INFN, Trieste, Italy
Course Overview |

14:15 - 15:00	Gilberto Diaz / <i>Universidad de Los Andes, Merida, Venezuela</i> Linux OS: General overview
15:00 - 16:00	Gilberto Diaz/Stefano Cozzini Linux OS details for cluster computing
16:00 - 16:30	--- Coffee Break ---
16:30 - 18:00	Practical session: Linux installation
18:00 - 20:00	--- Dinner ---
20:00 - 22:00	Night Laboratory

Day 2: Introduction to Linux clusters

18 January 2005

09:00 - 10:00	Gilberto Diaz Introduction to networks
10:00 - 11:00	Stefano Cozzini Introduction to cluster computing
11:00 - 11:30	--- Coffee Break ---
11:30 - 12:30	Gilberto Diaz/Stefano Cozzini Advanced network issue for cluster computing
12:30 - 14:00	--- Lunch Break ---
14:00 - 15:30	Gilberto Diaz Cluster installation issues
15:30 - 16:00	Coffee Break
16:00 - 17:30	Practical exercises: network configurations and network services for cluster computing
17:30 - 18:00	Discussions and comments
18:00 - 20:00	--- Dinner ---
20:00 - 22:00	Night Laboratory

Day 3: Installing Linux cluster

19 January 2005

09:00 - 09:30	Stefano Cozzini Overview of cluster installation tools
09:30 - 10:30	Gilberto Diaz Installation tools (I) (Npaci-Rocks)

10:30 - 11:00 --- Coffee Break ---

11:00 - 12:30 **Gilberto Diaz**
Practical exercises: installing Npaci-Rocks

12:30 - 14:00 --- Lunch Break ---

14:00 - 15:30 **Stefano Cozzini/Gilberto Diaz**
Installation tools (II) (Oscar packages)

15:30 - 16:00 --- Coffee Break ---

16:00 - 17:45 **Stefano Cozzini/Gilberto Diaz**
Practical exercises: Installing Oscar

17:45 - 18:15 **Discussions and Comments**

18:15 - 20:00 --- Dinner ---

20:00 - 22:00 **Night Laboratory**

Day 4: Hardware solution for Linux clusters (CPUs) and monitoring/managing tools

20 January 2005

09:00 - 10:00 **Roberto Innocente / SISSA/ISAS, Trieste, Italy**
Cluster hardware (I): Basic elements

10:00 - 11:00 **Gilberto Diaz/Stefano Cozzini**
Monitors/managing tools for Linux clusters

11:00 - 11:30 --- Coffee Break ---

11:30 - 12:30 **Roberto Innocente**
Clusters hardware (II): the CPUs: - Multi-threading in IA-32 architectures; - IA64 vs Opteron etc etc; - Memory performance in Xeon and AMD compute nodes

12:30 - 14:00 --- Lunch Break ---

14:00 - 15:30 **Axel Kohlmeyer / Ruhr Universitaet Bochum, Germany**
KISS approach and cluster computing

15:30 - 16:00 --- Coffee Break ---

16:00 - 17:45 **Practical exercises: installing monitoring tools and managing tools**

17:45 - 18:15 **Discussions and Comments**

18:15 - 20:00 --- Dinner ---

20:00 - 22:00 **Night Laboratory**

Day 5: Network issues and parallel programming techniques

21 January 2005

- 09:00 - 09:30** **Stefano Cozzini**
Introduction to writing parallel programming
- 09:30 - 11:00** **To be announced**
Parallel programming with MPI (I)
- 11:00 - 11:30** --- Coffee Break ---
- 11:30 - 13:00** **Roberto Innocente**
Cluster hardware III: networks
- 13:00 - 14:30** --- Lunch Break ---
- 14:30 - 16:00** **Stefano Cozzini**
Practical exercises: MPI exercises (I)
- 16:00 - 16:30** --- Coffee Break ---
- 16:30 - 17:45** **To be announced**
Practical exercises
- 17:45 - 18:15** **Discussions and Comments**
- 18:15 - 20:00** --- Dinner ---
- 20:00 - 22:00** **Night Laboratory**

Day 6: Beowulf and openMosix paradigms for Linux clusters and I/O issues

24 January 2005

- 09:00 - 10:00** **Gilberto Diaz/Stefano Cozzini**
Resource managers and batch systems
- 10:00 - 11:00** **Roberto Innocente**
Mosix approach to Linux clusters
- 11:00 - 11:30** --- Coffee Break ---
- 11:30 - 13:00** **Axel Kohlmeyer**
Running and benchmarking applications on cluster
- 13:00 - 14:30** --- Lunch Break ---
- 14:30 - 16:00** **Stefano Cozzini/Roberto Innocente**
Practical exercises: installing an openMosix cluster
- 16:00 - 16:30** --- Coffee Break ---

16:30 - 17:45 **Axel Kohlmeyer/Stefano Cozzini**
Practical exercises: using batch system for benchmarking exercises

17:45 - 18:15 **Open discussions and comments**

18:15 - 20:00 --- Dinner ---

20:00 - 22:00 **Night Laboratory**

Day 7: Optimization and profiling techniques for PC-based clusters

25 January 2005

09:00 - 10:00 **Axel Kohlmeyer**
Tools for HPC in cluster computing: Compiling and HPC libraries and other

10:00 - 11:00 **Axel Kohlmeyer**
Optimization techniques (I): optimize within the node

11:00 - 11:30 --- Coffee Break ---

11:30 - 13:00 **Axel Kohlmeyer**
Optimization techniques (II): optimize with libraries and parallel tuning of the clusters

13:00 - 14:30 --- Lunch Break ---

14:30 - 16:00 **Stefano Cozzini/Axel Kohlmeyer**
Practical exercises: optimization techniques

16:00 - 16:30 --- Coffee Break ---

16:30 - 17:45 **Stefano Cozzini**
Practical exercises: using tools for HPC on Linux cluster

17:45 - 18:15 **Open discussions**

18:15 - 20:00 --- Dinner ---

20:00 - 22:00 **Night Laboratory**

Day 8: Parallel files systems and I/O issues

26 January 2005

09:00 - 10:30 **Gilberto Diaz/Stefano Cozzini**
I/O issues and parallel file systems

10:30 - 11:00 **Open discussion**

11:00 - 13:30 --- Lunch and preparation for travel to Accra ---

13:30 - 18:30 --- TRAVEL TO ACCRA ---

Day 9: System management of a Linux cluster

27 January 2005

09:00 - 18:00 **SEMINAR AT KACE**

Day 10: HPC on Linux Clusters: A tool for national development

28 January 2005

08:00 - 08:30 --- Arrival of guests ---

08:30 - 08:40 **Welcome address: Director General AITI-KACE**

08:50 - 09:00 **F.K.A. Allotey**
Address by Chairman

08:50 - 09:00 **Address by Minister**

09:00 - 09:30 **C. Dzidonu**
Critical path to ICT policy development for accelerated growth in the subregion: Ghana experience

09:30 - 10:00 **Axel Kohlmeyer**
Towards effective high speed computing for research and forecasting: The KISS approach to building Linux clusters

10:00 - 10:30 **Dr. Omane**
New generation tool for monitoring and management of public utilities: The SCADA

10:30 - 11:00 **Discussions**

11:00 - 11:15 --- Cocoa Break ---

11:15 - 11:45 **Nii Quaynor**
Role of private sector in Advanced Technology-driven economic development

11:45 - 12:15 **Naval Capt. K. Osei**
Combat modeling, simulation and wargames in battlefield digitisation: Prospects for technology transfer and diffusion for economic development

12:15 - 12:45 **Stefano Cozzini**
From Cluster to Grid computing: Enhancing the power of computing in Information Systems

12:45 - 13:15 **Chris Mungai**
Seamless approach to migration from Microsoft to Linux: The economics of Open Source computing

13:15 - 13:45 **Discussions**

13:45 - 14:00 **Chairman's Remarks and Closing Ceremony**