parcomp-UofHYD-2004

Technical Programme *for*

Workshop on Practical aspects of Parallel Computing

Organized by

Centre for Development of Advanced Computing, Pune

at

Centre for Modelling, Simulation and Design, University of Hyderabad

September 21, 2004 (Tuesday) ~ September 24, 2004

Workshop: Day 1 September 21, 2004 (Tuesday)

Time (Hrs)	Activity
0900 ~ 0930	Inauguration and the overview of Parallel Computing workshop by C-DAC
0930 ~1000	Introduction to Parallel Computing: Why Parallel Computing & Scope of Parallel Computing
1000 ~1100	An overview of Parallel Computing, Application Trends, Uni-Processors: Features of the memory sub-system hierarchy, SIMD, MIMD Machines, Cluster Computing and Interconnection networks
1100 Hrs ~1115 Hrs Tea break	
1115 ~1200	Parallel Programming Paradigms, Programmability Issues, Programming Models
1200~1300	**Explicit Parallelism** :Introduction to MPI: MPI Basics, features of MPI, Point-to-Point and Collective Communication library calls, Using MPI in simple programs
13:00 Hrs ~ 14:00 Hrs: Lunch Break; 16:30 Hrs ~ 16:45 Hrs: Tea Break	
1400~1800	**Hands-on Session:** Performance of selective FORTRAN/c programs on *uni-processor of Cluster (IBM p690) with compiler optimization features; using code restructuring techniques, Performance of parallel programs, Programming using MPI, Simple MPI Parallel programs using point-to-point and Collective Communications*

Workshop: Day 2 September 22, 2004 (Wednesday)

Time (Hrs)	Activity
0900~1000	**Performance Metrics & Speed Up :**Types of Performance requirements, Basic Performance metrics; Workload Speed Metrics; Performance of Parallel Computers-Parallelism and interaction overheads; Overhead Quantification and measurement methods; Performance of parallel programs; Performance metrics; Scalability and Speed-up Analysis
1000~1100	Basic Compiler Techniques: What an Optimizing Compiler does to get maximum performance of your code? Compiler role in loop optimization techniques; Summary of performance of application with/without compiler optimizations on IBM P690 Clusters; Single processor optimization techniques - Optimization techniques to ease the memory access;
1100 Hrs ~1115 Hrs: Tea break	
1115~1200	**Explicit Parallelism:** Data Parallel Programming –f90/f95/HPF
1200~1300	**Explicit Parallelism:** Shared Memory Programming –OpenMP (History, Overview, Programming Model, OpenMP Constructs, Performance Issues and examples, Explicit Parallelism: Advanced Features of OpenMP)
13:00 Hrs ~ 14:00 Hrs: Lunch Break; 16:30 Hrs ~ 16:45 Hrs: Tea Break	
1400~1800	**Hands-on Session:** *Simple MPI and OpenMP Parallel programs, Performance of serial programs* for matrix computations using math libraries BLAS; *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* using different MPI library calls and performance issues on Clusters

Workshop: Day 3 September 23, 2004 (Thursday)

Time (Hrs)	Activity
0900~1000	Principles of Parallel Algorithms design - Decomposition techniques; Static and Dynamic load balancing features; Overheads in algorithm design and performance Issues
1000~1100	**Explicit Parallelism:** Shared Memory Programming -An overview of Pthreads
1100 Hrs ~1115 Hrs Tea break	
1115~1230	**Explicit Parallelism:** Advanced Features of MPI : MPI advanced point-to-point communication MPI Communication modes; MPI Collective Communication and Computations; MPI Derived Datatypes; Cost of Message Passing
1230 ~ 1300	**Programs on Combination of MPI/OpenMP & Advanced Feature of OpenMP:** Advanced feature of openMP; Combining MPI and OpenMP; Profiling; Parallelizing Function; Performance of MPI/OpenMP programs Examples OpenMP Programs, Advance Features of OpenMP.
Lunch Break 1300 Hrs ~ 1400 Hrs; Tea Break: 1630 Hrs ~ 1645 Hrs	
1400~1800	**Hands-on Session:** *Simple MP,OpenMP, PThreads, Parallel programs, Performance of serial programs* for matrix computations using math libraries BLAS; *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* using different MPI library calls and performance issues on Clusters

Workshop: Day 4 September 24, 2004 (Friday)

Time (Hrs)	Activity
0900 ~1000	Performance Visualization tools for Parallel Programs and case studies
1000 ~ 1100	An overview of Application and System Benchmarks
1100 Hrs~1115 Hrs: Tea break	
1115 ~ 1200	An overview of Performance of Scientific Applications.
1200 ~ 1230	Open Session, Feedback and Conclusions
1230 Hrs ~ 1400 Hrs: Lunch Break; 1630 Hrs ~ 1645 Hrs: Tea Break	
1400~1600	**Hands-on Session** (Day 4): *Performance of parallel programs* using combination of and MPI; OpenMP and MPI; *Performance of MPI parallel programs* for matrix computations using different decomposition techniques from algorithm point of view; *Demonstration of MPI parallel programs* using parallel visualization tools; *Demonstration of MPI parallel programs* to measure communication overheads on clusters using MPI; *Demonstration of Performance for selective application and system benchmarks (*NAS, ScaLAPACK, LINPACK) on IBM p690 machines and network of IBM p690 machines
16:00 ~ 1800	**Special Lectures on Grid Computing**
	Introduction to Grid Computing: History and Challenges; What is grid? What is Globus ? Grid Applications, An overview of Grid Architecture, What is involved in the Globus project? Who is using the Globus Toolkit? Grid enabled Message Passing libraries - (MPICH-G2)
	Classification of Grid applications – Distributed, Collaborative, Data-Intensive, On-demand; Category of applications - Loosely Coupled, Pipelined, Tightly Synchronized, Widely Distributed; Compute Intensive & Data Intensive Applications