

**Five Days Technology Workshop On Heterogeneous Computing - CPU/GPU
HPC Cluster – Algorithms & Performance of Application Kernels
(Initiatives on Power Efficiency - Green Computing) (HeGaPa-2012)**

Venue : CMSD, University of Hyderabad Date : July 16-20, 2012

FEEDBACK

- CD proceedings of HeGaPa-2012 was well appreciated and laboratory sessions, based on mixed programming provided an opportunity to learn about the fundamentals of re-write, design new algorithms on High Performance Computing (HPC) GPU Cluster using different programming paradigms.
- Participants got an opportunity to work on Heterogeneous Computing Platforms (Cluster of Multi-Core Processor systems with GPU Accelerator Devices (Hybrid Computing Platforms) and AMD APUs) based on heterogeneous mixed programming i.e. MPI, Pthreads, OpenMP with CUDA and OpenCL
- Participant's feedback study indicates that there is a scope to improve the programming on emerging parallel processing platforms such as heterogeneous computing platforms focusing on theory and laboratory sessions for numerical linear algebra kernels.
- Participants require code-walk through sessions on use of various OpenACC compiler Pragmas for highly data parallel application kernels
- Participants require one- or two full-day sessions to use profiler and OpenACC compiler directives programming paradigm for parallelization of application kernels on CUDA enabled NVIDIA GPUs
- Participants require demonstration of performance of application or numerical linear algebra kernels (NLA) with and without usage of OpenACC compiler Pragmas.
- Participants were exposed to intrinsic features of underlying hardware and software aspects of heterogeneous computing platforms, in order to map application kernels to target platforms based on heterogeneous programming
- Participants recommended the importance of laboratory sessions focusing on High Performance Computing GPU (HPC GPU) Cluster based on different programming paradigms (MPI, Pthreads, OpenMP) on *host-cpu* and OpenCL programming on *device* with support of AMD Accelerated Parallel Processing (AMD APP) Software, AMD APUs & CUDA enabled NVIDIA heterogeneous hardware platforms.
- Participants were given an opportunity to *understand*, *write*, and *execute* the codes based on different programming on heterogeneous hardware technologies which provided strong foundation to solve real-life applications.
- Participants wanted special sessions on demonstration of scientific applications on Heterogeneous Parallel Processing Platforms
- Participants would like to have academia and industry speaker to spend sufficient time during the laboratory sessions to discuss tuning and performance techniques for applications and numerical linear algebra (NLA) kernels.
- Participant's feedback convey that important steps for programming on Heterogeneous computing platforms based on CUDA and OpenCL for numerical computations should be explained with more example programs, focusing on "optimizations carried out to get performance."

- The participants of HeGaPa-2012 need more focus on laboratory sessions in which parallelization of one or two application kernels using different programming paradigms to understand performance issues.
- Participants feel that special sessions may be required for ‘*interaction among the participants*’ in each session after going through *theory* and *laboratory sessions* in order to understand tuning and performance aspects on GPUs for simple computing kernels
- The workshop programme should include special sessions on demonstration of scientific applications on *Heterogeneous Parallel Processing Platforms*
- Some of the Industry experts who delivered keynote talks on GPUs (*CUDA & OpenCL*) and applications on *Heterogeneous Computing platforms*) are required in the laboratory sessions to interact with the participants in order to understand difficulties associated with the tuning and performance of application kernels on HPC GPU Cluster.
- The participants require access to HeGaPa-2012 laboratory computing systems for a period of one month to re-write some of their application kernels.
- The participants require focus on laboratory sessions on parallelization of application kernels on HPC GPU Cluster by taking one or two application kernels using different programming paradigms.
- The participants would like to know on *Performance of applications and Benchmarks* on Heterogeneous computing platforms and require detailed explanation on techniques employed to achieve maximum sustained performance of benchmarks or applications on HPC GPU Cluster
- Participants would like to know more about performance modeling on GPUs for selective NLA kernels.
- Participants recommended special sessions for use of Open Source Software libraries on Heterogeneous computing platforms (GPUs) from application perspective.
- Participants would like to know more about tools to understand behavior of OpenCL Codes on Heterogeneous Computing platforms