Parallel Computing Workshop on PARAM 10000 at IIT, Kanpur

Organized by

Centre for Development of Advanced Computing (C-DAC), Pune, India

Call For Participation

C-DAC has undertaken a project sponsored by Ministry of Information Technology, Government of India, for popularizing the use of PARAM 10000 among Premier Academic Institutions in India for research/academic pursuits. As a part of C-DAC's efforts in this project, a 3-day Workshop on Parallel Computing and Training Program on PARAM 10000 is being conducted at IIT-Kanpur. The workshop emphasizes on various aspects of parallel computing and includes Hands-on sessions on PARAM 10000. By understanding the presentation material covered and the software programs provided in this workshop, scientists and engineers can develop and solve large-scale scientific applications on PARAM 10000.

The peak performance of given PARAM 10000 parallel computing system is 6.4GF. The processors of PARAM 10000 belong to Sun Enterprise 250 family. It has 3 compute nodes and 1 server node. Each node is a dual-processor SMP (shared memory, symmetric multiprocessing) system having 2MB of level 2 cache. The processors are based on SUN Microsystem's UltraSparc architecture, each operating at 400 MHz. Each compute node has 512 MB of main memory, while each server node has 1 GB of main memory. The C-DAC HPCC (High Performance Computing and Communication) software is a part of PARAM 10000 programming environment that supports development and execution of both sequential and message passing programs. This software effectively addresses the performance and usability challenges through a high performance flexible software environment, which adheres to established and emerging standards in parallel and distributed computing. The workshop is meant for beginners as well as advanced level users of parallel computers and it provides an opportunity for participants to learn and use of parallel computing to solve large-scale scientific applications. Hands-on sessions will be conducted to explain practical aspects of parallel computing.

Topics Overview:

- An Overview of PARAM 10000
- PARAMNet – System-area Networks
- Application and System Benchmarks on PARAM 10000
- Performance and Scalability Analysis
- An Overview of Message Passing Interface – MPI
- HPCC software - Active Messages over PARAMNet
- HPCC software - CDAC-MPI
- HPCC software - Compilers and Tools
- Parallel Programming Models and Paradigms
- Principles of Parallel Algorithm and Design

Demonstration of applications

- Application Software: Finite Elements and Composite Analysis
- Bio-informatics Appications

An Overview of Hands-on Session: The Parallel Computing workshop focuses on elaborate hands-on session on PARAM 10000 each day. In the DAY-ONE hands-on session, simple MPI programs in Fortran and C languages that executes on PARAM 10000 are discussed. Programs based on point-to-point communication, collective communication and computation and simple MPI programs are included. The DAY-TWO hands-on session introduces you to write programs for algorithms involving dense matrix computations in several numerical contexts. We have used different methods of decomposition of matrices and provided MPI programs in Fortran and C languages. The DAY-THREE hands-on session focuses on writing programs for direct/iterative methods to solve linear system of matrix equations, and simple algorithms for sparse matrix - vector multiplication. Also, parallel non-numerical algorithms such as Parallel sorting algorithms and graph-coloring algorithms are discussed. Special class of parallelisation methods to solve partial differential equations by finite difference and finite element method are covered in the DAY-THREE hands-on session.