Summary of
Performance Enhancement on Emerging Parallel Processing Platforms (PEEP-2008)

Centre for Development of Advanced Computing (C-DAC), Pune and Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune, jointly conducted five-day workshop on Performance Enhancement on emerging Parallel Processing technologies (PEEP-2008) from September 23-27, 2008 at IUCAA.

One of the objective of PEEP-2008 is understand performance issues for applications on Multi-Core Processors, GPU Computing using CUDA Programming, GPU- Stream Accelerators, Cell Processors-Cell programming and Multi-Core Processors-Clusters. The second objective is aware of performance optimization techniques and programming paradigms on Multi-Core Processors, GPU computing, GPGPU – Stream Computing and Cell processor technology for solving large-scale problems in science/engineering and commercial domains. The workshop provides an opportunity for interaction among the various participants from different academic institutes and research organizations in the country and leading IT company experts who are working in the area of emerging parallel processing platforms.

PEEP-2008 proceedings, and hands-on (CD) soft-copy is developed in order to impart a sense of unity to this expanding and exciting field of emerging parallel processing technologies. By understanding the presentation material covered and the programs in the Hands-on softcopy CD as building blocks, scientists and engineers could piece together more complicated software tools that are tailored specifically for their needs, emerging parallel processing platforms using Multi-Cores, GPU Computing, GPU-Stream computing, and Cell processors.

The PEEP-2008 workshop proceedings covers current trends in Multi-Core processors, performance enhancement through software multi-threading, performance analysis tools, Keynote address talks from academic institutes and from IT company sponsors such as AMD, Intel, HP, IBM, and NVIDIA on Multi-Cores, application perspective using Multi-Cores, GPU computing, GPGPU, GPU-Stream computing and Cell processors technology. Special sessions have been arranged to demonstrate emerging parallel processing technology such as performance analysis tools on Multi-Cores, Intel Thread Building Blocks (TBB), GPU computing-CUDA, GPGPU Stream Computing and Cell Processors in which IT company experts were actively involved.

The PEEP-2008 Hands-on session programs provide foundation for application user to write good parallel algorithms to extract performance of large-scale applications and libraries on emerging parallel processing platforms such as Multi-Cores processors, GPU Computing – CUDA Prog., GPGPU- Stream Accelerators & Cell Processors. Most of the articles of the notes include broad coverage of practical aspects of emerging parallel processing platforms and have been selected from several important books and web sites.

The PEEP-2008 workshop participants will get an opportunity to use several Multi-Core Processors (Multi Socket and Multi-Core processors). The Hands-on effectively addresses the performance and usability challenges with a suite of tools that participants found useful in measuring, understanding, and improving the performance of their parallel programs during the hands-on session.

The PEEP-2008 workshop is organized as TWO modes in which participant can attend 5-day programme (Both Mode 1 & Mode 2) or exclusively Mode 2 programme. The rich set of codes is provided on various computing platforms to understand performance issues and address new set of programs that are written for this workshop. This workshop will give insights into performance aspects of sequential /parallel programs using different programming paradigms. Participants will use Intel & AMD Multi-Core systems, Cluster of Multi-Core processors, GPGPUs, and GPU Computing systems. The 4th and 5th day of this workshop will cover an overview of GPU Computing, GPGPUs-Stream Accelerators, GPU Computing-CUDA programming software toolkit, **Intel** Multi-Core TBB, Cell Processor Programming with Hands-on session. Also, special lecture on importance of RC-FPGA programming will be discussed.

Mode 1 (Day 1-3): This session includes twelve classroom lectures on Multi-Core processors and Software Multithreading. Three keynote lectures on emerging topics of Multi-Core processors from application perspectives will be covered. Second half of each day, participants will get expose to Programming using OpenMP, Pthreads, f77/f90, MPI-2.0, use of Tuning & Performance Visualization tools, and Performance issues on Multi-Core processors. The day-1, day-2, and day-3 hands-on session introduce the participants to the fundamentals of parallel programming on Multi-Core processors by letting the participant to write simple parallel programs that executes on Quad-Core processors. Also, participants will be exposed to the practical aspects of classroom lectures in the hands-on session. Software IT Companies **HP**, and **Intel** will deliver keynote talks.

Mode 2 (Day 4-5): During this session, participants will get an overview of evolving GPU Computing, Cell Processor, **Intel** TBB-Multicore Programming for HPC applications. On Second half of each day, participants will get an opportunity to walk-through some of the programs specifically designed for this workshop. Software IT Companies **IBM**, **NVIDIA**, and **AMD** will deliver keynote talks. GPGPUs - Stream Accelerators & GPU Comp. - CUDA Programming Demonstration: **NVIDIA**, and **AMD** will demonstrate GPU Computing-CUDA Programming, GPGPUs- Stream Accelerators on fourth day and fifth day of PEEP-2008. Experts from **IBM** & University will cover an overview of Cell Processor technology and demonstrate Cell processors with programming examples. **C-DAC** experts will deliver keynote talk on RC-FPGA programming. The day-4 and day-5 is focus on current and future emerging parallel processing platforms and Programming Paradigms such as Intel TBB, GPU computing-CUDA programming, GPGPU-Stream Computing and Cell Programming.

C-DAC and IUCAA views the PEEP-2008 workshop Proceedings (CD proceedings) and the Hands-on session softcopy presentation notes as a continuously evolving resource on parallel computing. Hand-on Session softcopy document offers the application users a great opportunity to learn about the fundamentals of writing parallel programs using different programming paradigms, emphasizing on optimization techniques to extract the performance on parallel processing platforms.