

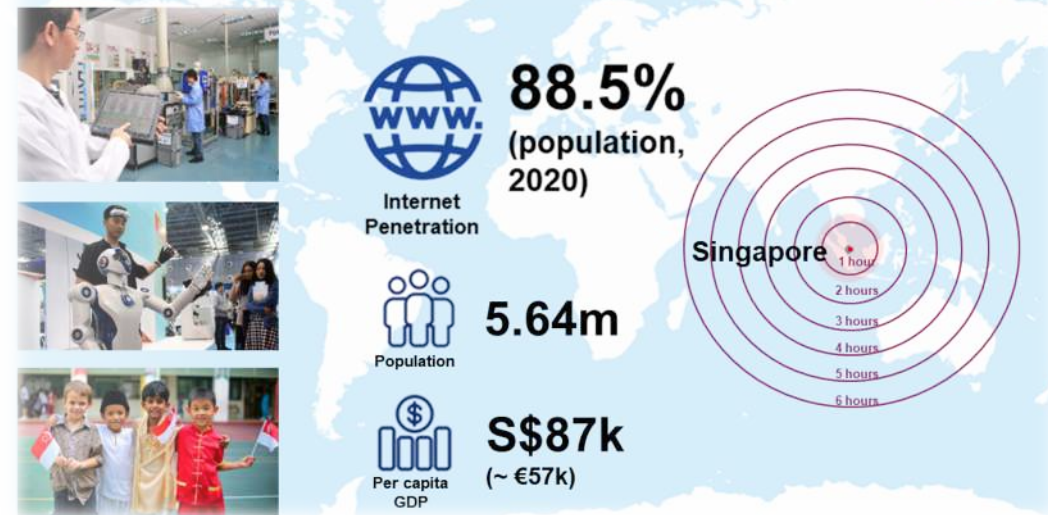
e-Science Activities in Singapore

Prof Tan Tin Wee | Chief Executive, NSCC Singapore

International Symposium on Grids & Clouds (ISGC) 2023 Conference |
21 March 2023

Who We Are

- **National Supercomputing Centre (NSCC) Singapore**
- National Research Infrastructure funded by the government's National Research Foundation
- Home of Singapore's first petascale supercomputer and provider of national HPC resources
- All researchers from Singapore universities, research institutes, government agencies and industries have access to NSCC's HPC resources



Singapore Upgrades HPC Infrastructure to Support Future Research Demands

❑ Upgrading Infrastructure

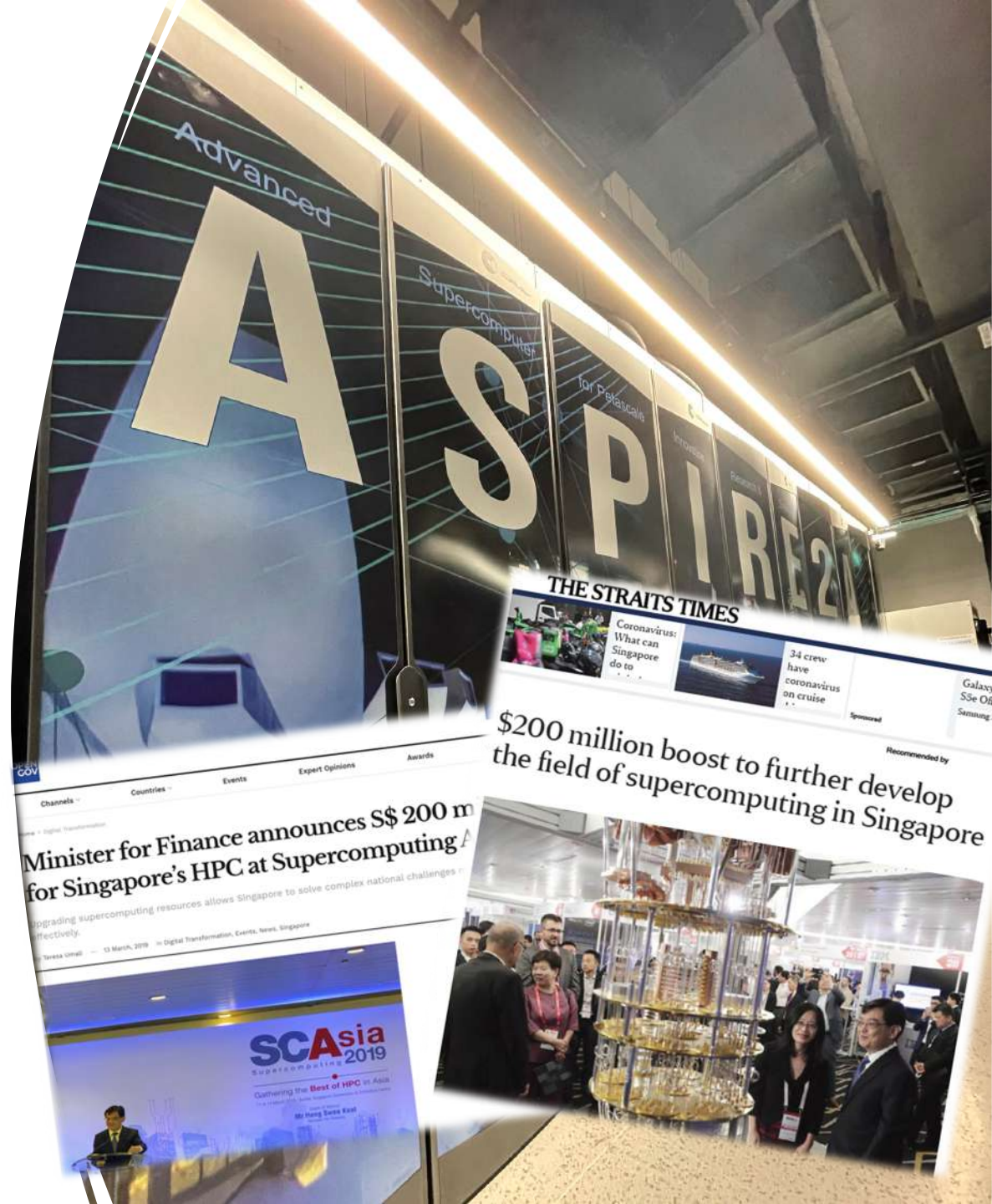
- From ASPIRE 1, AI Platform@NSCC, HTC1000 to ASPIRE 2A, and the benefits for Singapore R&D

❑ Connecting Singapore Research with the World

- Our links and connectivity in partnership with SingAREN

❑ Growing Local HPC Community & Int'l Collaboration

- e.g. Edge Supercomputing @ Singapore Hospitals and collaborations with overseas partners



UPGRADED INFRASTRUCTURE

From 1 PFLOP (2016) to 10-20 PFLOPS (2025) & Beyond

PAST



- 1 PFLOPS System**
 - 1,288 nodes (dual socket, 12cores/CPU ES-2690v3)
 - 128GB DDR4 RAM/node
 - 10 large memory nodes (1x6TB, 4x2TB, 5x1TB)
- Accelerator Nodes**
 - 128 nodes with Tesla K40 GPUs
- 13PB Storage**
 - GPFS & Lustre File Systems
 - I/O bandwidth up to 500GB/s
- Infiniband Interconnection**
 - EDR (100Gbps) Fat Tree with full bisectional bandwidth within cluster

- Add-on Systems (ASPIRE 1+)**
- AI.Platform (6 x DGX-1)
 - 1,000 cores HTC System
 - *Koppen* - 160 TFLOPS Cray XC-50, Climate System

CURRENT



- Full production – est. mid-2023**
- Aggregate ~10 PFLOPS raw compute power
 - 8x – 10x more powerful than current ASPIRE1

FUTURE



~10-20 PFLOPS Capacity

Note: Floating-point operations per second, or FLOPS, is a measure of compute performance or how quickly and effectively a computer works. P or peta (used in units of measurement) denotes a factor of 10¹⁵. The current Top 500 supercomputers today are minimally in the PFLOPS range.

DEMOCRATISING ACCESS TO RESOURCES

Some of Our Local and International Partners



National HPC Support for Local Research

- Call for Research Projects on ASPIRE 1
 - Resources provided to date (c.2016-2022):

3.5B	CPU/GPU HOURS PROVIDED	10,000 >1,700	USERS HOSTED
			PROJECTS SUPPORTED

- Call for Educational HPC Projects
 - Resources provided to date:

43M	CPU/GPU HOURS PROVIDED	212	PROJECTS SUPPORTED

- Early Call for Users to New ASPIRE 2A
 - Launched in October 2022 as a pilot user phase to stress test the new system.
 - Overwhelming response from the Singapore community.
 - ASPIRE 2A scheduled for full release in middle of 2023.



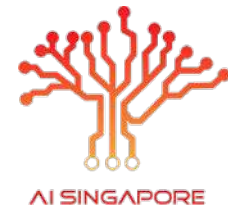
DEMOCRATISING ACCESS TO RESOURCES

Nurturing HPC in education and helping upskill professionals in Singapore

NSCC's new partnership with educational institutes and professional bodies to leverage Singapore's national supercomputer for student education and upskilling of professionals to support future jobs in areas such as HPC, AI, data science and analytics, and advanced simulation and modelling.

Areas of collaboration include:

- **New HPC curriculum** development
- **Training courses** and workshops
- **Student competitions** to nurture interest and build HPC capability



DEMOCRATISING ACCESS TO RESOURCES

Singapore HPC and quantum computing

THE STRAITS TIMES

S'pore boosts investments in quantum computing with 2 new programmes



SPH Hong Swee Keat (right) viewing a universal quantum computer model at the Supercomputing Asia 2020 conference. PHOTO: SPH

Bel Hanafi
Tech Correspondent

PUBLISHED: MAY 26, 2022, 11:04 AM SGT

SINGAPORE - Singapore is stepping up its investments in quantum computing with two new initiatives aimed at boosting talent development and providing better access to the nascent technology.

Deputy Prime Minister Heng Swee Keat on Tuesday (May 31) announced the launch of the National Quantum Computing Hub, which will pool expertise and resources from the Centre for Quantum Technologies and other institutions, and the National Quantum Fables Foundry.



The National Quantum Computing Hub (NQCH) is a joint initiative of the NUS **Centre for Quantum Technologies (CQT)**, A*STAR **Institute of High Performance Computing (IHPC)** and **NSCC**



Researchers at **CQT** and **IHPC** will develop quantum computing hardware and middleware.



NSCC will host a **quantum computing facility** and **provide the supercomputing power** needed to develop and train the algorithms that could eventually be used on quantum computers.

DEMOCRATISING ACCESS TO RESOURCES

Support for international data intensive research

Project Call for Singapore-Japan HPC resources

- **Call for Fugaku Projects via NSCC – Collaboration with RIST**

Singapore researchers have unique access to Japan's mighty Fugaku supercomputer since 2021 in a collaboration between NSCC, Research Organization for Information Science and Technology (RIST) and RIKEN Center for Computational Science (R-CCS).



10

RESEARCH
PROJECTS

2,000,000

NODE
HOURS



ACCESS TO
FUGAKU

JAPAN'S TOP
SUPERCOMPUTER

Promoting and facilitating international research data transfers

- **New collaboration provides faster access to the Protein Data Bank for Asian / Oceania region researchers**

San Diego Supercomputing Center (SDSC) and Singapore Advanced Research and Education Network (SingAREN) signed MoU at SCA23 event to facilitate Open Science Data Federation and a cache server of the Research Collaboratory for Structural Bioinformatics Protein Data Bank (RCSB PDB) for regional researchers.



SDSC-SingAREN MOU



Data Mover Challenge 2023

- **Data Mover Challenge (DMC) 2023**

The DMC a biennial competition that bring together experts from industry and academia in a bid to test their software and solutions for transferring huge amounts of research data. DMC 2023 was launched at the SCA23 event.

<https://www.nsc.sg/data-mover-challenge-2023>



National
Supercomputing
Centre

Thank You

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