HUST Team Heptagon

Introduction

Student Members

Kaixi Li

Leader of HUST SC16 team. Good at Shell Scripts, Operating Systems, Computer Network and Computer Organization. Studying in Electronic Engineering and major in Computer Science.
Be awarded to champion and ePrice application optimization in ASC 16. Win Best Linpack in ISC 16. Be awarded to first prize in forth RDMA Programming Competition. Responsible for team communication, machine configuration and application Paraview.

Yingzhong Guo

Good at Algorithm and Parallel Computing. Major in Software Engineering. Interested in Cloud Computing and Distributing Systems. Be awarded to first prize in third RDMA Programming Competition. Team Member of ASC 16. Win Best Linpack in ISC 16. Responsible for application Distributed Password Auditing/Recovery.

Jingbo Wang

Major in Computer Science. Be awarded to champion and ePrice application optimization in ASC 16. Win Best Linpack in ISC 16. Good at Algorithm and Machine Learning. Responsible for application ParConnect and help team to help deal with academic problems.

Kaijie Li

Studying at the Communications Engineering, Interested in Computer Hardware, Network Communication and Heterogeneous Computing like GPU. Team Member of ASC 16. Win Best Linpack in ISC 16. Responsible for application Distributed Password Auditing/Recovery and help to issue HPL and HPCG.

Mingyao Sheng

Major in Computer Science. Team member of ASC 16. Interested in Parallel Computing and Heterogeneous Computing. Responsible for application ParConnect.

Sixu Hu

Sophomore student, major in Computer Science. Responsible for HPL and HPCG. And also help to manage the cluster.

Mentor

Xuanhua Shi

Xuanhua Shi is a professor in Service Computing Technology and System Lab (SCTS) and Cluster and Grid Computing Lab in China. His research interests are mainly on parallel and distributed systems. Recent work focuses on scalability, resilience and autonomy of large-scale distributed systems, such as peta-scale systems, and data centers.

Hardware and Software Configuration

System Design

8 Heterogeneous Nodes with 4 CPU Nodes and 4 GPU Nodes for the balance of power consumption and the high performance. We remove Ethernet switch between nodes reduce power consumption and use IPoIB for communication and management. And we use port forward to realize the precision of the fan lever control.

Software Environment

· CentOS 7
· Nvidia CUDA 8
· Intel Parallel Studio XE
· Openmpi
· IPoIB

Application

HPL and HPCG

· Performance Prediction
· Calculate theory parameter
· Use GPU accelerator, latest CUDA optimized version and adjust allocation proportion between GPU and CPU
· Modify MPI and GPU bind and task division.
· Adjust GPU frequency to ensure power consumption limit.

Distributed Password Auditing/Recovery

We found that there are several open source software which could crack passwords and it more import to find a better password cracking dictionary rather than to implement more efficient code. After discussion and consideration, we choose John the Ripper which is customized by ourselves to solve Distributed Password Recovery. John the Ripper has MPI support while some other software can not run on cluster directly. We also decide to focus our attention on better password cracking dictionary and better password generation.

paraview

· Enable MPI and OS (Off-Screen) Render
· use Intel Parallel Studio
· Compare OSMesa with GPU Direct Render

ParConnect

· By transforming this problem into that of finding weakly connected components in the de Brujin Graph.
· Use the novel distributed memory algorithm to identify connected subgraphs, such as excluding completed partitions and load balancing.
· Choose a suitable number of MPI processes for full scale runs in order to minimize the impact of substantial network traffic.
· Recreate the graphs and tables presented in the paper for large datasets.

Power Management

· Automated scripts for fan level and CPU clock frequency.
· Use PowerTOP and SystemTap to monitor CPU state.
· Enable CPU P-State and gpu idle to reduce unnecessary power consumption.
· Disable turbo boost and limit highest frequency to ensure power limitation.

Why Will We Win?

· Rich Experience of previous and current team members in HPC competition, such as asc, isc, sc and rdma.
· Strong comprehensive ability because we team members come from different colleges, including Math, Electronic Engineering, Communication Engineering, Software Engineering and Computer Science.
· Strong interest and driving force to explore HPC.
· Sponsors' support and help and discussion from professional.