Evolution of High-Performance Computing Environment (HPCE) Clusters at the Computer Center -I

LEO Cluster (2007–2010) : Early High-Performance Computing in HPCE

HPC at IIT Madras has step into Cluster Computing signiificantly with a full setup of

System Configuration:

Head Node:
- Server: 1 × HP Proliant DL360 Server
- Processor: Intel® Xeon® CPU E7330 @ 2.40 GHz (Core 2 Quad, 8 CPUs)
- Storage: 160 GB Hard Disk (with mirroring)

Compute Nodes:
- Total Nodes: 14
- Server: HP Proliant DL140 Servers
- Processor: Intel® Xeon® CPU E7330 @ 2.40 GHz
- Storage: 250 GB SATA Hard Disk

Storage Configuration:

- Utilizes the filesystem from the SNP machine of the SGI Altix 350 server
- A user quota of 2 GB is set for each user
- Quotas help manage storage allocation effectively and ensure fair usage

Software Stack

Text File Editor	Compilers	Parallel Computing Frameworks
✓ Gvim/ VI editor ✓ Emacs ✓ Gedit	✓ Gnu compilers 4.5.4 ✓ Intel compilers 13.0.0 ✓ Javac 1.7.0 ✓ Python 2.7/2.7.3 ✓ Cmake 2.8.10.1 ✓ Perl 5.10.0	✓ openmpi ✓ mpich ✓ Intel-mpi
Research Software Package		**Scientific Libraries**
Commercial Software ✓ Ansys/Fluent 13,14,14.5 ✓ Amber 11,12 ✓ Abaqus 6.10,6.11,6.12 ✓ Comsol 4.3,4.3a ✓ Mathematica 8,9 ✓ Matlab 2013a,2013b ✓ Gaussian 09 version A.02		✓ FFTW -3.3.2 ✓ HDF5 ✓ MKL ✓ GNU Scientific Library ✓ BLAS ✓ LAPACK ✓ LAPACK++
Open Source Software ✓ NAMD 2.9 ✓ Gromacs 4.0.7,4.5.5 ✓ OpenFoam2.1.1 ✓ Scilab ✓ LAMMPS (parallel)		**Interpreters and Runtime Environments** ✓ Java 1.7.0 ✓ Python 2.7/2.7.3 ✓ Numpy 1.6.1
Visualization Software		**Debugger**
✓ Gnuplot 4.0		✓ Gnu gdb ✓ Intel idb

GPU Cluster LIBRA (2012–2017) : Advancing HPC with GPU Technology

A GPU cluster is a computer cluster in which each node is equipped with a Graphics Processing Unit (GPU). By harnessing the computational power of modern GPUs via General-Purpose Computing on Graphics Processing Units (GPGPU), very fast calculations can be performed with a GPU cluster.

HPC at IIT Madras has strengthened its GPU power significantly with a full setup of

- 1 Head Node on HP Proliant DL380 G7 servers with Dual Processors, Six-Core Intel Xeon 5670 series processors with 24GB RAM and 146gb of SAS Hard disk.
- 8 nodes based on HP Proliant SL390s server of Dual processor, Six-core, Intel Xeon X5675 Processors with 3 Telsa M2070 GPU card and 146gb of SAS Hard disk in each node
- Achieves a performance of 6TFLOPS

Key features of M2070:

- Tesla M2070 is a professional GPU by NVIDIA, launched on July 25th, 2011.
- Designed for high-performance computing (HPC) and scientific simulations.
- 448 CUDA cores, 6 GB memory.

Super Cluster VEGA (2008–2012): Supercomputing Advancements in HPCE

Performance:

- 13.96 TFLOPS
- Ranked 436th in the world

System Configuration:

- 256 nodes
- 128 nodes connected via InfiniBand (IB)
- 128 nodes connected via Gigabit (GB)
- Each node is equipped with one head node
- HP Proliant DL160 G5 servers with Quad-core Intel Xeon processors with Dual Processor, Quad-core Intel E5472
- Memory: 16 GB RAM
- Storage: 250 GB SATA Hard Disk

Storage Configuration:

- NAS Storage Rack – 30 TB of storage and a Tape Library containing 48 tapes for automated backups.
- HP SFS Parallel File System – Distributed over three separate racks, employing RAID-5 and offering a licensed storage capacity of 80 TB.
- The SFS storage is shared by both the Clusters

TOP500 CERTIFICATE

Cluster Platform 3000-DL160, Xeon 54xx 3.0 GHz, GigE, Hewlett-Packard

Indian Institute of Technology Madras, India

is ranked

No. 436

among the world's TOP500 Supercomputers with
13.917 TFlop/s Linpack Performance
The 32nd TOP500 list was published at SC08 in Austin, TX November 18th, 2008

Congratulations from The TOP500 Editors

GNR Cluster (2013–2020) : Specialized Computing in High-Performance Environments

This cluster is named after the scientist Prof. G N Ramachandran.

HPC at IIT Madras currently has introduced a cluster for the B.Techs and beginners with a setup of

- 1 Head Node on Super micro servers with Dual Processors, Eight-Core Intel Xeon Ivy bridge E5-2650v2 series processors with 4 X 8GB RAM and 500 GB of SATA Hard disk.
- 16 compute nodes based on super micro server with Dual processor, Eight-core Intel Xeon Ivy Bridge E5-2650v2 series Processors with 4 X 8 GB RAM and 500 GB of SATA Hard disk in each node.
- 14TB of shared storage.