

**C-DAC Internal Workshop Schedule on Parallel Computing on Message Passing Cluster - PARAM 10000
May 07, 2003 (Wednesday) ~ May 09, 2003 (Friday)
Workshop Co-ordinator : Dr.VCV.Rao (Team Leader, NPSF, C-DAC, Pune)**

Time	Activity
DAY 1	
09:00 - 09:10	08:30 Hrs - 09:00 Hrs Breakfast at C-DAC Roof-Top Pavilion • Introduction to Workshop - Workshop Coordinator (Dr. VCV. Rao)
09:10 - 09:45	• An overview of Parallel Computing: SIMD, MIMD machines and clusters (Dr. Sandeep Joshi)
11:15 - 12:00	11:00 Hrs - 11:15 Hrs : Tea Break at C-DAC Roof-Top Pavilion • Implicit / Explicit Parallelism: An overview (Dr. VCV. Rao)
12:00 - 13:00	• Explicit Parallelism: Message Passing Programming: Introduction to MPI: MPI Basics; Features of MPI; Point-to-Point and Collective Communication library calls (Mr. Subba)
14:00 - 18:30	13:00 Hrs - 14:00 Hrs : Lunch Break at C-DAC Roof-Top Pavilion 16:30 Hrs - 16:45 Hrs: Tea Break at C-DAC • Hands-on Session (Day1): Performance of selective FORTRAN/C programs on Uni-processor of PARAM 10000 without compiler optimization features; With compiler optimization features; Using code restructuring techniques such as loop un-rolling, loop fission and loop fusion, loop distribution, loop interchange and other loop optimization techniques to ease the memory access pattern; Performance of <i>serial programs</i> for matrix computations using math libraries BLAS I, BLAS II, BLAS III; Programming using OpenMP on PARAM 10000 (Ms. Sudha, Mrs. Manisha, Mr. Kalyana Krishna, Mr. Sridhar)
DAY 2	
09:00 - 09:45	08:30 Hrs - 09:00 Hrs : Breakfast at C-DAC Roof-Top Pavilion • Single processor optimization techniques • Code restructuring techniques such as loop optimizations techniques (Loop collapsing; Loop alignment, Loop fission, Loop distribution, Loop unrolling, Loop interchange, Negatives of loop unrolling, and Loop fusion) • Uni-Processor Benchmarks (Mr. Kalyana Krishna)
10:00 - 11:00	• Models of Parallel Computers, An Overview of PARAM 10000/ PARAM Padma (Dr. Sandeep Joshi)
	11:00 Hrs - 11:15 Hrs : Tea Break at C-DAC Roof-Top Pavilion

- 11:15 - 12:00
- Explicit Parallelism: Shared Memory Programming - Pthreads and OpenMP **(Mr. Kalyana Krishna & Mrs. Manisha)**
- 12:00 - 13:00
- Types of Performance requirements, Basic Performance metrics; Workload & Speed Metrics; Performance of Parallel Computers - Computational Characteristics; Parallelism and interaction overheads; Overhead Quantification and measurement methods; Performance of parallel programs; Performance metrics, Scalability & Speed-up Analysis **(Dr. VCV. Rao)**
- 13:00 Hrs - 14:00 Hrs : Lunch Break at C-DAC Roof-Top Pavilion
16:30 Hrs - 16:45 Hrs : Tea Break at C-DAC
- 14:00 - 18:30
- Hands-on Session (Day 2):
Performance of serial programs for matrix computations using math libraries BLAS I, BLAS II, BLAS III; Performance of F90 programs using Sun-Performance libraries and Compilers; Parallel MPI Fortran 77/C/F90 programs on vector-vector, matrix-vector and matrix-matrix multiplication algorithms; Solution of matrix system of linear equations by Direct/Iterative Methods; Parallel Programs for Partial differential equations using proper MPI library calls and their impact on performance; Demonstration of benchmarks on one node of PARAM 10000
- Day 3**
- 08:30 Hrs - 09:00 Hrs Breakfast at C-DAC Roof-Top Pavilion
- 09:00 - 09:45
- Performance Visualization tools for Parallel Programs and case studies **(Ms. Sudha)**
- 10:00 - 11:00
- Explicit Parallelism: Message Passing Interface - Advance features of MPI **(Mr. Subba)**
- 11:00 Hrs - 11:15 Hrs : Tea Break at C-DAC Roof-Top Pavilion
- 11:15 - 12:00
- Explicit Parallelism: Shared Memory Programming - Advanced features of OpenMP; Mixed mode programming MPI - OpenMP **(Mr. Kalyana Krishna)**
- 12:00 - 13:00
- Application and System Benchmarks on PARAM 10000/ PARAM Padma **(Mr. Subba / Mrs. Manisha)**
- 13:00 Hrs - 14:00 Hrs : Lunch Break at C-DAC Roof-Top Pavilion
16:30 Hrs - 16:45 Hrs: Tea Break at C-DAC
- 14:00 - 15:00
- Principles of Algorithms design - Decomposition techniques; Static and Dynamic load balancing features; Overheads in algorithm design and performance issues **(Dr. VCV Rao)**
- 15:00 - 18:00
- Hands-on Session (Day 3):
Performance of programs using Pthreads, OpenMP and MPI on vector-vector, matrix-vector, matrix-matrix multiplication and Sparse matrix vector multiplication algorithms; Solution of matrix system of linear equations by Direct/Iterative Methods; Performance of parallel programs using combination of Pthreads, MPI; OpenMP; and MPI - OpenMP models. **(Mr. Subba, Mr. Kalyana Krishna, Mr. Sridhar, Ms. Sudha, Mrs. Manisha)**

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