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contact@nscg.sg

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2020
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04 - 07 February 2020
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SupercomputingAsia 2020 (SCA20)

Early Bird Registration is Now Open!

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Setting the benchmark!

NTU student team bests top teams from around the world to clinch LINPACK Benchmark award at the SC19 conference for the third year running.



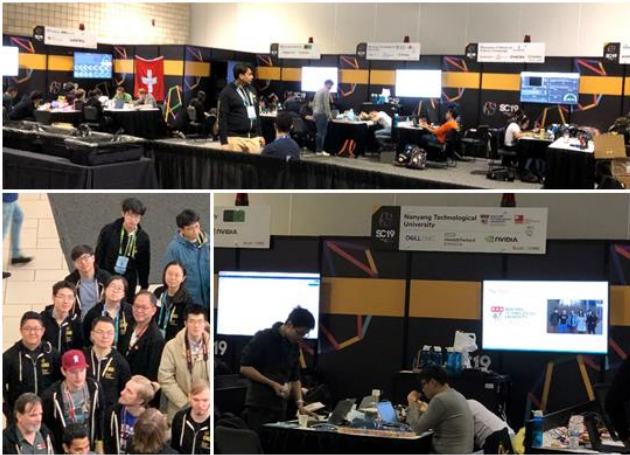
The NTU team showed their dominance again in the Highest LINPACK Benchmark category by winning the award for the third year running.

As the saying goes, third time's the charm but for the student team from [Nanyang Technological University \(NTU\)](#), it was more than luck that allowed them to beat sixteen of the world's top supercomputer student teams to clinch the coveted award. [The LINPACK Benchmark](#) measures the number of floating-point operations, or FLOPS that a computer can perform per second, which is essentially the performance of a supercomputer. The system that the team rigged together clocked in the highest LINPACK Benchmark speed at 51.7 teraFLOPS. Today's supercomputers typically performs at speeds above one petaFLOPS.

"The students performed well at the [SC19 Student Cluster Competition \(SCC\)](#). The consistency of their performance over the years is attributed to the students' hard work, lots of sacrifices over many weekends and the support of the entire high performance computing ecosystem such as the NTU HPC Club, alumni team members, NSCC staff, Nvidia Technology Center and our other sponsors", said Associate Professor Francis Lee from NTU who has mentored the consecutive NTU teams taking part in the global high performance computing (HPC) competitions since 2016.

The NTU team's dominance in the LINPACK Benchmark was not their only achievement at the [SC19 conference](#),

“The consistency of their performance over the years is attributed to the students’ hard work, lots of sacrifices over many weekends and the support of the entire high performance computing ecosystem...”



Team members worked through the night over the 48-hour challenge period to achieve the Highest LINPACK Benchmark and come in fourth out of the sixteen global student teams that took part.

the world’s largest supercomputing event. The team came in fourth place overall in a competition that saw sixteen teams from renowned universities across the world vie for the honour to be the world’s best student supercomputing team.

“It was not an easy journey as the biggest challenge the team faced was that the members were mostly new to the HPC realm,” said Mr Chen Zhiwei, the team lead and currently a Year 4 NTU student doing a double degree in Business and Computing. To make up for it the team met at least twice a week in the months leading up to the competition to discuss systems architecture and optimisation strategies for each of the competition applications. “We are proud of the team’s achievement and we hope to continue to achieve more success in the future.”

The SC19 SCC tests the skills of undergraduates and high school students in designing and building small supercomputing clusters. The students learn scientific applications, optimisation techniques and are limited to running the challenge using less than 3,000 watts of power during the non-stop, 48-hour competition that simulates real-world scientific workloads.



The winning team - Mr Tan Sze Tiong (Director, Centre of Excellence for Environmental Sustainability Research, HDB), Dr Koh Wee Shing (Senior Scientist, IHPC, A*STAR), Dr Poh Hee Joo (Senior Scientist, IHPC, A*STAR), Mr Fachmin Folianto (Senior Research Engineer, I²R, A*STAR).

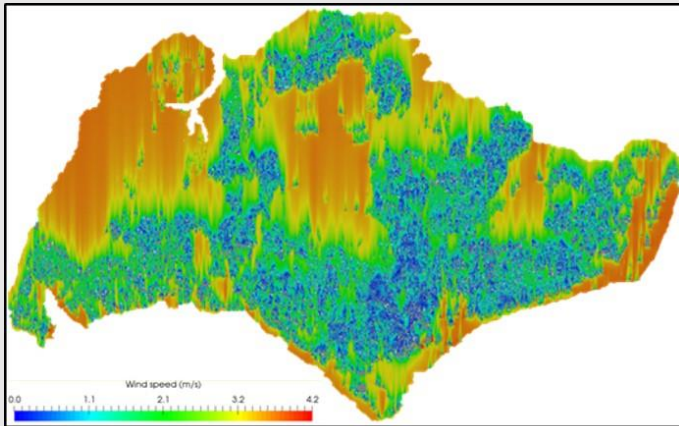
Urban planning simulation tool based on HPC technology wins President’s Technology Award (PTA)

Using the ASPIRE 1 supercomputer, the tool was used to create a complete three-dimensional (3D) air flow simulation encompassing Singapore’s built environment.

A research team from A*STAR and HDB helped create a high-resolution modelling and simulation tool for built environments to aid in town planning. Dr Poh Hee Joo ([Institute of High Performance Computing](#), IHPC, A*STAR), Dr Koh Wee Shing (IHPC, A*STAR), Mr Fachmin Folianto ([Institute for Infocomm Research](#), I²R, A*STAR)

“... implementing the first ever 3D

air flow simulation at 10-metre horizontal resolution, which included all the buildings in Singapore... took only five days to complete using some 6000 processors of NSCC's ASPIRE 1"



Wind Flow Mapping for whole of Singapore which was achieved using the innovative IEM tool, and with NSCC's supercomputing resources.

and Mr Tan Sze Tiong ([Housing & Development Board](#), HDB) developed the Integrated Environmental Modeller (IEM) which won the PTA at this year's [President's Science & Technology Awards \(PSTA\)](#) ceremony.

Other environmental factors that can be included in the virtual simulation include solar irradiance, wind flow and air temperatures. The unique feature of the simulation is that it combines these multiple effects into one model compared with models in the market that only assess one to two environmental factors. This capability produces simulations that mirror real-life, everyday environments more closely. The tool has also been verified and calibrated with ground truth measurements under typical urban conditions.

"The most significant innovation of IEM is its integration," said Dr Poh Hee Joo who led the research team that won the award. The IEM is the first integrated and scalable tool to combine all key environmental physics and their complex interactions allowing the effects of buildings, terrain, vegetation, water bodies, road pavements and urban elements to be fully captured in a single unified platform. "The work was also done entirely in-house and with open source codes based on the latest high performance computing (HPC) technology."

"The computationally scalable IEM also pushed the technological boundaries in supercomputing by implementing the first ever 3D air flow simulation at 10-metre horizontal resolution, which included *all the buildings in Singapore!*" said Dr Poh adding that the simulation took only five days to complete using some 6000 processors of [NSCC's ASPIRE 1 supercomputer](#).

The long term vision for the IEM tool is to morph it into a highly accurate "Digital Twin" model for use with any urbanised area, which is capable of accounting for various factors affecting the urban environment. When coupled with other indices such as a quality of life index, IEM could be used to plan for highly sustainable and liveable environments, and future cities.

The PSTAs are the highest honours bestowed on exceptional Singapore research scientists and engineers for their excellent achievements in science and technology. The annual awards recognise and celebrate outstanding and invaluable contributions by individuals or teams to the R&D landscape here. Apart from the PTA, the project also garnered other awards including the [ASEAN Outstanding Engineering Achievement Award](#) and the Minister for National Development's R&D Merit Award.

Using the [ASPIRE 1](#)

supercomputer - FAQs

Ever wanted to leverage on the power of the ASPIRE 1 supercomputer? Accessing the NSCC Supercomputer Service is as easy as 1-2-3...



NSCC's Advanced Supercomputer for Petascale Innovation, Research & Enterprise (ASPIRE) 1 is Singapore's first national petascale supercomputer that is available to local research institutes, universities and companies.

1) Ask for an account

- Write in to NSCC Business Development (email: bizdev@nscg.sg) to request for a trial account.
- Get an introductory trial plan of up to 2 months.
- A basic monthly trial plan comes with 5,000 CPU core hours or 500 GPU node hours and 50GB of storage.

2) Create an account

- Go to NSCC's Account Creation website (<https://go.nscg.sg/trial>) to create a trial account.
- Provide Project Title and Description.
- It takes 3-5 working days to create the trial account.
- A Username and Password will be emailed to the trial user.

3) Start supercomputing!

- Users can start accessing the supercomputer via designated nodes from around Singapore.

Useful links for ASPIRE 1 users:

- **Users Guide**
(<https://help.nscg.sg/user-guide>)
- **Training Calendar** for supercomputer
(<https://www.nscg.sg/hpc-calendar/>)
- **NSCC's AI system** step-by-step guide (currently six DGX-1s)
(https://help.nscg.sg/wp-content/uploads/AI_System_QuickStart.pdf)
- **FAQs**
(<https://help.nscg.sg/faqs/>)



What you will have access to in ASPIRE 1



Computing resources

- 1,288 compute nodes for CPU-based workloads
- 128 GPU nodes for scientific computing with accelerators
- 10 fat memory nodes for large memory calculations
- 6 DGX1 nodes for AI/ML/DL applications
- 2 visualisation nodes for rendering and scientific visualisation jobs.



Intra-connections (within the cluster) for computing

- Fully bisectonal EDR InfiniBand
- Fat-tree topology



Inter-connections among A*STAR, NTU and NUS

- RDMA Long-Haul (10-80km) Connectivity



Storage

- 13PB GPFS and LUSTRE parallel file system
- Backup tier via DMF



Plugging into the global supercomputing ecosystem at SC19

NSCC's participation at the world's largest supercomputing conference was an opportunity to showcase Singapore's high performance computing (HPC) development and capabilities.

The Singapore Pavilion at the [SC19 conference](#) - the International Conference for High Performance Computing, Networking, Storage, and Analysis – was an excellent international platform to promote NSCC, its resource and the SupercomputingAsia 2020 (SCA20) conference.

NSCC worked with some of Singapore's local HPC industry partners to give these companies exposure to the global marketplace. The local small and medium-sized enterprises (SMEs) featured were [ERS Industries Pte Ltd](#), a data centre solutions provider, and [Archanan](#) which provides development environments that virtualise and emulate an organisation's HPC production system.

The team also took the opportunity to cement ties with other HPC centres such as those from Japan, Europe and the United States, and to explore areas of possible collaboration.



The Singapore Pavilion at SC19 saw a host of collaborator meetings and visitors to the booth.

Delivering the Keynote at ASTI's annual stakeholders meeting



Associate Professor Tan Tin Wee (bottom right), Chief Executive, NSCC, delivered the Keynote at ASTI's annual stakeholders' meeting via video conferencing.

NSCC's Chief Executive (CE), Associate Professor Tan Tin Wee, was invited to deliver the keynote message during the annual meeting of the Advanced Science and Technology Institute (ASTI).

Prof Tan was invited to address the stakeholders and staff at the annual meeting of [ASTI, one of the R&D institutes of the Department of Science and Technology \(DOST\)](#), Philippines. The event, which was themed 'Towards a Shared Infrastructure for Research and Education', introduced the audience to NSCC, its capabilities, the initiatives to develop the HPC ecosystem within Singapore and the growing links between HPC centres around the world.

The address, delivered via video conferencing, also highlighted NSCC's experience as one of the pioneers of research networks and HPC in the region, and how the developing infrastructure is helping advance research and innovation.



The delegation from Singapore's Ministry of National Development (MND) were briefed about NSCC's resources and given a tour of the supercomputer facilities.

NSCC hosts visitors from MND

Visitors from Singapore's [Ministry of National Development \(MND\)](#) were at NSCC to learn more about the high performance computing (HPC) capabilities and how to access them.

The MND delegation was given an introduction to NSCC and a briefing on the general economic and social trends that drive the need for supercomputer resources in Singapore. NSCC shared some of the HPC use cases that were relevant to MND's built environment domain.

The visitors were also given a tour of Singapore's first petascale supercomputer, ASPIRE 1, and briefed about the unique warm water cooling technology that helps make the data centre more energy efficient. NSCC highlighted the deployment of some 6,000 sensors in the NSCC data centre that monitors

the supercomputer in real-time and enhances the operations of the data centre.



**Powering Innovation
Supercomputing in Asia**

National Supercomputing Centre (NSCC) Singapore

1 Fusionopolis Way, Connexis South, #17-01 Singapore 138632