

HPC Status report from Thailand

NSTDA Supercomputer Center
ThaiSC

Dr. Piyawut Srichaikul

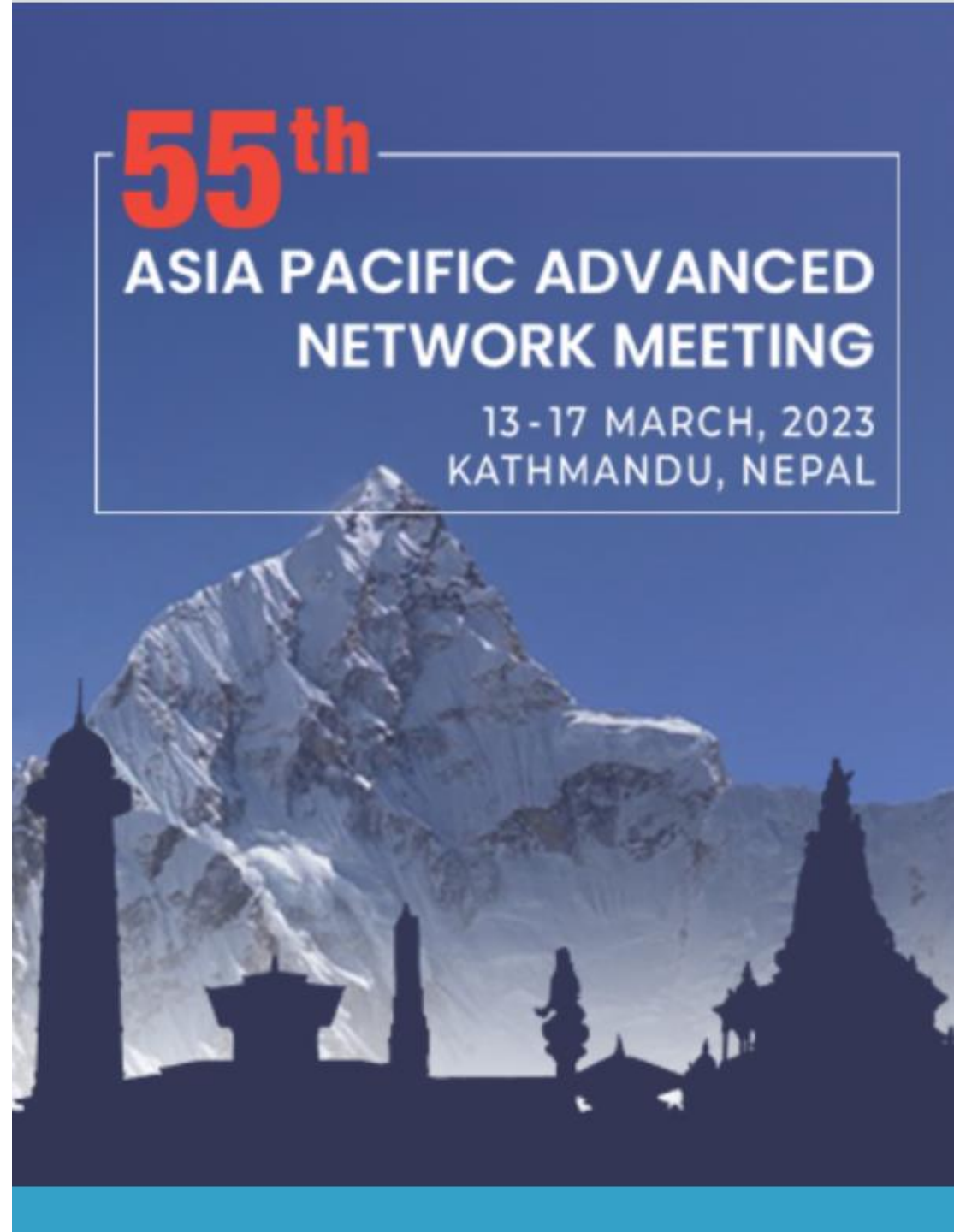
NSTDA Supercomputer Center (ThaiSC)

National Science and Technology Development Agency (NSTDA)

55th

**ASIA PACIFIC ADVANCED
NETWORK MEETING**

13-17 MARCH, 2023
KATHMANDU, NEPAL



HPC Status in Thailand

- **Overview of HPC Infrastructure in Thailand**
- National e-Science Infrastructure Consortium
- NSTDA Supercomputer Center (ThaiSC)



A Survey of High Performance Computing (HPC) Infrastructure in Thailand

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Majority of Available HPC resources (2022)

Thailand total HPC resources

789	Nodes
64,276	Cores
92	TB Total memory
25,352	TB Total Storage
GPUs 149*v100, 825*A100	

From 23 Organizations

13 universities, 4 research institutes,
3 government departments,
State enterprise (EGAT), Public company (SCG)

Major application areas

- 1 **HPC services: parallel processing, MPI, OpenMP, batch processing, and high performance calculation libraries**
- 2 **Engineering designs: finite element calculation, ANSYS, CAD/CAM, CFD, mechanical modeling and simulation, Chemical Simulation**
- 3 **Basic sciences: astronomy, high energy physics, multi-physics, molecular dynamics, molecular modeling**
- 4 **Weather forecast: Weather Research and Forecasting Model, and Regional Atmospheric Modeling System**
- 5 **Artificial Intelligence (AI): Machine Learning (ML), Natural Language Processing (NLP), and TensorFlow**

GPU

HPC Resource	# of nodes	# of cores	GPUs	Memory/Node	Total Memory	Total Storage	Interconnections
BUU	1	224	N/A	3 TB	3 TB	1 PB	100 Gbps InfiniBand
CDTI	7	224	2 x T4 NVIDIA	128 GB	896 GB	56 TB	10 Gbps Ethernet
CU	2	256	6 x T4, 16 x A100 NVIDIA	1 TB	2 TB	300 TB	200 Gbps InfiniBand
CMKL	6	768	48 x A100 NVIDIA, 1 x Phi	1 TB	6 TB	500 TB	200 Gbps InfiniBand
EGAT	13	1,008	1 x Xeon Phi	448 GB	6,080 GB	200 TB	100 Gbps InfiniBand
				704 GB			
SIRIRACH	2	256	16 x A100 NVIDIA	1 TB	2 TB	500 TB	200 Gbps InfiniBand
Med-CU	9	1,456	12 x A100 NVIDIA	256 GB	13 TB	2 PB	100 Gbps InfiniBand
				512 GB			
				1 TB			
HII	24	864	6 x V100, 3 x A100 NVIDIA	384 GB	9,216 GB	1.1 PB	100 Gbps InfiniBand
KU-WATA II	12	240	N/A	256 GB	3,072 GB	46 TB	2x10 Gbps Ethernet
Poseidon AI	1	40	8 x V100 NVIDIA	512 GB	512 GB	120 TB	100 Gbps InfiniBand
KKU	7	396	4 x V100, 8 x A100 NVIDIA	1 TB	3,328 GB	50 TB	10 Gbps Ethernet, 200 Gbps InfiniBand

NARIT	38	1,600	12 x V100 NVIDIA	512GB	11 TB	90 TB	100 Gbps InfiniBand
NBT	4	640	16 x A100 NVIDIA	3 TB	8 TB	3.3 PB	100 Gbps InfiniBand
				1 TB			
KRYPTON	5	1,008	N/A	768 GB	3,840 GB	200 TB	100 Gbps InfiniBand

LANTA	334	42,752	704 x A100 NVIDIA	256 GB	170 TB	10 PB	200 Gbps InfiniBand
				512 GB			
				4 TB			
TARA	68	4,320	28 x V100 NVIDIA	192 GB	36 TB	776 TB	100 Gbps InfiniBand
				3 TB			

PSU	2	256	16 x A100 NVIDIA	1 TB	2 TB	550 TB	200 Gbps InfiniBand
SCG	26	1,144	1 x V100 NVIDIA	192 GB	5 TB	50 TB	56 Gbps InfiniBand
SUT	8	256	N/A	96 GB	768 GB	10 TB	56 Gbps InfiniBand
SLRI	18	168	N/A	48 GB	792 GB	90 TB	100 Gbps InfiniBand

TMD	172	5,504	16 x K80 NVIDIA, 8 x Xeon Phi	128 GB	22 TB	120 TB	100 Gbps Intel OPA
TU	6	96	6 x Geforce 1060Ti NVIDIA	64 GB	384 GB	10 TB	1 Gbps Ethernet
VISTEC	24	800	78 x V100, 2 x A100 NVIDIA	384 GB	6,144 GB	78 TB	100 Gbps InfiniBand
				768 GB	3,072 GB		

				512 GB	2,048 GB		
Total	789	64,276	149 x V100, 825 x A100		92.38 TB	25,352 TB	

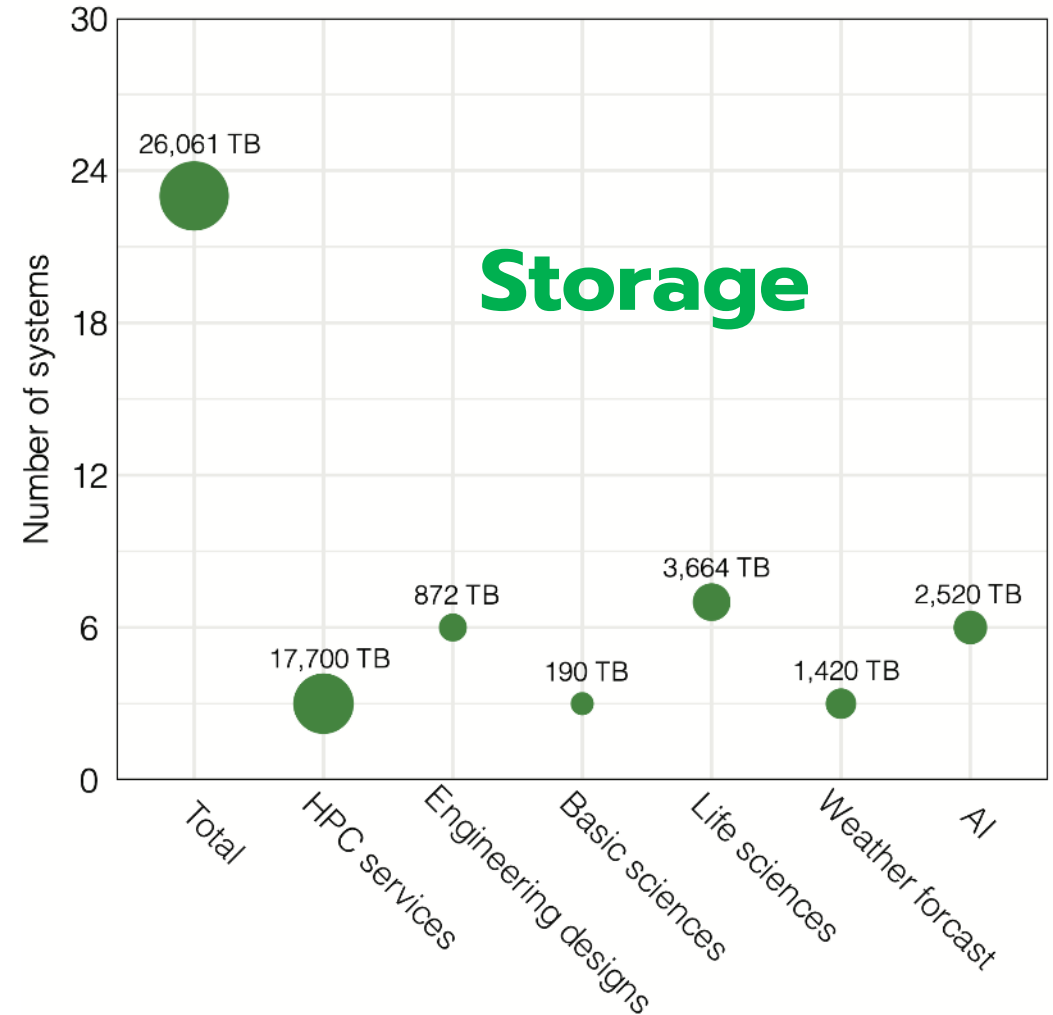
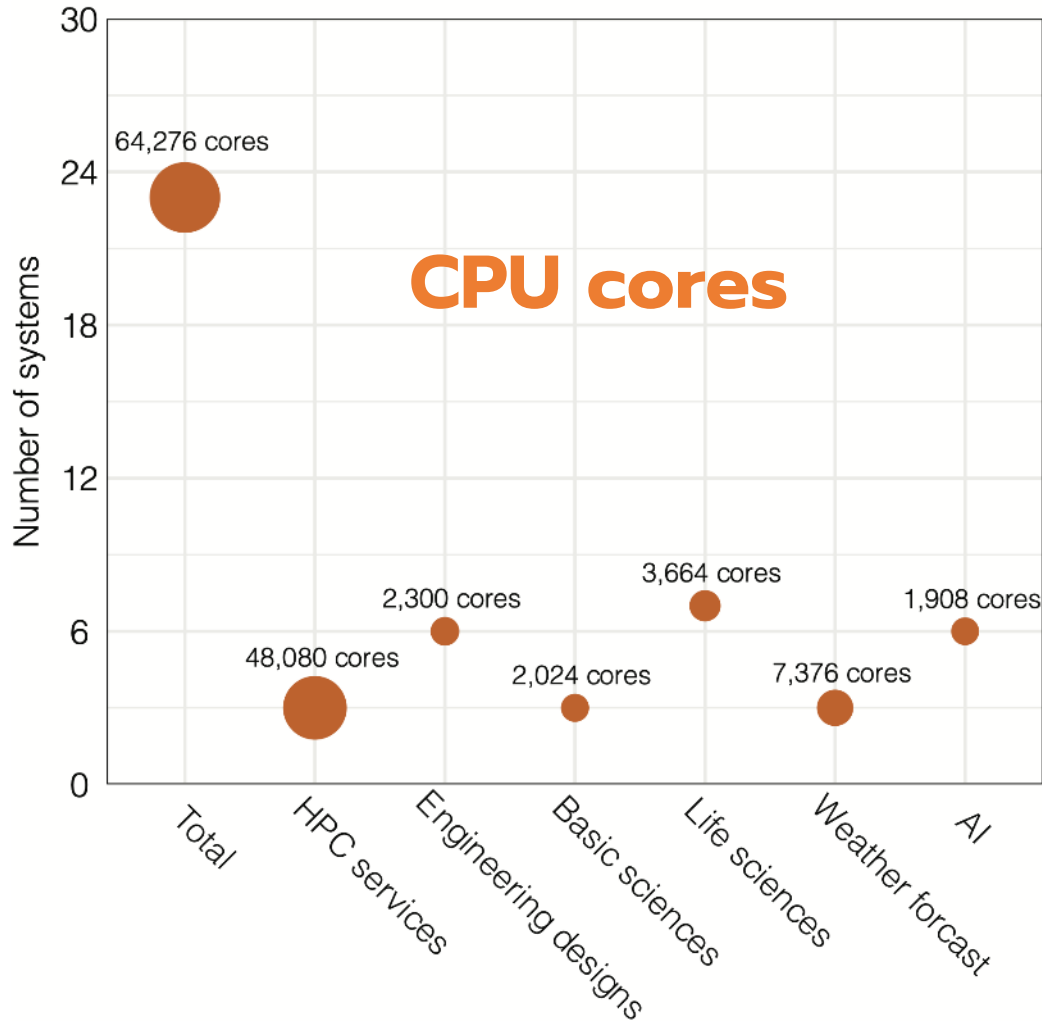
CPU + GPU

CPU

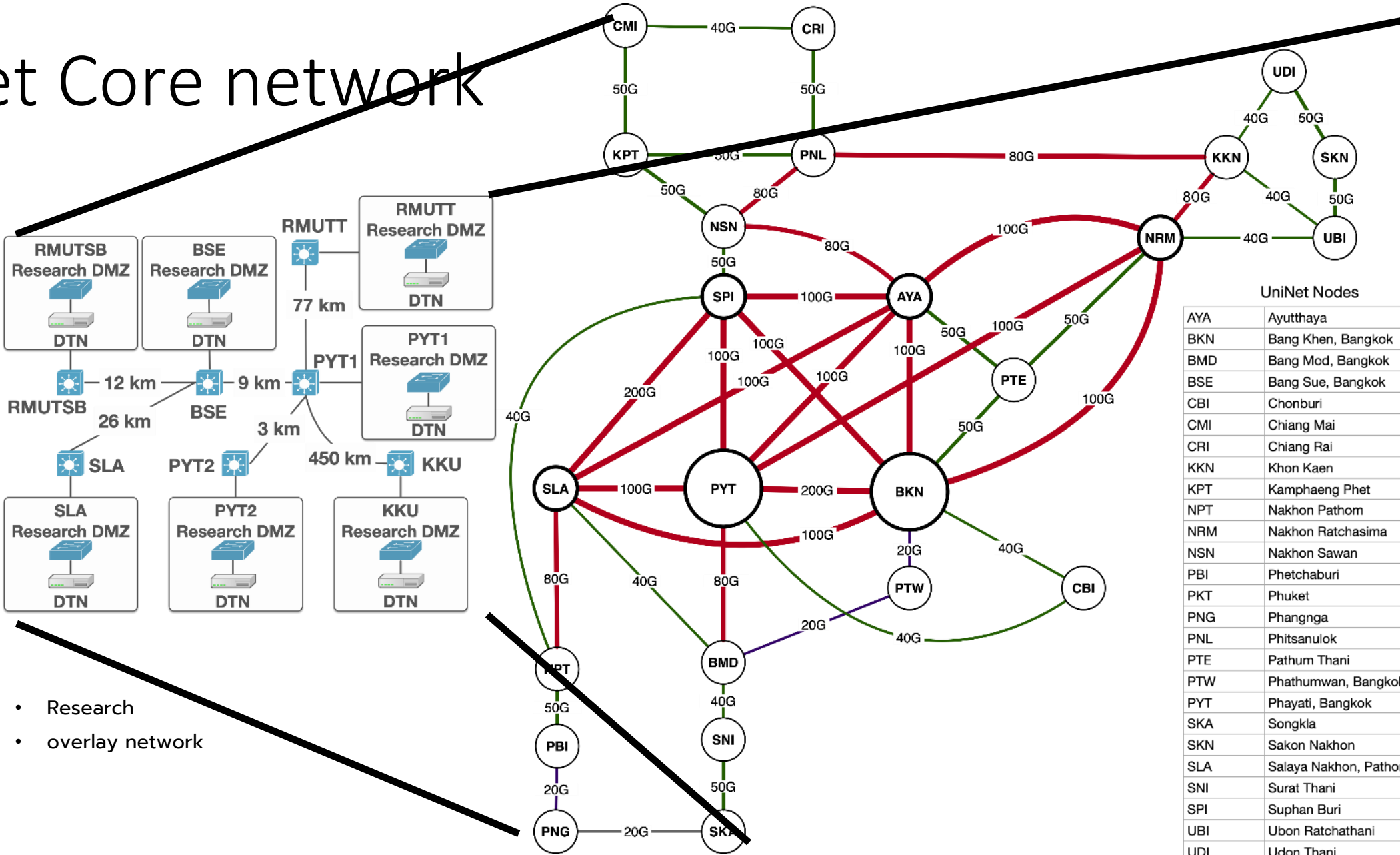
Total



Capacity vs Application Area



UniNet Core network



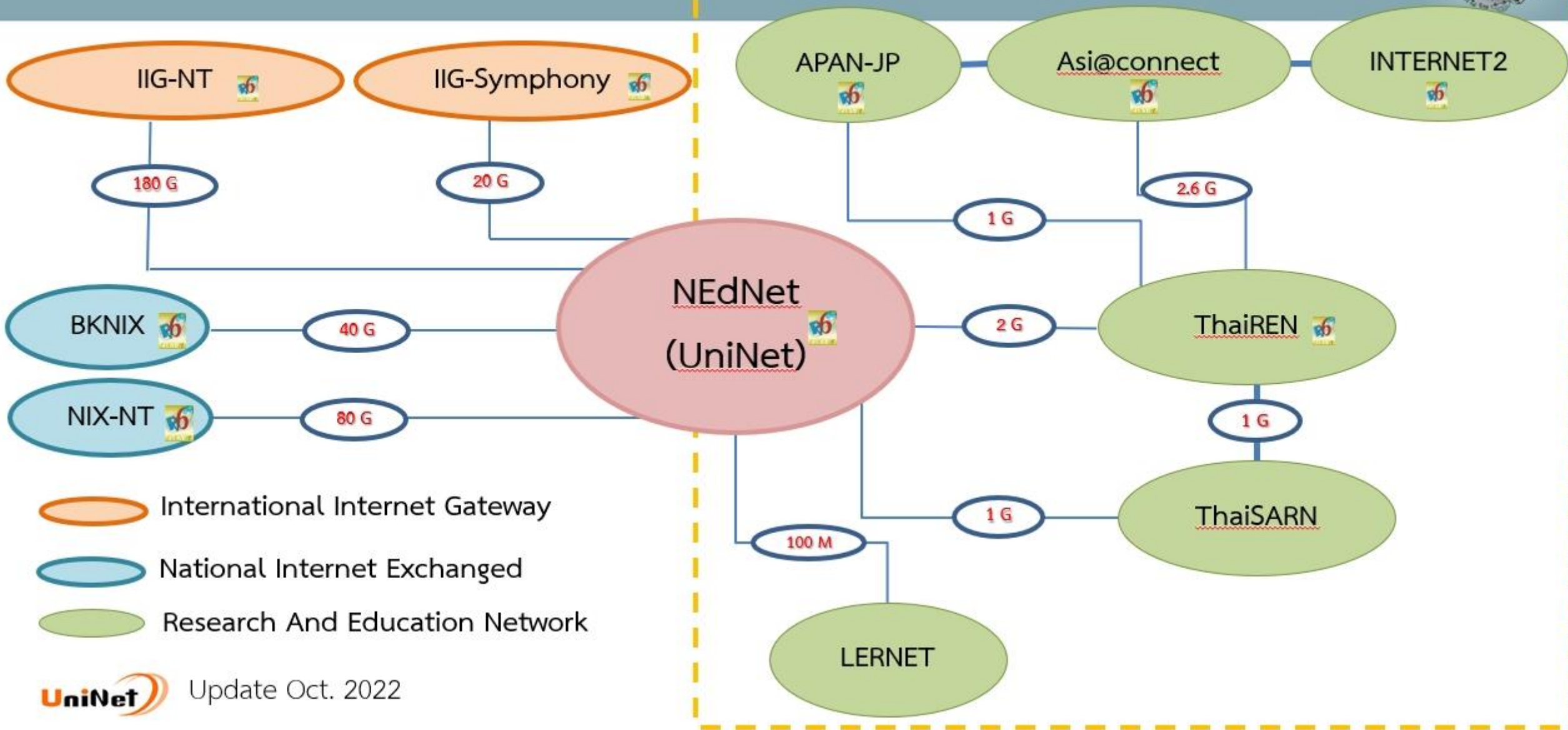
UniNet Nodes

AYA	Ayutthaya
BKN	Bang Khen, Bangkok
BMD	Bang Mod, Bangkok
BSE	Bang Sue, Bangkok
CBI	Chonburi
CMI	Chiang Mai
CRI	Chiang Rai
KKN	Khon Kaen
KPT	Kamphaeng Phet
NPT	Nakhon Pathom
NRM	Nakhon Ratchasima
NSN	Nakhon Sawan
PBI	Phetchaburi
PKT	Phuket
PNG	Phangnga
PNL	Phitsanulok
PTE	Pathum Thani
PTW	Phatumwan, Bangkok
PYT	Phayati, Bangkok
SKA	Songkla
SKN	Sakon Nakhon
SLA	Salaya Nakhon, Pathom
SNI	Surat Thani
SPI	Suphan Buri
UBI	Ubon Ratchathani
UDI	Udon Thani

- Research
- overlay network

Network Peering Internet Map

Research And Education Network



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National e-Science Infrastructure Consortium (2011-present)



- A great vision from [H.R.H. Princess Maha Chakri Sirindhorn](#) that collaborating with CERN, which can help raising the level of fundamental science in Thailand.
- Founded in 2011 from 5 founding members institutes and expand to 9 members in 2019
- Collaboratively develop sustainable e-Science Infrastructure that [support computational science research](#) in Thailand. As well as facilitate Thai scientists to [compute and store the LHC data from CERN](#).

Current members 2023



National e-Science Infrastructure Consortium (2011-present)



HPC research facilities shared by the members

64 Core, 3.8 TB

Computational related to Nuclear technology (for radiotherapeutics, agriculture product, germ, plant breeding)

592 Core, 150 TB

High energy particle physic, Computational chemistry

656 Core, 64.5 TB

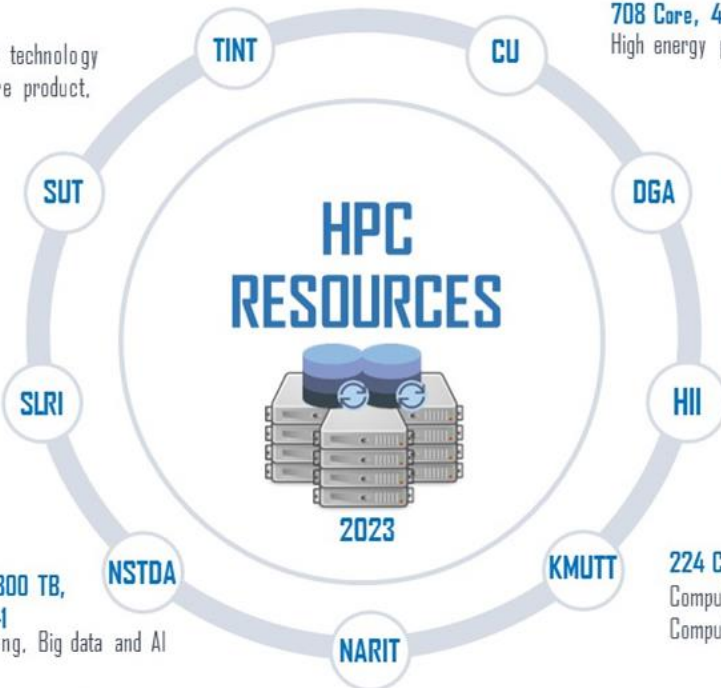
Research using Synchrotron light, High energy particle physic, Computational chemistry

Krypton and TARA
960 Core, 400 TB and **4,320 Core, 800 TB,**
2*DGX-1

Computational science, Computer engineering, Big data and AI

LANTA Supercomputer

the 70th most powerful supercomputer in the world
31,744 Core, 10,000 TB



708 Core, 405 TB

High energy particle physic, Computational chemistry

Data Lake, Open Data

Cloud, Big data, Government data

1,376 Cores, 788 TB

Weather forecast (WRF-ROMS, SWAN, ROMS), Climate change, Machine learning

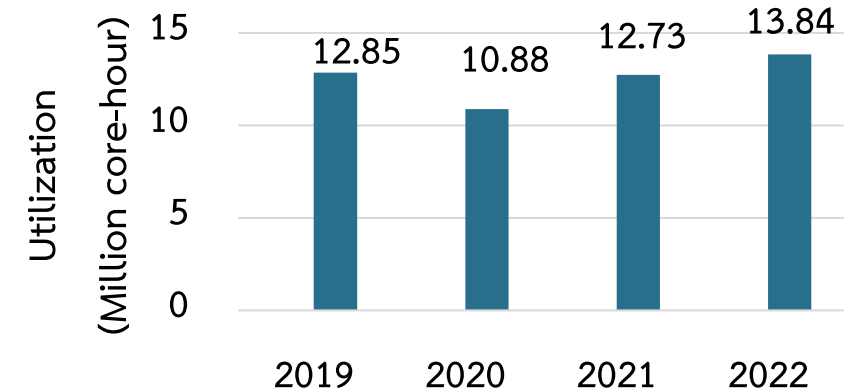
224 Core, 30 TB

Computer science and engineering
Computational chemistry, Biology

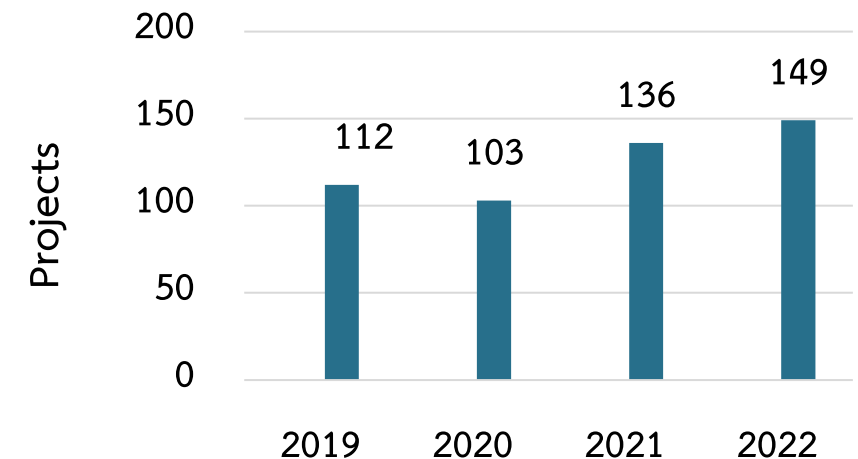
708 Core, 1,100 TB

Computational Astrophysics and Cosmology, Astronomical data analysis and modeling, Weather Research

Computing service provisioning



Number of active projects



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NSTDA Supercomputer Center: ThaiSC

National Science and Technology Development Agency (NSTDA)

missions include the development of S&T infrastructure to support national STI development in Thailand



National S&T Infrastructure (NSTI)



NSTDA Supercomputer Center (ThaiSC): commissioned in 2019 to provide a world-class supercomputer facility for

1

Supporting Thailand's R&D needs for computational power

2

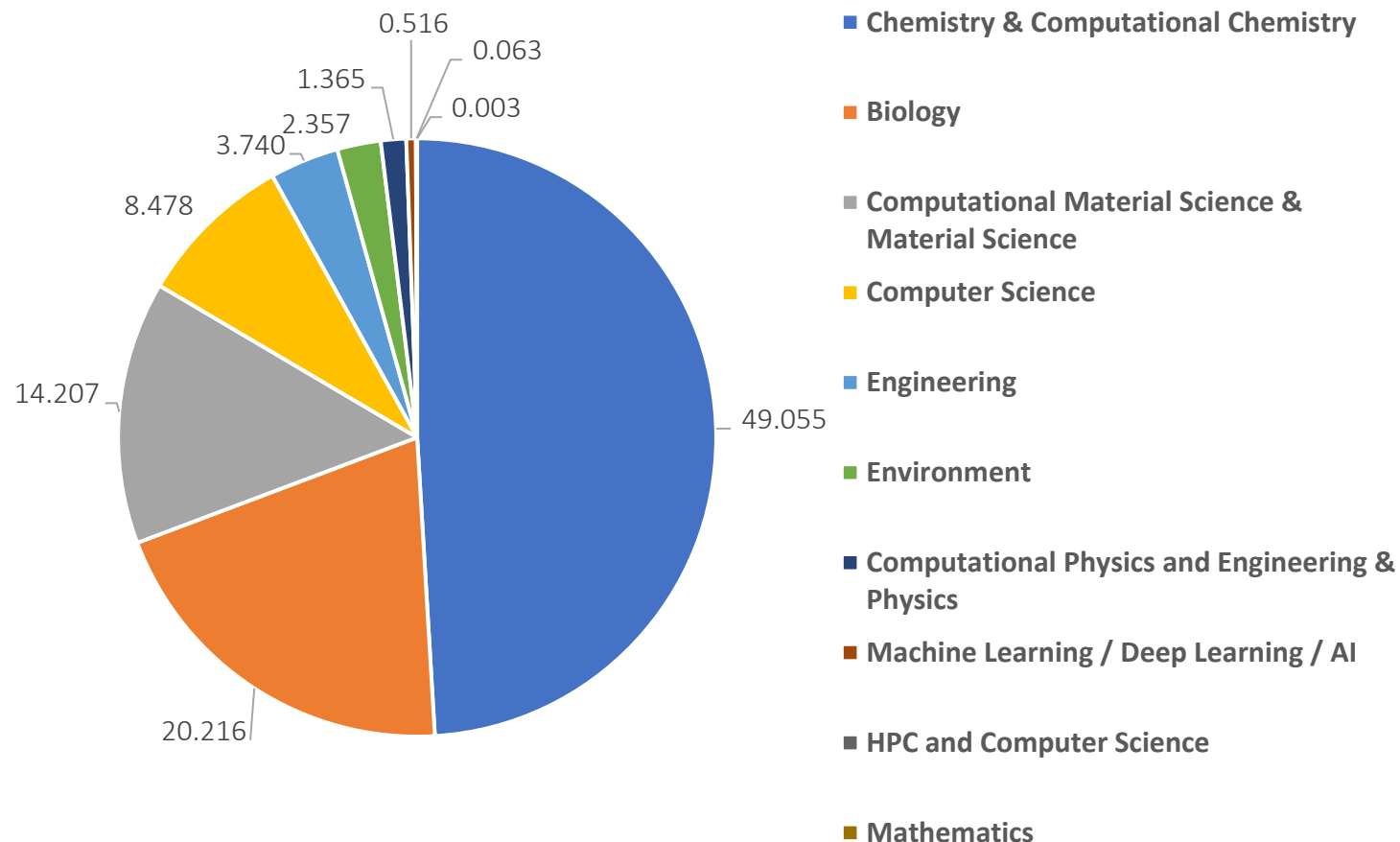
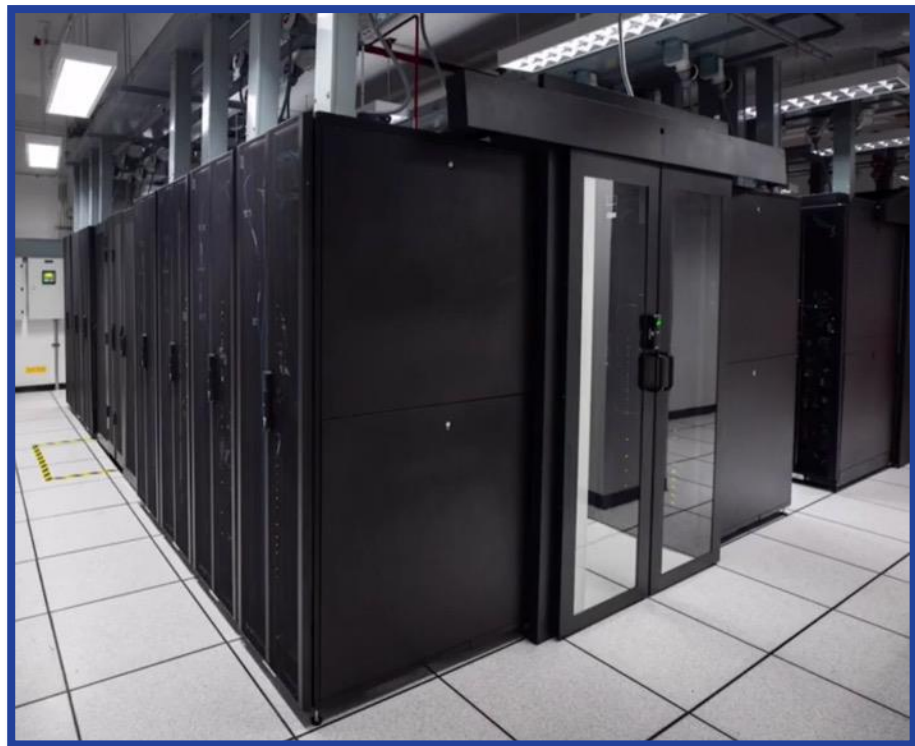
Addressing important and urgent national agendas requiring advanced computing resources

3

Promoting high-tech industries through advanced AI & computing.

TARA HPC Cluster (2019- Feb2023)

- Largest HPC for general public R&D in Thailand
- Service 76.04 million core-hours for
> 200 R&D projects and > 700 users

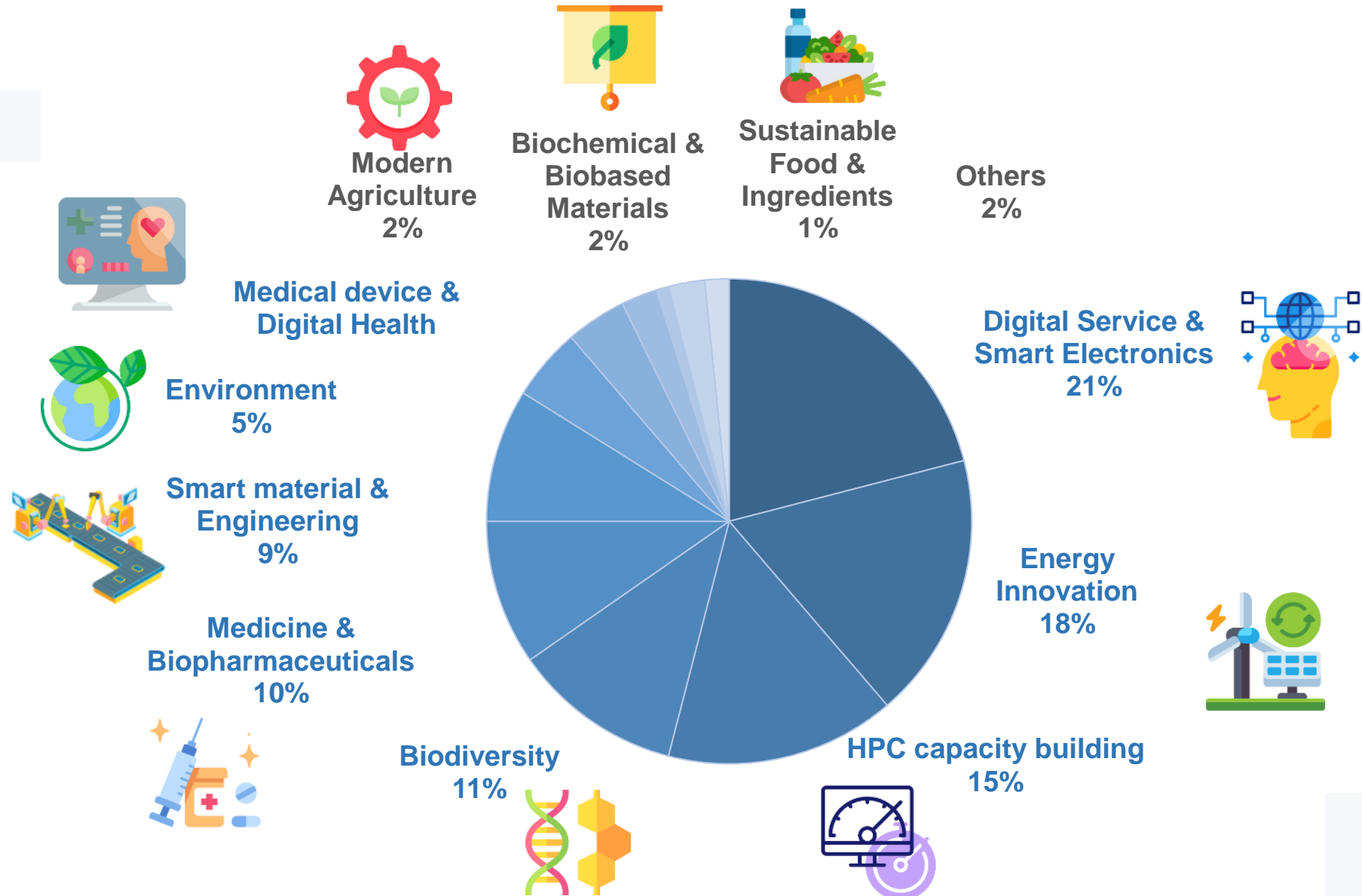


CPU = 4,320 Cores



Storage = 750 TB

TARA User Project Category



TARA's Users

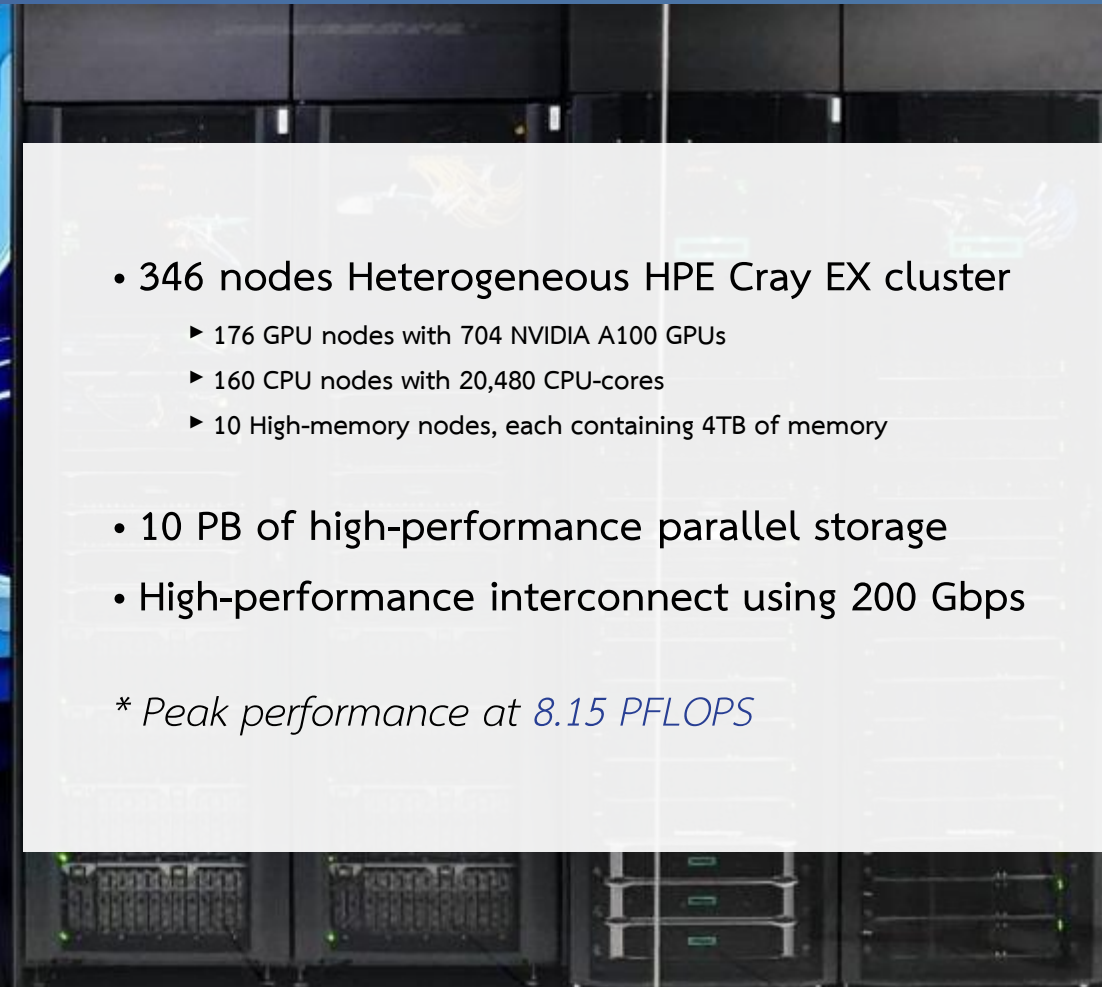


AI FOR THAI



COVID-19 Network Investigations Alliance

Lanta cluster



- 346 nodes Heterogeneous HPE Cray EX cluster
 - ▶ 176 GPU nodes with 704 NVIDIA A100 GPUs
 - ▶ 160 CPU nodes with 20,480 CPU-cores
 - ▶ 10 High-memory nodes, each containing 4TB of memory

- 10 PB of high-performance parallel storage
- High-performance interconnect using 200 Gbps

- * *Peak performance at 8.15 PFLOPS*

LANTA Work In Progress



2023



2024 +

Pioneer Program

For research projects (Thailand Only)

Frontier Science

- Novel material and catalyst design
- Prediction platform for drug discovery

Urgent & Important Issues

- Biosensor design
- Weather & climate model

Large-Scale AI Research

- Healthcare
- Language model
- Multimedia

Pioneer Program

Big research projects (collaborated with Thai PI)

Initiative Model

POC for Shared HPC Infra for ASEAN

International Partners and Networks

เครือข่ายภูมิภาคที่เกี่ยวข้อง

ASEAN/ EU / Asia-Pacific*

(*Japan, Australia, Saudi Arabia & AMS)

ร่วมมือกันผ่าน

ASEAN HPCTF,

EU-ASEAN,

Asia Pacific-EU และ AHC

USA

USC & ANL: Research collaboration between ThaiSC, University of Southern California (USC) & Argonne National Laboratory (ANL)

*MOU for Collaboration between 8 organizations & 7 countries is under discussion and adjustment.

Luxemburge

UNILUX: MOU on Cooperation in the Field of High-Performance Computing and Cloud Computing Platform between University of Luxembourg & NECTEC

Spain

BSC: HPC Network with Barcelona Supercomputer through EU-ASEAN collaboration on HPC

Saudi Arabia
Supercomputing Core Lab, KAUST: MOU for Collaboration*

Finland

CSC – IT Centre for Science Ltd.: MOU for Collaboration*

Poland

Interdisciplinary Centre for Mathematical and Computational Modelling: MOU for Collaboration*

Japan

- **RIKEN/R-CCS:** MOU between R-CCS & NECTEC (under MOU RIKEN & NSTDA)
- **R-CCS:** MOU for Collaboration*
- **AIST:** MOU AIST & NSTDA

Taiwan

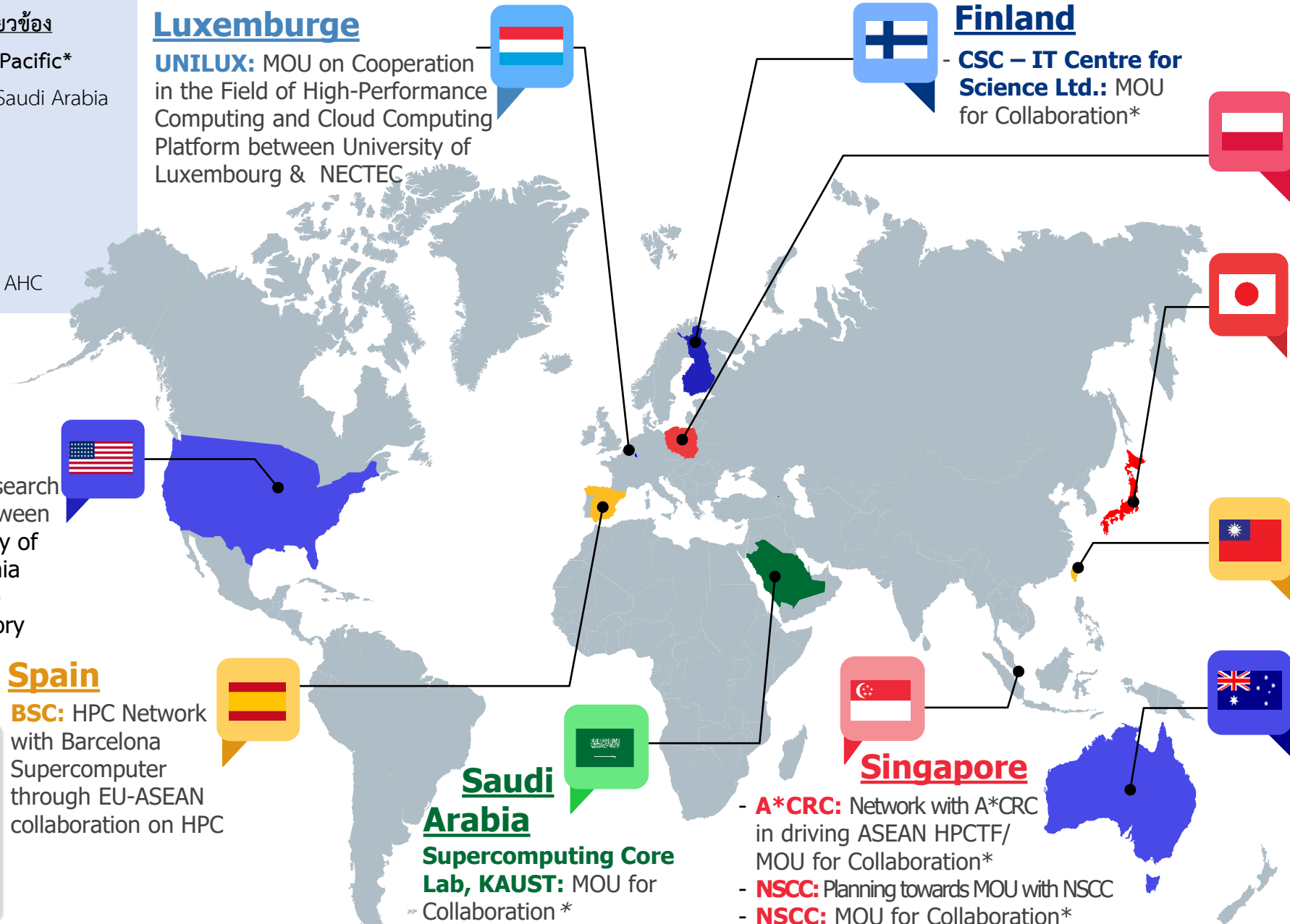
- **NARLabs:** MOU between NARLabs & NSTDA

Australia

Pawsey Supercomputing Centre & The Australian National University represented by the **National Computational Infrastructure:** MOU for Collaboration*

Singapore

- **A*CRC:** Network with A*CRC in driving ASEAN HPCTF/ MOU for Collaboration*
- **NSCC:** Planning towards MOU with NSCC
- **NSCC:** MOU for Collaboration*





ASEAN HPC Task Force



EU-ASEAN Collaboration on HPC:
within framework of Enhanced Regional
EU-ASEAN Dialogue Instrument (E-READI)

The 3rd ASEAN HPC Task Force Meeting



5-6 September 2019, Bangkok, Thailand

ASEAN HPC Taskforce Activities

EU-ASEAN HPC School 2021 & 2022

Background:

- The EU-ASEAN HPC Schools were endorsed from ASEAN HPC Task Force (HPCTF), the European Union Delegation to ASEAN, ASEAN Secretariat, Thailand's Ministry of Higher Education, Science, Research and Innovation (MHESI), and the private sector. The schools were organized by the ASEAN HPCTF and carried out in the framework of Enhanced Regional EU-ASEAN Dialogue Instrument (E-READI).
- **2021 (5-9 July 2021):** the school was hosted virtually by the National Science and Technology Development Agency (NSTDA) Supercomputer Center (ThaiSC), Thailand
- **2022 (5 – 10 December 2022):** the school took place in person at Kasetsart University & Thailand Science Park, Thailand



Objectives:

To facilitate the development of HPC skills and capacity growth in ASEAN and its applications to critical problems of major social and economic importance, such as the fight against COVID-19 and natural disaster prevention.

School website: <https://www.hpcschool.net/>



NSTDA Supercomputer Center

ThaiSC

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