

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

Technical Programme

Jointly Organized by

Centre for Development of Advanced Computing (C-DAC), Pune &
 Centre for Modeling & Simulation (CMSD), HPC Facility, University of Hyderabad, Hyderabad

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

Day 1: July 16, 2012 (Monday)

8:30 AM ~ 9:00 AM: Registration	
9:00 AM ~ 10:00 AM	Welcome & Inauguration <ul style="list-style-type: none"> • Prof. KPN Murthy, Director, CIS, University of Hyderabad • Dr. S.K.Udgata, Director, CMSD, University of Hyderabad • Dr. Srinidhi, K, Director, Product Application Engineering, AMD India • Dr. VCV.Rao, Associate Director, C-DAC, Pune
10:00 AM ~ 10:30 AM	An Overview of HeGaPa-2012 workshop
10:30 AM - 10:45 AM ~ Coffee & Tea Break	
1:00 PM -2:00 PM ~Lunch	
10:45 AM ~ 11:30 AM	Keynote Talk (Industry): Heterogeneous Computing on Accelerating Processing Units (APUs) – OpenCL – Application Perspective Speaker : Dr. Srinidhi, K , Director, Product Application Eng., AMD, India
11:30 AM ~ 11:45 AM	Class-room Lecture : An overview of Programming Environment and Hand-on Session in HeGaPa-2012 Sessions Speaker : VCV.Rao, C-DAC, Pune & Mr. Sarmrit, C-DAC, Pune
11:45 AM ~ 12:30 PM	Invited Talk: Prog. on Host-CPU's (MPI,Threads,OpenMP) of GPU Cluster Speaker : Dr. Rajeev Wankar, Dept. of Comp. Sc., U. of Hyderabad
12:30 PM ~ 1:00 PM	Classroom Lecture & Lab session: An Overview of GPGPU – Prog. Environment & Introduction to Heterogeneous Prog.– OpenCL – Speaker : Nisha Agarwal, C-DAC, Pune
1:00 PM - 2:00 PM ~ Lunch	
4:00 PM - 4:15 PM ~ Coffee & Tea Break	
2:00 PM ~ 3:30 PM	Lab. Session: Mixed Programming (MPI-OpenMP, MPI-TBB, MPI-Pthreads); Basic Prog. on Host-CPU with CUDA enabled NVIDIA GPUs; Basic Prog. on OpenCL; OpenCL-Matrix Computations on Multi-GPUs; Use of Work Groups & Work-items – Memory Optimizations-OpenCL
3:30 PM ~ 4:00 PM	Classroom Lecture & Lab Session : An Overview of OpenACC – Compiler Directives – CUDA NVIDIA GPUs ; Example programs Speaker : VCV.Rao, C-DAC, Pune
4:30 PM ~ 5:00 PM	Classroom Lecture & Lab. Session: An Introduction to OpenCL and Code walk through session for simple Heterogeneous Programming – OpenCL - AMD APUs & GPUs Speaker : Nisha Agarwal, C-DAC Pune
5:00 PM ~ 5:30 PM	Classroom Lecture & Lab Session : Code walk-through sessions – Introduction to Matrix Computations on CUDA enabled NVIDIA GPUs Speaker : Sonia Bansal C-DAC,Pune
5:00 PM ~ 6:30 PM	Lab. Session: Mixed Prog. (MPI, OpenMP, Pthreads &CUDA / OpenCL); Benchmarks Execution; OpenAC-NVIDIA-PGI OpenACC Compiler Directives; CUDA NLA-Alg., Code-Walk through – OpenCL Programs – on AMD APUs/ AMD GPUs; -OpenCL (Platform Devices & Device Query)

Day 2: July 17, 2012 (Tuesday)

9:00 AM ~ 9:45 AM	Classroom Lecture & Lab Session: An Overview of Prog. on GPGPUs - CUDA enabled NVIDIA GPUs / Performance Issues - Numerical Linear Algebra Kernels; Data Re-arrangement Kernels for Performance Speaker : VCV.Rao, C-DAC, Pune	
9:45 AM ~ 10:30 AM	Classroom Lecture & Lab Session : Programming on NVIDIA Multiple GPUs; Tuning & Performance for Numerical Linear Algebra Kernels; Programs based on CUBLAS Libraries; Error & Memory Checks Speaker : Nisha Agarwal, C-DAC, Pune	
10:30 AM - 10:45 AM ~ Coffee & Tea Break		1:00 PM -2:00 PM ~Lunch
10:45 AM ~11:30 AM	Keynote Talk (Industry) : Advanced in CUDA enabled NVIDIA GPUs (An Overview of CUDA 5.0 & Tools) Speaker: Priyanka, NVIDIA, Hyderabad	
11:30 AM ~12:15 PM	Invited Talk (Industry) : PGI Compilers on Host-CPU & NVIDIA-PGI OpenACC -Compiler Directives Speaker: Mr. Shankarang, PGI & GTE-India	
12:15 PM ~ 1:00 PM	Classroom Lecture & Lab Session: Performance of Matrix comps. & Data parallel applications on OpenACC; Performance of NLA (MAGMA) & CUBLAS on CUDA enabled NVIDIA GPUs Speaker : Samrit M & Nisha Agarwal, C-DAC, Pune	
1:00 PM - 2:00 PM ~ Lunch		4:00 PM - 4:15 PM ~ Coffee & Tea Break
2:00 PM ~ 4:00 PM	Lab. Session: Programming using CUDA enabled NVIDIA GPUs- CUDA SDK tools; Examples programs Pthreads, OpenMP on host-CPU; Use of OpenACC Compiler Pragmas; NLA Alg. & OpenACC APIs on GPUs	
4:15 PM ~ 5:00 PM	Key-note Talk (Academia): Middle Stratum Operations - A Quantum Leap in High Performance Computing? Speaker : Prof K. Venu, Visiting Professor, School of Physics, U of HYD	
5:00 PM ~ 6:00 PM	Lab. Session: Performance of Tiled matrix - matrix multiplication on CUDA GPUs; - CUDA memory Access; Warp level parallelism; Tuning & Performance on Multi-CUDA enabled NVIDIA-GPUs; CUDA SDK; Demonstration of NLA Algorithms (MAGMA, BLAS)OpenACC APIs	

Day 3: July 18, 2012 (Wednesday)

9:00 AM ~ 9:45 AM	Classroom Lecture & Lab. Session : Performance Issues- CUDA Streams & Concurrent Asynchronous Execution on Single /Multi-GPUs Speaker : Sonia Bansal, C-DAC, Pune	
9:45 AM ~ 10:30 AM	Classroom Lecture & Lab. Session: An Overview of Profiling & CUDA Macro Errors; Memory Checks – CUDA enabled NVIDIA GPUs; OpenACC -Compiler Directives -NVIDIA GPUs Speaker: VCV.Rao, C-DAC, Pune	
10:30 AM - 10:45 AM ~ Coffee & Tea Break		1:00 PM -2:00 PM ~Lunch
10:45 AM ~ 11:45 AM	Invited Talk (Academia) : Tuning & Performance (Memory Coalescing and Warp Parallelism) CUDA -NVIDIA GPUs – Application Case Study Speaker : Ajit Padyana, SSSIHL, Prashanti Nilayam, Andhra Pradesh	
11:45 AM ~ 12:15 PM	Invited Talk (Industry/Academia): Performance of Application Kernels – Solution of Partial Differential Equations (PDEs) by Finite difference /Finite Element Methods on NVIDIA GPU Cluster Speaker : A Pavan Kumar Reddy, IIIT-Allahabd	
12:15 PM ~ 1:00 PM	Classroom Lecture & Lab Session : Performance Issues of Numerical Linear Algebra algorithms on CUDA NVIDIA GPUs Speaker : Nisha Agarwal, C-DAC, Pune & Samrit M, C-DAC, Pune	

Day 3: July 18, 2012 (Wednesday)

1:00 PM - 2:00 PM ~ Lunch		4:00 PM - 4:15 PM ~ Coffee & Tea Break	
2:00 PM ~ 4:00 PM	Lab. Session & Demonstration: Tuning and Performance – Using Shared memory, memory Coalescing; tiled partition on Single /Multiple GPUs on AMD-APP GPUs; CUDA Streams & Concurrent Asynchronous execution examples; Use of CUBLAS libraries and CUDA SDK		
4:15 PM ~ 5:00 PM	Invited Talk (Academia): Performance of Application Kernels –Image Processing Kernels (Image Inpainting & Face Detection) on NVIDIA GPUs Speaker : Jitendra Bajiya, IIIT-Allahabad		
5:00 PM ~ 6:30 PM	Lab. Session & Demonstration: Example programs on <i>host-cpu</i> (Pthreads, OpenMP) and CUDA or OpenCL on Multiple GPUs; Tuning & Performance of NLA Algorithms on APUs and use of CUBLAS and CUSPARSE libraries ; Application kernels based on Mixed Prog. Pthreads); Tuning & Performance for matrix computations based on, MAGMA –CUDA Libraries & Performance Issues		

Day 4: July 19, 2012 (Thursday)

9:00 AM ~ 9:45 AM	Classroom Lecture & Lab. Session: Heterogeneous Programming –AMD APP – APUs - OpenCL Programming for Matrix Computations; AMD APP–SDK & Prog. Env /Libraries Speaker : Nisha Agarwal CDAC, Pune & Sonia Bansal, C-DAC, Pune		
9:45 AM ~ 10:30 AM	Invited Talk (Industry): Heterogeneous Computing on Accelerating Processing Units (APUs) – OpenCL – Application Perspective Speaker : J.K.Velu, AMD, Bengaluru		
10:30 AM - 10:45 AM ~ Coffee & Tea Break		1:00 PM -2:00 PM ~Lunch	
10:45 AM ~11:30 PM	Classroom Lecture & Lab. Session : An Overview of HPC GPU Cluster – APP Tech – OpenCL Programming - Numerical Linear Algebra; AMD Demonstration of Application Kernels Speaker : Nisha Agarwal, C-DAC, pune		
11:30 PM ~ 12:15 PM	Classroom Lecture & Lab. Session: OpenCL Performance Issues – Numerical Linear Algebra; AMD & Performance Issues		
12.15 PM ~1:00 PM	Key-Note Talk (Industry) : Accelerators are here to stay with us in the HPC world Speaker : Rajesh Chhabra, Director, Altair		
1:00 PM - 2:00 PM ~ Lunch		4:00 PM - 4:15 PM ~ Coffee & Tea Break	

Day 4: July 19, 2012 (Thursday)

1:00 PM - 2:00 PM ~ Lunch		4:00 PM - 4:15 PM ~ Coffee & Tea Break	
2:00 PM ~ 3:45 PM	Lab. Session - Demonstration : Programming based on OpenCL, Tuning and Performance of OpenCL on GPGPUs; OpenCL for matrix-matrix multiplication - tiled techniques for partitioning of a matrix, shared memory optimization, Wavefront level parallelism; Example program on Numerical Linear Algebra based on AMD-APP OpenCL		
3:45 PM ~ 4:00 PM	Invited talk (Academia / R & D) : An Overview of High Performance Computing Facility (HPC) at CMSD, University of Hyderabad Speaker : Shri Vinod Kumar, Systems Manager, CMSD, UoH		
1:00 PM - 2:00 PM ~ Lunch		4:00 PM - 4:15 PM ~ Coffee & Tea Break	
4:15 PM ~ 5:00 PM	Key-note talk (Academia) : High Performance Computing – Monte Carlo Simulations Issues & Challenges Speaker : Prof. K.P.N.Murthy, Director, CIS, University of Hyderabad		
5:00 PM ~ 6:30 PM	Classroom Lecture & Lab. Session : Programs for Numerical Linear Algebra on HPC GPU Cluster (OpenCL on NVIDIA/AMD-APP GPUs) Benchmarks & Application Kernels on HPC GPU Clusters (MPI-OpenCL, Pthreads-OpenCL).		

Day 5: July 20, 2012 (Friday)

10:30 AM - 10:45 AM ~ Coffee & Tea Break		Lunch ~1:00 PM ~2:00 PM	
9:00 AM ~ 9:45 AM	Classroom Lecture & Lab. Session : An Overview of Programming on HPC GPU Cluster – CUDA enabled NVIDIA GPUs /OpenCL; Cluster Management & Health Monitoring Challenges Speaker : VCV.Rao, C-DAC, Pune		
9:45 AM ~ 10:30 AM	Classroom Lecture & Lab. Session : An Overview of Energy Profiling and Power Efficiency of HPC Systems with GPUs – An Overview of Top-500, Green-500, & Graph-500 Benchmarks) Speaker : VCV.Rao, C-DAC, Pune		
10:30 AM - 10:45 AM ~ Coffee & Tea Break		Lunch ~1:00 PM -2:00 PM	
10:45 AM ~11:30 AM	Key-note talk (Academia) : Image Processing – Video High Resolution Algorithms on GPUs Speaker : Dr. Pallav Baurah, Professor, SSSIHL; Prashanti Nilyam, A.P		
11:30 AM ~12:30 PM	Invited Talk (Industry) : Power management- The new Holy Grail of HPC Speaker : Subhasis Bhattacharya, Altair India		
1:00 PM - 2:00 PM ~ Lunch		4:00 PM - 4:15 PM ~ Coffee & Tea Break	
2:00 PM – 2:45 PM	Lab. Session – Demonstration : Demonstration of BLAS and LINPACK (Top-500) on HPC GPU Cluster – in collaboration with NVIDIA Speaker : Mr. Samrit M		
2:45 PM ~ 4:00 PM	Lab. Session - Demonstration : Matrix Comps. on HPC GPU Cluster using different programming paradigms (MPI /Pthreads /OpenMP) OpenCL on host-CPU & AMD-APP OpenCL/CUDA-NVIDIA on devices.		
4:15 PM ~ 6:00 PM	Lab. Session : Programming examples using AMD APP - OpenCL, Integrated Script CUDA enabled NVIDIA GPUs & OpenCL NVIDIA/AMD-APP for Numerical Linear Algebra; Single /Multi-GPU (CUDA / OpenCL Prog.); Demonstration of MPI-GPU Cluster programs on AMD APUs, HPC GPU Cluster – AMD APP OpenCL & NVIDIA CUDA with MPI		
6:00 PM ~ 6:15 PM	HeGaPa-2012 Workshop Feedback & Closure		