



Linking Scientific Computing in Europe and the Eastern Mediterranean

HPC Roadshow

Overview of HPC systems and software
available within the LinkSCEEM project



Overview

- **Available HPC Systems**
 - BA
 - Cy-Tera
 - Euclid
- **Available Visualization Facilities**
- **Software Environment**



HPC System at Bibliotheca Alexandrina

- **SUN cluster of peak performance of 12 Tflops**
 - 130 eight-core compute nodes
 - 2 quad-core sockets per node, each is Intel Quad Xeon E5440 @ 2.83GHz
 - 8 GB memory per node, Total memory 1.05 TBytes
- **36 TB shared scratch (lustre)**
- **Node-node interconnect**
 - Ethernet & 4x SDR Infiniband network for MPI
 - 4x SDR Infiniband network for I/O to the global Lustre filesystems



HPC System at Bibliotheca Alexandrina



Cy-Tera HPC System at Cyl

- **Cy-Tera is the first large cluster as part of a Cypriot National HPC Facility**
- **Cy-Tera Strategic Infrastructure Project**
 - A new research unit to host a HPC infrastructure
 - RPF funded project

The Project Cy-Tera (NEA ΥΠΟΔΟΜΗ/ΣΤΡΑΤΗ/0308/31) is co-financed by the European Regional Development Fund and the Republic of Cyprus through the Research Promotion Foundation



- **LinkSCEEM uses the Cy-Tera HPC System at The Cyprus Institute**



Cy-Tera HPC System at Cyl

- **Hybrid CPU/GPU Linux Cluster**
- **Computational Power**
 - 98 x 2 x Westmere 6-core compute nodes
 - Each compute node = 128GFlops
 - 18 x 2 x Westmere 6-core + 2 x NVIDIA M2070 GPU nodes
 - Each GPU node = 1 Tflop
 - Theoretical Peak Performance (TPP) = 30.5Tflops
- **48 GB memory per node**
- **MPI Messaging & Storage Access**
 - 40Gbps QDR Infiniband
- **Storage: 360TB raw disk**



Cy-Tera HPC System at Cyl



Cy-Tera HPC System at Cyl

■ Cy-Tera Software

- RHEL 5.6 x86_64 Operating System
- TORQUE + MOAB Resource Management
- Intel Compiler Suite (optimised on Intel architecture)
- PGI Compiler Suite (including OpenACC for accelerators)
- CUDA + OpenCL
- Optimised math libraries

■ Other software required by users can also be made available

- Licences will have to be purchased by users



Cy-Tera HPC System at Cyl

- **Power**
 - Total Power ~ 60kW
- **Power Reducing Design**
 - More efficient CPUs
 - More efficient GPUs
 - Rear Door Water Cooled Heat Exchangers
- **Cy-Tera is ~ 4x more power efficient than the other Cyl systems**



Euclid HPC System at Cyl

- **Hybrid CPU/GPU Linux Cluster**
- **Training Cluster of the LinkSCEEM project**
- **Computational Power**
 - 6 eight-core compute nodes + 2 NVIDIA Tesla T10 processors
 - Theoretical Peak Performance (TPP) ~ 0.5 Tflop/s
- **16 GB memory per node**
- **MPI Messaging & Storage Access**
 - Infiniband Network
- **Storage: 4TB raw disk**



Visualization at Bibliotheca Alexandrina

■ Visualization facility based on CAVE Technology

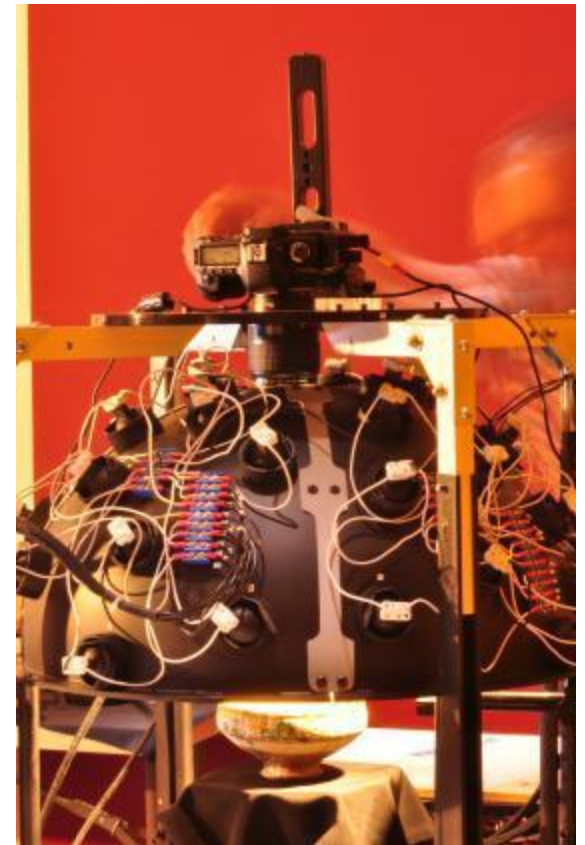
- Computer Aided Virtual Environment system – FLEX
- Using stereoscopic projection together with high-resolution 3D computer graphics, an illusion is created which makes the user feels that he/she is immersed in a virtual environment.
- This helps the user to have better perception and hence analysis of the visualized data.



**Digital Projection HIGHlite
8000Dsx projection
system (4 projectors).**

Visualization at The Cyprus Institute

- Polynomial Texture Map (PTM) Dome
- Stereoscopic Projection System
- 3D TV



Available Software/Tools

- **Compilers:** gcc, intel, pgi, cmake, lf64
- **MPI:** OPEN MPI, IntelMPI, MVAPICH2, MPICH2
- **Libraries:**
 - CUDA: Parallel computing architecture graphics processing
 - ATLAS, GotoBlas: Basic Linear Algebra routines
 - GSL: C/C++ library with a wide variety of mathematical routines
 - LAPACK: Software library of numerical linear algebra routines
 - FFTW: Library for computing Discrete Fourier Transforms
 - NetCDF: Creation, access, and sharing of array-oriented scientific data



Available Software/Tools

- **METIS: Graph Partitioning**
- **ParMETIS: MPI-based parallel library which extend METIS**
- **Gromacs: Molecular Dynamics Package**
- **Scalasca: Performance optimization tool for parallel programs**
- **ParaView: Multi-platform data analysis and visualization application**
- **VMD: Molecular modelling and visualization program**
- **OpenFoam: Computational Fluid Dynamics software package**
- **MEDICI**
 - Content Management System for data sharing
 - Mostly used for Cultural Heritage Purposes (images, 3D images viewers, PTM viewers)
- **UNICORE - Uniform Interface to Computing Resources**
 - Makes distributed computing and data resources available in a seamless and secure way in intranets and the internet



LinkSCEEM User Support

- **Primary User Support**

- User support is provided via an online helpdesk system. The helpdesk service can be contacted via the email address:

hpc-support@linksceem.eu

- **All user queries relating to LinkSCEEM computer resources should be directed to this email address.**



Thank you

