National Tsing Hua University

➢Introduction to NTHU

Our School

Located in Hsinchu Taiwan, National Tsing Hua University is a comprehensive research university offering a full range of degree program in science, technology, engineering, humanities, social science, and management. It consistently ranks as one of the best universities in East Asia.

Our Team

Our team is composed of four senior students, and two junior students. Bobby is our team captain and our system administrator. He also attend the SC15 competition. Gordon and Stanley are in charge of the Password Cracking. Clara is the only female member in our team, and she studies Paraview. AFG and Reese are the junior students, and they work on Parconnect together.

All of our team members major in Computer Science. We joined the team because we are really interested in learning knowledge related to parallel programming, cluster environment setup, and HPC application optimization, etc. We all very look forward to SC16 and are ready to take on new challenges.

(Left to right: Stanley, Gordon, Clara, AFG, Reese. Bobby in the front)

➢Hardware Configuration

Our server is supported by Quanta Computer, which is one of the larger vendor for servers and computers. They are a Taiwan-based company, and they have supported us for the past several years. Their machines are really stable and power efficient. So we can be a competitive team every year. Originally, we were exploring a more powerful server using power shelf. Unfortunately, we couldn't split the power source to two cables. So we have to use a more traditional server architecture, but it is still very powerful.

Item	Configuration
Server	Quanta Grid D51BV-2U
CPU	Intel Xeon E5-2699 v4 x 2, 2.2Ghz, 22 cores (per node)
Memory	32G x 8, DDR4, 2400Mhz (per node)
Accelerator	NVIDIA Tesla P100
Disk	SSD (per node)
Interconnect	Infiniband Mellanox ConnectX®-3 HCA card, FDR switch

➢Software Configuration

We use CentOS as the operating system because of its stability and many resources on the website. Also, we compared different MPI libraries, try to find the best configuration for each application.

Item	Configuration
OS	CentOS 7.2
Compiler	GCC 4.8.5 / 6.2 Intel Compiler XE 2017
GPU software	CUDA Toolkit 8
MPI	Intel MPI 5.1.3 Open MPI 2.0.1 MVAPICH2 2.2

➢Preparation to SC16

Our team is formed since this February. But most of us has limited background knowledge on HPC before joining the team. Therefore, since then, we have a meeting with our professors and senior students(coaches) every week to learn the basics, and discuss the problems we encountered. To practice our language skill , we only use English in these meetings. Even during the summer break, we all have to stay in school or studying. Fortunately, Taiwan is not a huge country, so we can still go home and visit our family during the break. Because we have given so much efforts, we really want to win in the competition.

➢Strategy and Optimization Method

Password cracking

We collected many cracked password as the dictionaries for this competition. We also test the cracking software on several computing devices, including FPGA. After all our studies, we start thinking to be a real hacker one day!

Paraview

Paraview is a very powerful data analysis and visualization application. Its user guide is over hundreds of pages, but we read through all of them carefully, so we can be familiar with all the features from the tool. We also tried several extension plugins to handle more complicated use cases.

Paraconnect

Reproduce is something new in this year's competition. We study the algorithm from the paper, and we study the implementation from the code. We found the results indeed can be reproduced from our server, and we realize the importance of reproduction for research. We also further study the performance using Allinea profiling tools.

Power Consumption

Power management is the key factor in this competition. We wrote several utility tools by ourselves to adjust the clock speed of CPU, the fan speed of our server, etc. We also wrote a simple monitoring system to show the power consumption of each node, so we can control our power consumption more dynamically and accurately.
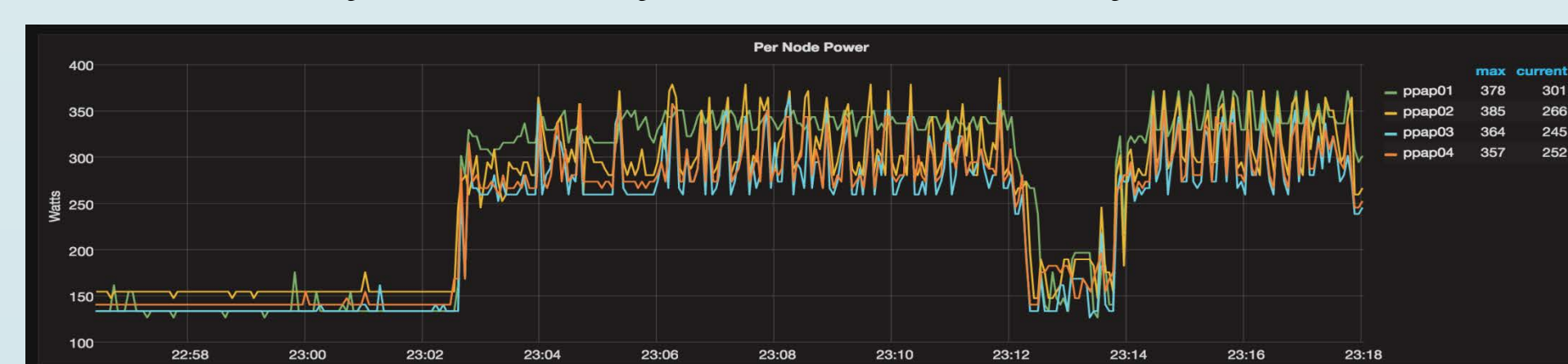
➢Why We Will Win?

Although it's tiring during the preparation, we all love what we do! The passion becomes strength supporting us.

In normal time, we will take courses and learn about the knowledge of supercomputing.

We sacrifice sleeping and leisure time in order to get a better performance!

We not only work on performance tuning, but also study the background knowledge and the architecture of these applications.

We have known each other for a long time, we formed an tight bound between each other!

We have participated in Taiwan Student Cluster Competition(TSCC)
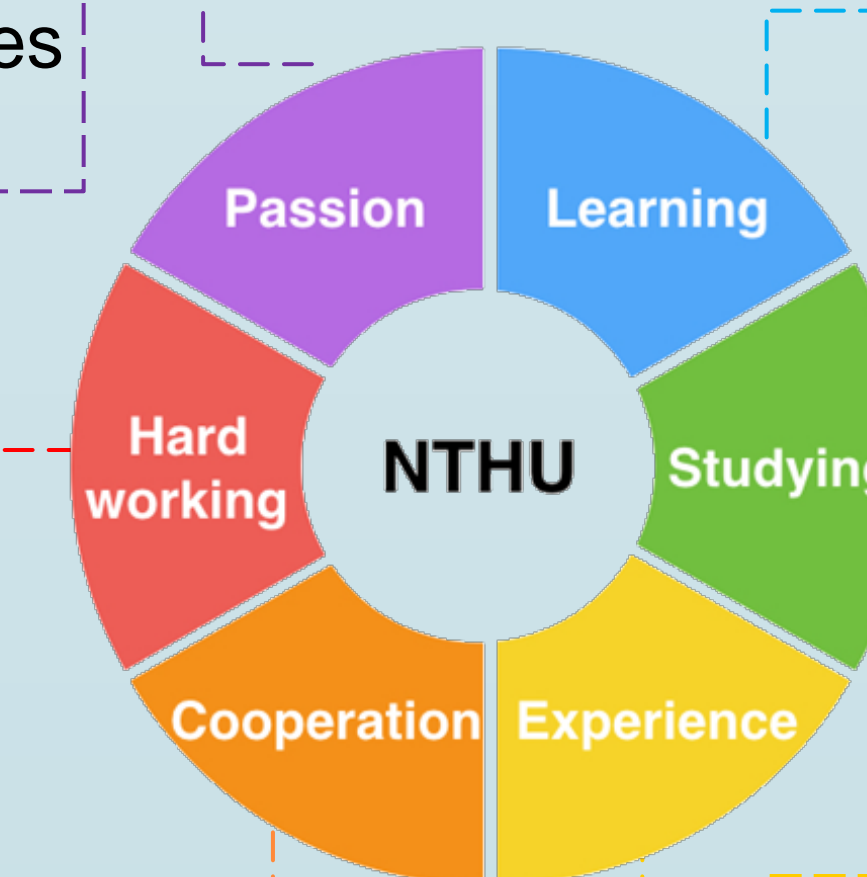
It is a kind of snack named "be good" in Taiwan, because its color is green, and green light usually means the server is stable. So by putting it on top of our server, it will keeps our server in good condition!

He is a god in Taiwan. We will bring him to any competitions, and he will bring us good luck!