จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University
Pillar of the Kingdom

9th Asian Forum for Accelerators and Detectors (AFAD 2018)

NETWORK AND COMPUTING IN THAILAND

Burin Asavapibhop
Department of Physics, Faculty of Science
Chulalongkorn University
Bangkok, Thailand

With deepest gratitude and appreciation to

Her Royal Highness Princess Maha Chakri Sirindhorn of Thailand

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HRH VISITED CERN

2000

2003

2009

2010

2015

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EOI: SLRI and CMS

Expression of Interest
In
The Participation of Physicists from Universities and Research Institutes from Thailand in the CMS Experiment at the CERN LHC Accelerator

The Synchrotron Light Research Institute (Public Organization) of Thailand ("SLRI") and the Institutes of the CMS Collaboration at the European Organization for Nuclear Research ("CERN") Large Hadron Collider ("LHC") accelerator hereby express their joint interest in enabling physicists from Thailand to participate in this experiment.

During HRH's 3rd visit, an EOI was signed between The Synchrotron Light Research Institute (SLRI) and the CMS Collaboration

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THAI-CERN COLLABORATION

- Launched the Thai-CERN Collaboration Program under the initiative of HRH Princess Maha Chakri Sirindhorn in 2009

- Chaired by Prof. Pairash Thajchayapong, Former Permanent Secretary of Ministry of Science and Technology

1. Chulalongkorn University (CU)
2. Suranaree University of Technology (SUT)
3. King Mongkut's University of Technology Thonburi (KMUTT)
4. Mahidol University (MU)
5. National Science and Technology Development Agency (NSTDA)
6. National Astronomical Research Institute of Thailand (NARIT)
7. Hydro and Agro Informatics Institute (HAII)
8. Thailand Institute of Nuclear Technology (TINT)
9. Synchrotron Light Research Institute (SLRI)
10. Thailand Center of Excellence in Physics (ThEP)
11. Thailand Research Fund (TRF)
12. Agricultural Research Development Agency (ARDA)
13. Institute for Promotion of Teaching Science and Technology (IPST)

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NATIONAL E-SCIENCE
INFRASTRUCTURE CONSORTIUM

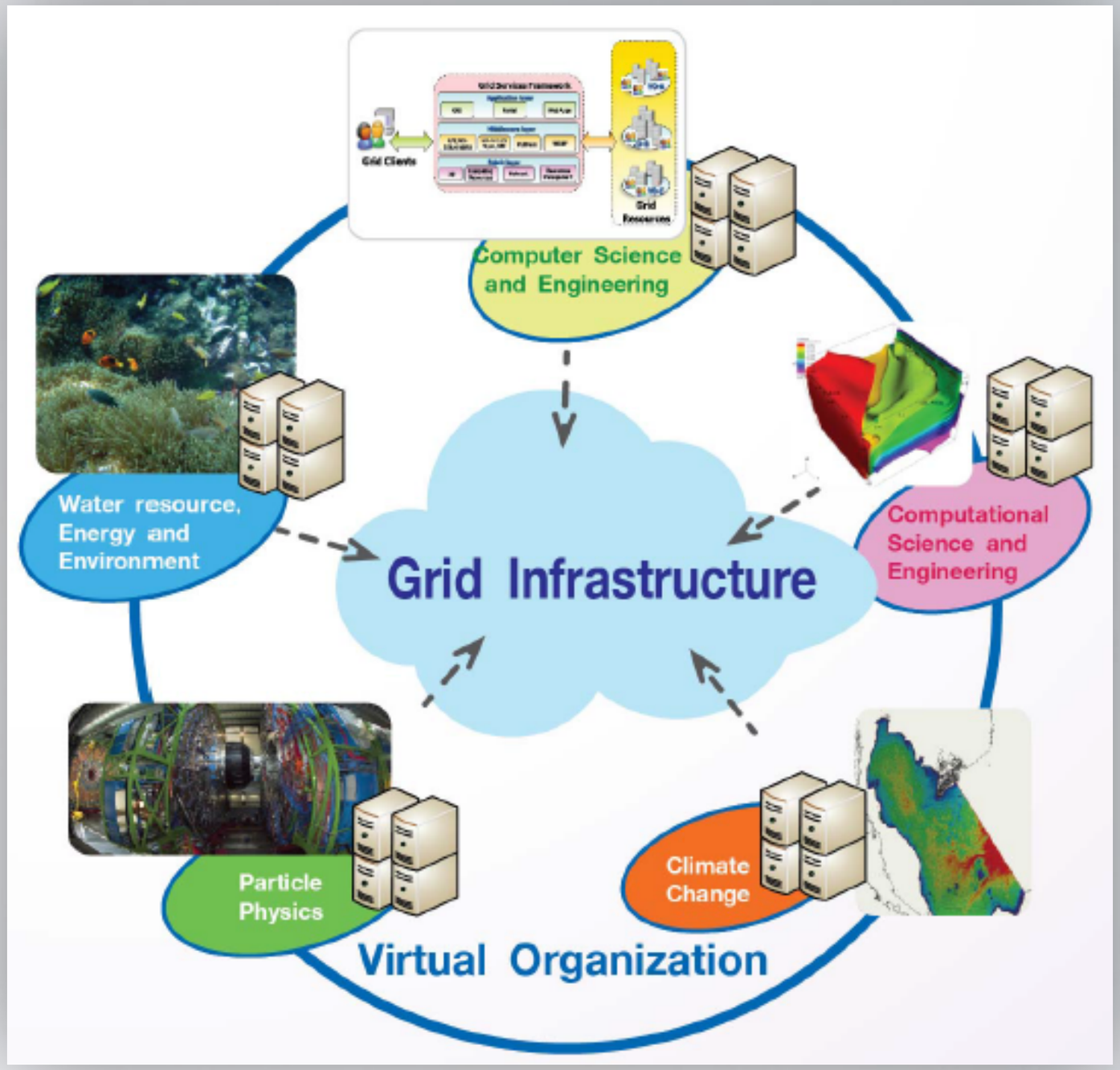
National e-Science Infrastructure Consortium MOU Signing
CU SUT KMUTT HAII NSTDA
27 September 2011

- Initiative to collaboratively develop national infrastructure for e-Science in Thailand
  - Run as a consortium
  - All members manage with their own budgets
- Heads of all institutes are steering committee
- Total Budget: USD$3.7Million
- Use Virtual Organization (VO) to manage application areas
- Shared resource, CPU and Data
- Open for new members toward National Infrastructure

Large-Scale Simulation Research Laboratory
National Electronics and Computer Technology Center

Current application areas:

- High energy physics & Astroparticle
- Climate change
- Water and energy resources, and, environment
- Computational science and engineering
- Computer science and engineering



MEMBERS

National Science and Technology Development Agency (NSTDA)

- under the administration of Ministry of Science and Technology
- consist of 4 national R&D centers:
  National Center for Genetic Engineering and Biotechnology (BIOTEC),
  National Metal and Materials Technology Center (MTEC),
  National Electronics and Computer Technology Center (NECTEC),
  and National Nanotechnology Center (NANOTEC)
- develop and apply computational approaches in research areas such as nanoscience, molecular biology, bio-informatics, engineering designs, and, environmental sciences as well as in the areas of networking infrastructure, technology and application development
- maintain a number of national scientific databases such as Genome Databases, Life Cycle Inventory Database, and, Annotated and Multimedia Corpus

MEMBERS

Hydro and Agro Informatics Institute (HAII)

- a public organization under the Ministry of Science and Technology
- develop a coherent plan to improve water resource management in Thailand
- research areas
  - Short-term weather prediction using coupling atmosphere and ocean models (WRF-ROMS)
  - Wind-Wave prediction using Simulating WAve Near-shore (SWAN) model and storm surge
  - Seasonal precipitation prediction
  - Flood forecasting system
  - Hydroinformatics

King Mongkut's University of Technology Thonburi (KMUTT)

- high performance computing and mobile sourcing platforms in collaboration with CERN
- data and opinion mining and the 3D medical imaging engines frameworks
- multidisciplinary research in the fields of bio-engineering and bioinformatics, Computation Fluid Dynamics, and particle physics simulation

MEMBERS

Suranaree University of Technology (SUT)

- Thailand's first autonomous university founded in 1990
- contribute to ALICE Tier-2 since 2013
- take part in promoting the Nakhon Ratchasima Province as the center for 5 areas, including the Education Hub, Medical Hub, Transportation and Logistics Hub, Food Hub and Tourism and Sports Hub

Chulalongkorn University (CU)

- Thailand's first institution of higher education founded in 1917
- contribute to CMS Tier-2 since 2013
- current research projects under e-Science include physics, chemistry, material science, and computer science

MEMBERS

Electronic Government Agency (EGA)

- under supervision of the Ministry of Information and Communication Technology
- key organization responsible for promoting and supporting the development of e-Government services

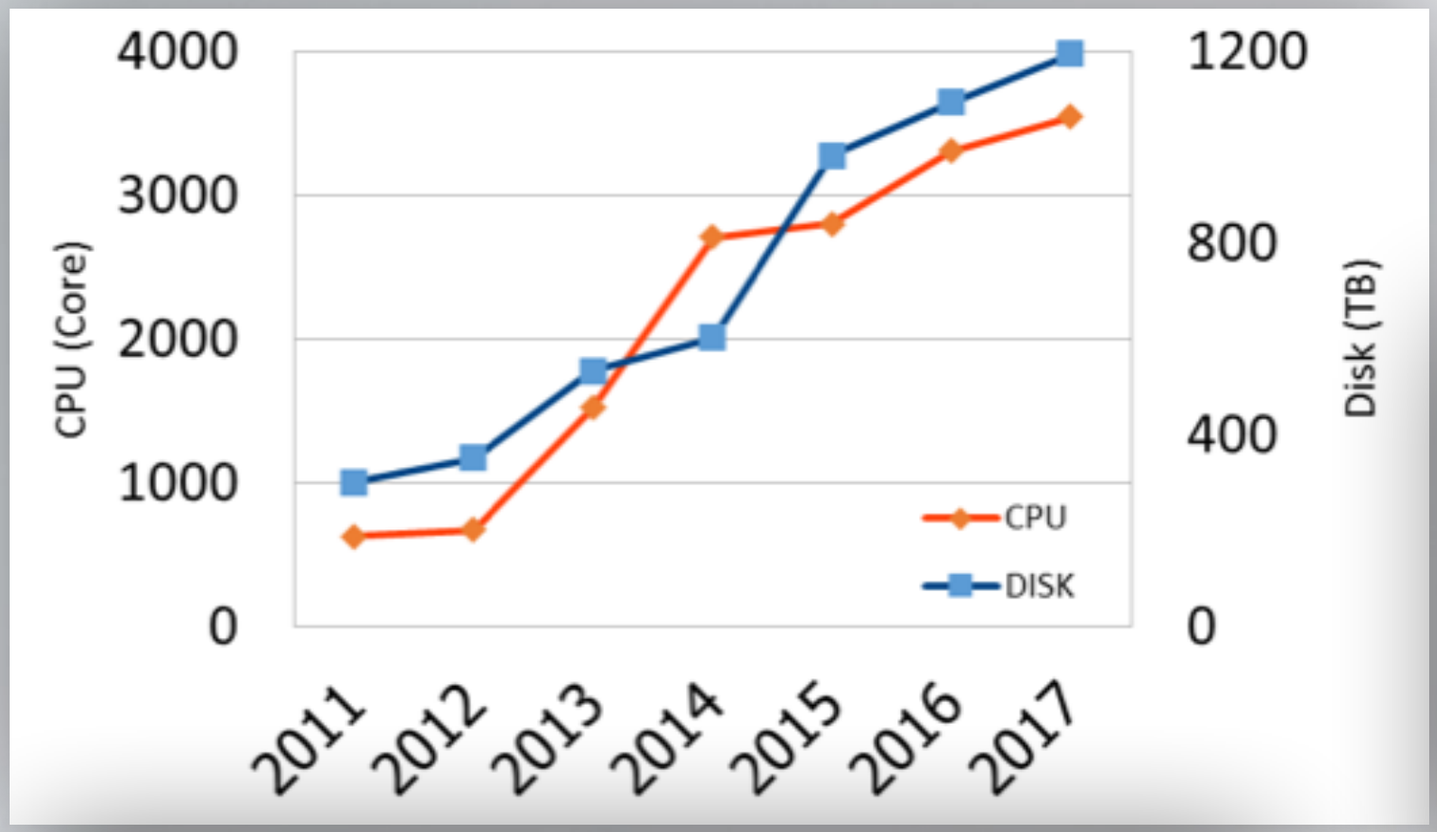
National Astronomical Research Institute of Thailand (NARIT)

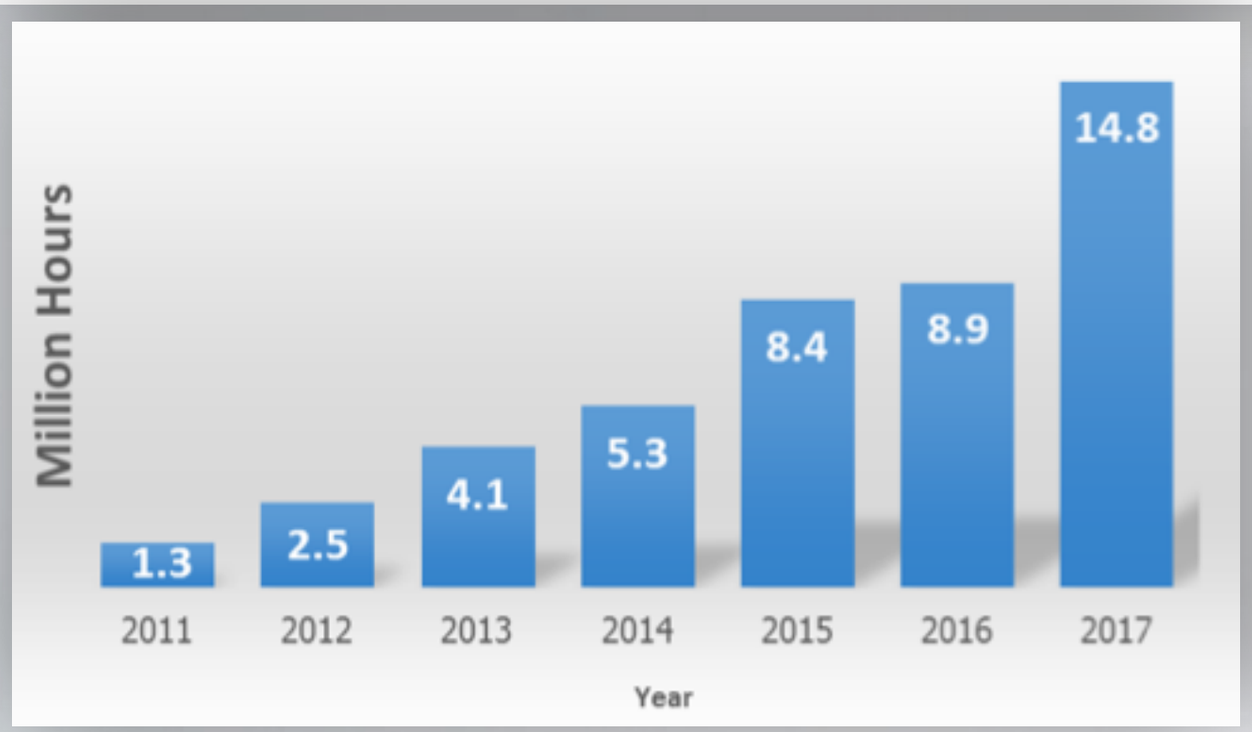
- a public organization under the Ministry of Science and Technology
- on-going researches involve handling and analysis of big dataset as well as complicated modeling of astrophysical processes and simulations
- computational astronomy at NARIT covers a wide range of subjects from stellar, extra-galactic astrophysics, astroclimate to cosmology

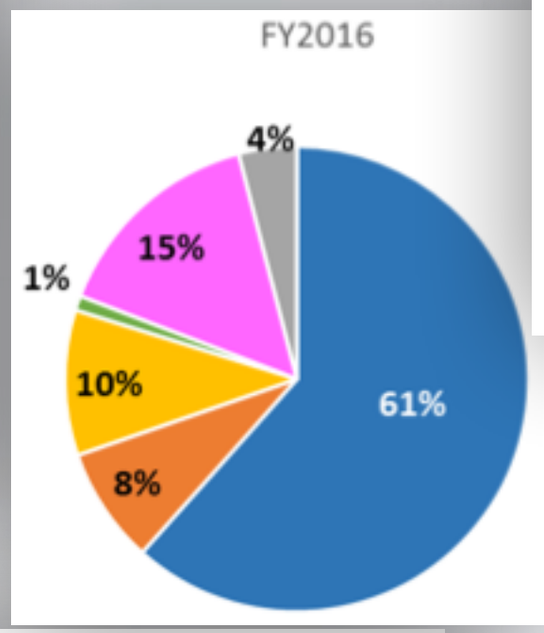
RESOURCES

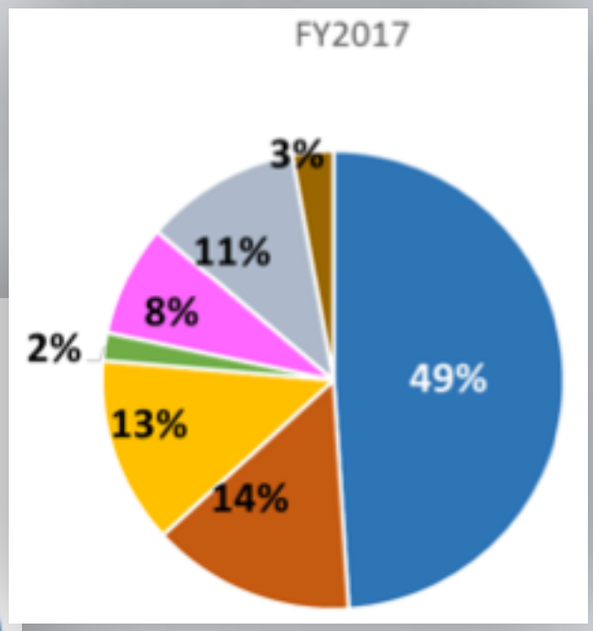
Site	CPU (Cores)	Storage (TB)
NSTDA	688	660
HAII	896	112
KMUTT	224	30
SUT	656	150
CU	340	106
EGA	80	13
NARIT	540	100
Total	**3,424**	**1,171**

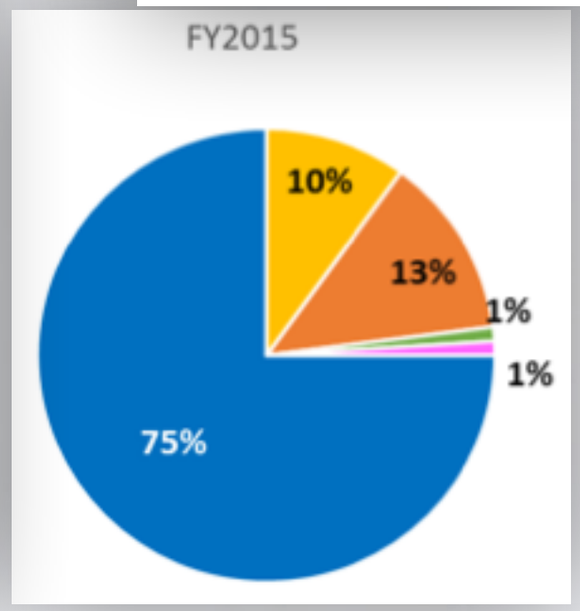
USAGES











NSTDA
KMUTT
SUT
CU
HAII
EGA
NARIT

OUTPUTS

FY	International Journal	National Journal	International Conference Proceedings	National Conference Proceedings	Others	**Total**
2012	17	1	12	15	7	**52**
2013	17	-	28	6	21	**72**
2014	47	1	18	5	15	**86**
2015	40	17	21	3	17	**98**
2016	37	1	18	5	26	**87**

Between the fiscal year 2011 and 2016, there are 167 research projects from35 institutions using computing resources.

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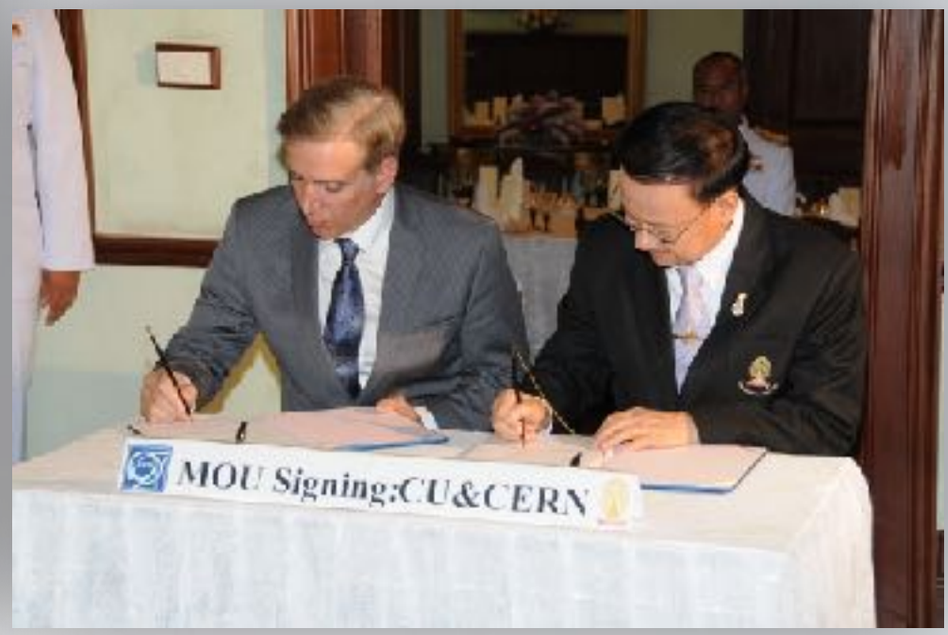
Chulalongkorn University is Thailand's oldest and one of the country's most prestigious universities.

Officially established on March 26, 1917 by King Vajiravudh (Rama VI) and named after his father King Chulalongkorn (Rama V).

- 18 Faculties, 3 Schools, 3 Colleges and 6 Institutes.
- ~20,000 Undergraduate students
- ~9,800 Master and 1,800 PhD students
- ~7,800 Faculty and staff



CU-CMS MOU Signing at Sra Patum Palace 14 July 2012

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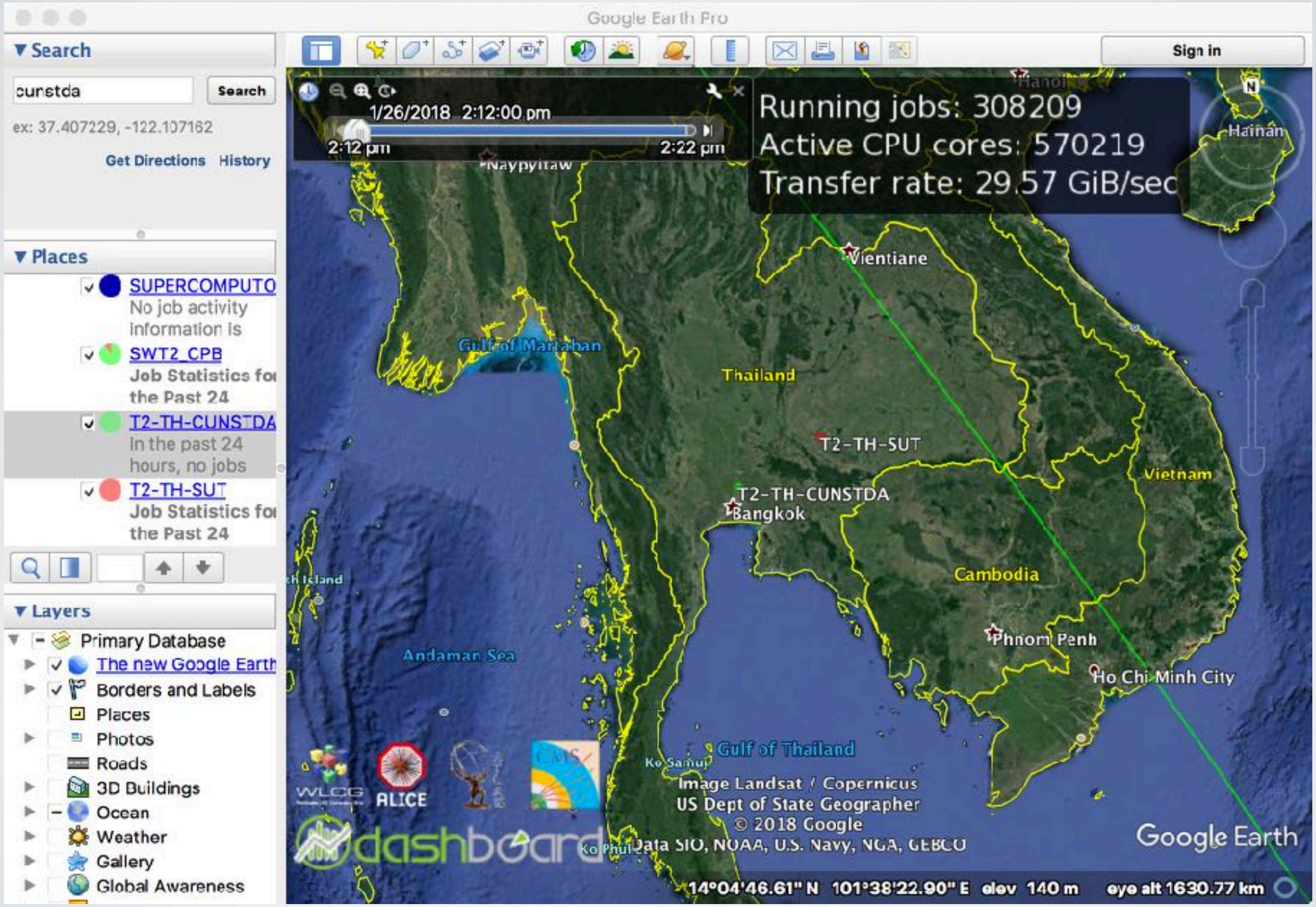
Chulalongkorn University together with the National Electronics and Computer Technology Center (**NECTEC**, under the NSTDA) will provide the necessary computing resources for the **CMS Tier-2**

CU-SUT-NSTDA-CERN MOU Signing
at Sra Patum Palace
10 October 2013


Google Earth Pro
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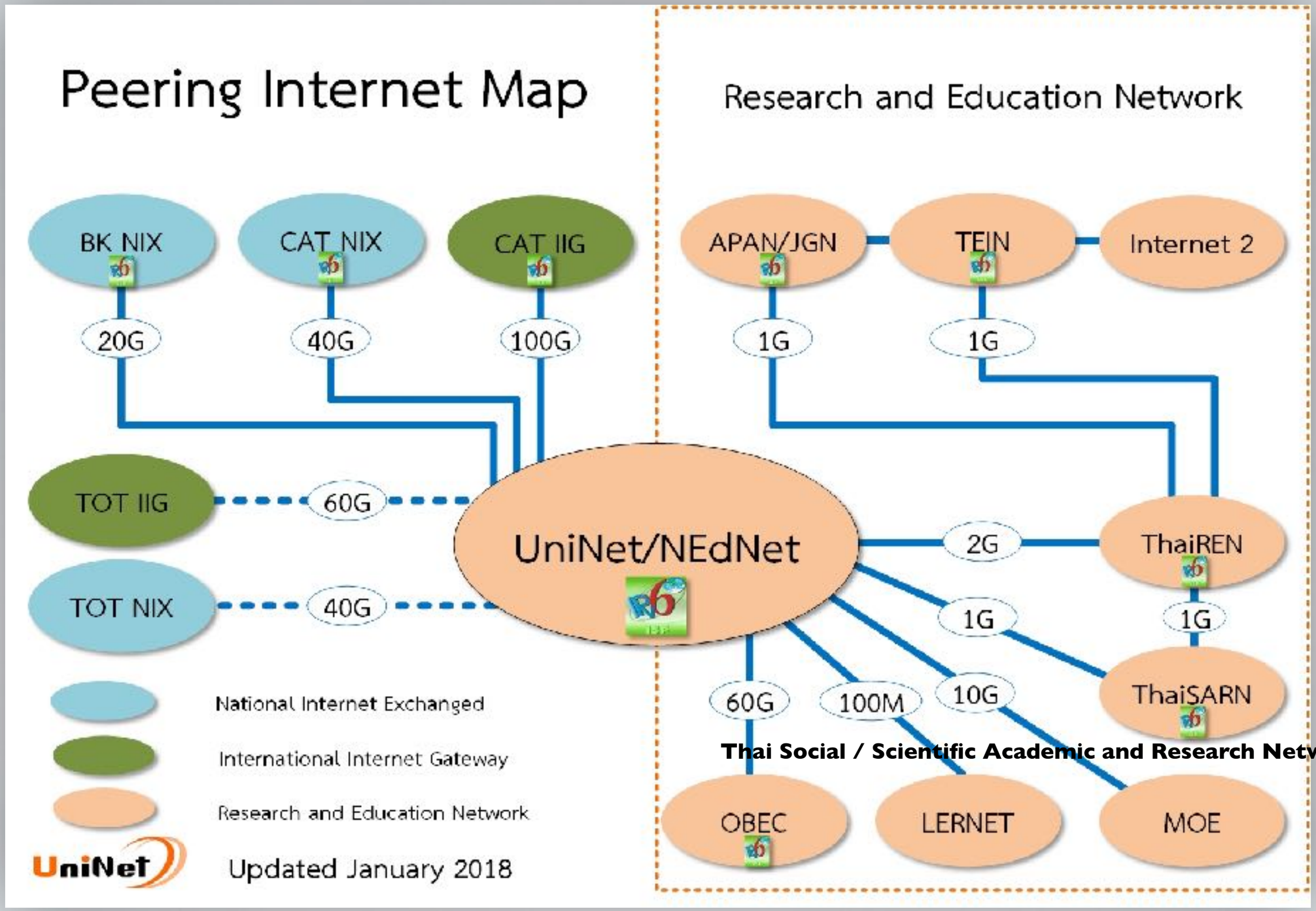
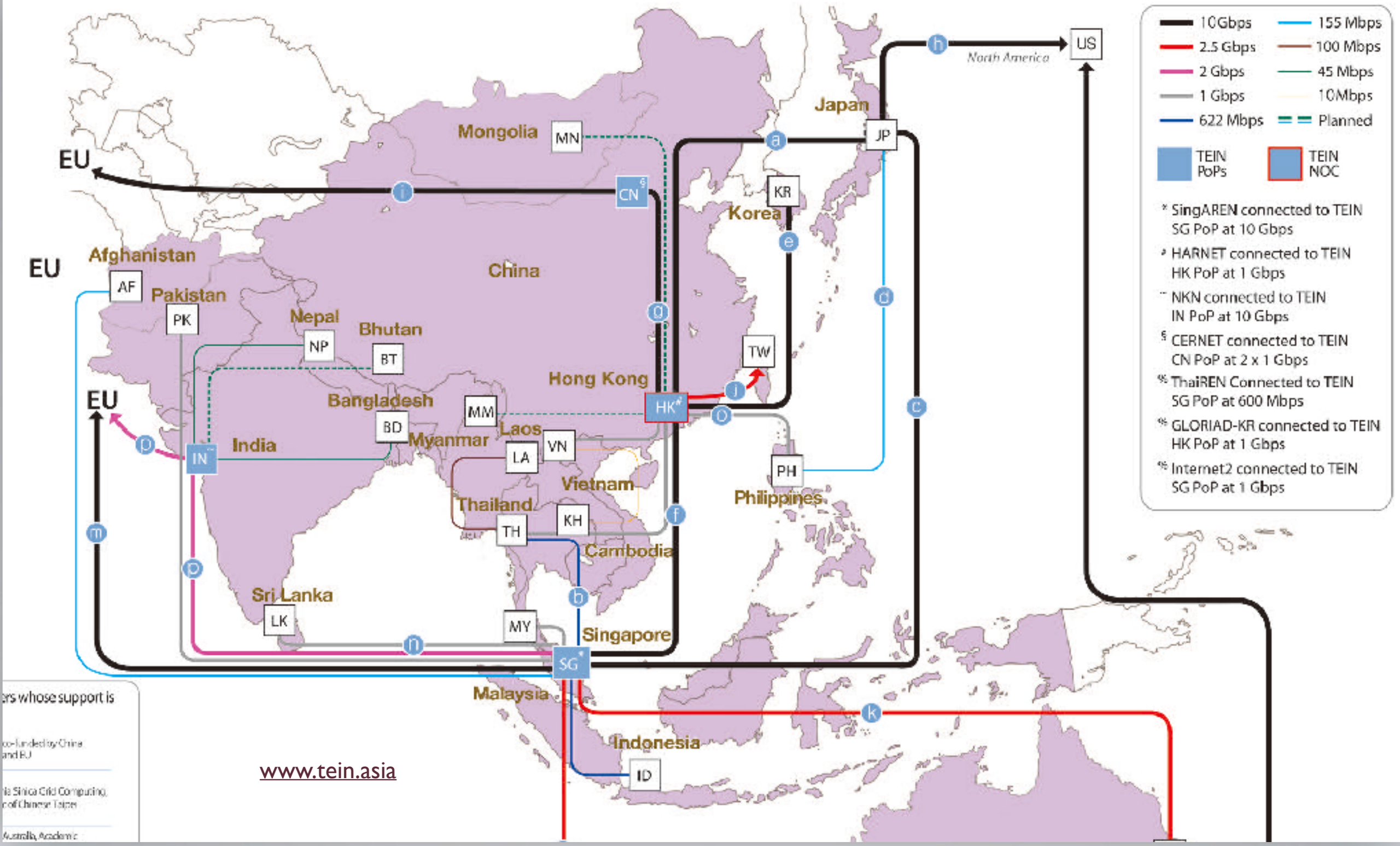
ex: 37.407229, -122.107162
Get Directions History
Places
SUPERCOMPUTO
No job activity information is
SWT2_CPB
Job Statistics for the Past 24
T2-TH-CUNSTDA
In the past 24 hours, no jobs
T2-TH-SUT
Job Statistics for the Past 24
Layers
Primary Database
The new Google Earth
Borders and Labels
Places
Photos
Roads
3D Buildings
Ocean
Weather
Gallery
Global Awareness
Sign in
1/26/2018 2:12:00 pm
2:12 pm
2:22 pm
Running jobs: 308209
Active CPU cores: 570219
Transfer rate: 29.57 GiB/sec
Naypyitaw
Hanoi
Hainan
Vientiane
Gulf of Martaban
Thailand
T2-TH-SUT
Vietnam
T2-TH-CUNSTDA
Bangkok
Cambodia
Phnom Penh
Ho Chi Minh City
Andaman Sea
Gulf of Thailand
Ko Samui
Image Landsat / Copernicus
US Dept of State Geographer
© 2018 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth
WLCG
ALICE
CMS
dashboard
14°04'46.61" N 101°38'22.90" E elev 140 m eye alt 1630.77 km


Peering Internet Map
Research and Education Network
BK NIX
CAT NIX
CAT IIG
APAN/JGN
TEIN
Internet 2
20G
40G
100G
1G
1G
TOT IIG
60G
TOT NIX
40G
UniNet/NEdNet
2G
ThaiREN
1G
1G
ThaiSARN
60G
100M
10G
Thai Social / Scientific Academic and Research Network
OBEC
LERNET
MOE
National Internet Exchanged
International Internet Gateway
Research and Education Network
UniNet
Updated January 2018


EU
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Myanmar
MM
Laos
LA
VN
Vietnam
Thailand
TH
KH
Cambodia
Sri Lanka
LK
MY
Singapore
SG
Malaysia
Indonesia
ID
Hong Kong
HK
TW
Korea
KR
Japan
JP
US
North America
PH
Philippines
10Gbps
2.5 Gbps
2 Gbps
1 Gbps
622 Mbps
155 Mbps
100 Mbps
45 Mbps
10Mbps
Planned
TEIN PoPs
TEIN NOC
* SingAREN connected to TEIN SG PoP at 10 Gbps
# HARNET connected to TEIN HK PoP at 1 Gbps
¨ NKN connected to TEIN IN PoP at 10 Gbps
§ CERNET connected to TEIN CN PoP at 2 x 1 Gbps
% ThaiREN Connected to TEIN SG PoP at 600 Mbps
% GLORIAD-KR connected to TEIN HK PoP at 1 Gbps
% Internet2 connected to TEIN SG PoP at 1 Gbps
www.tein.asia

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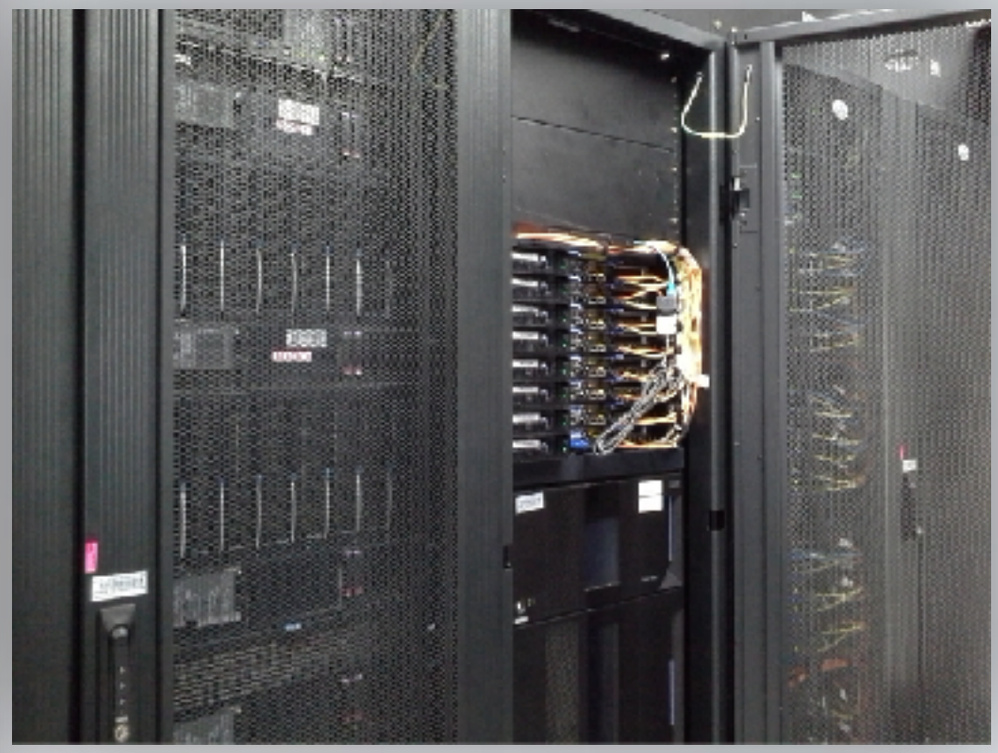
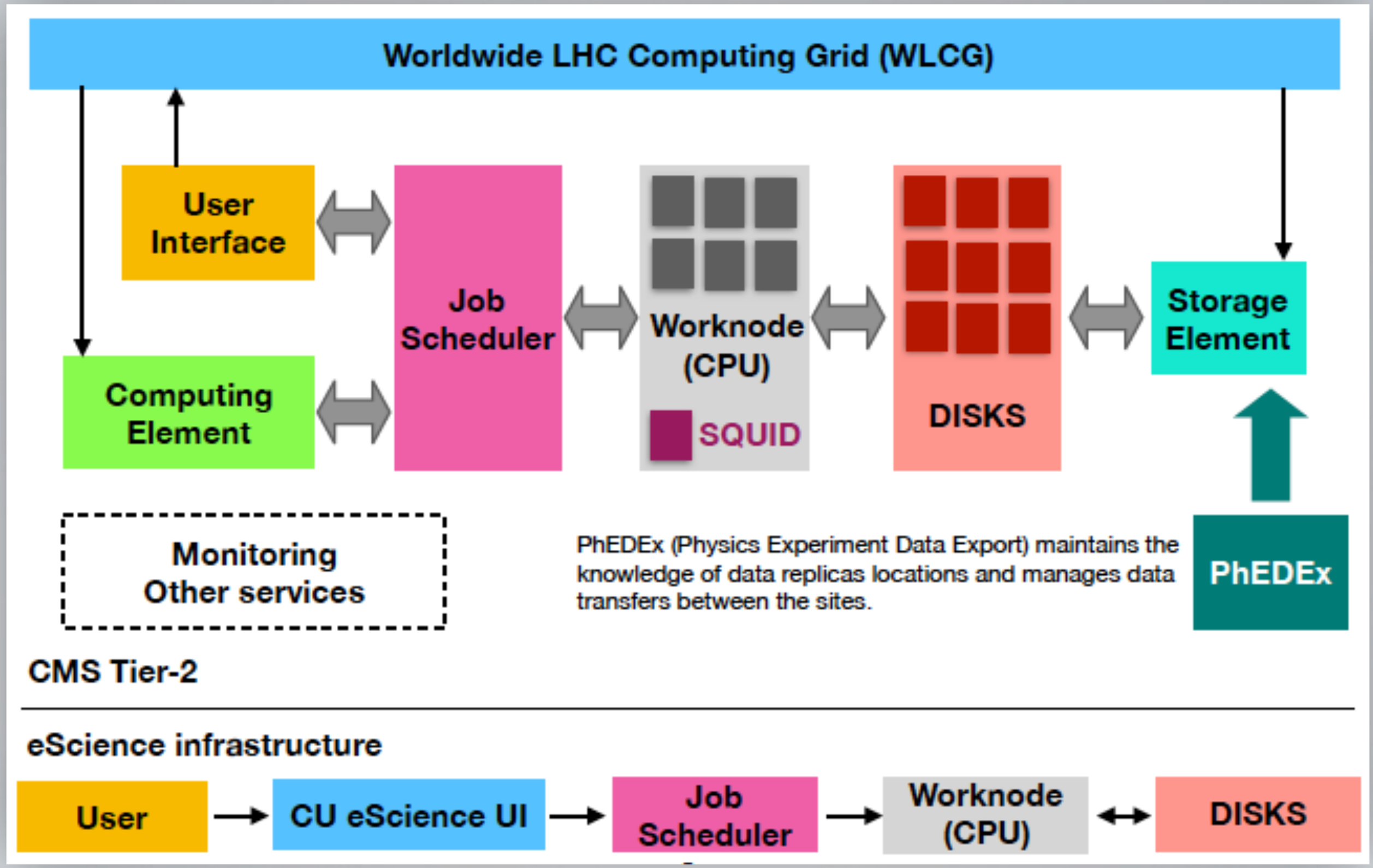
CMS CENTER @ CU

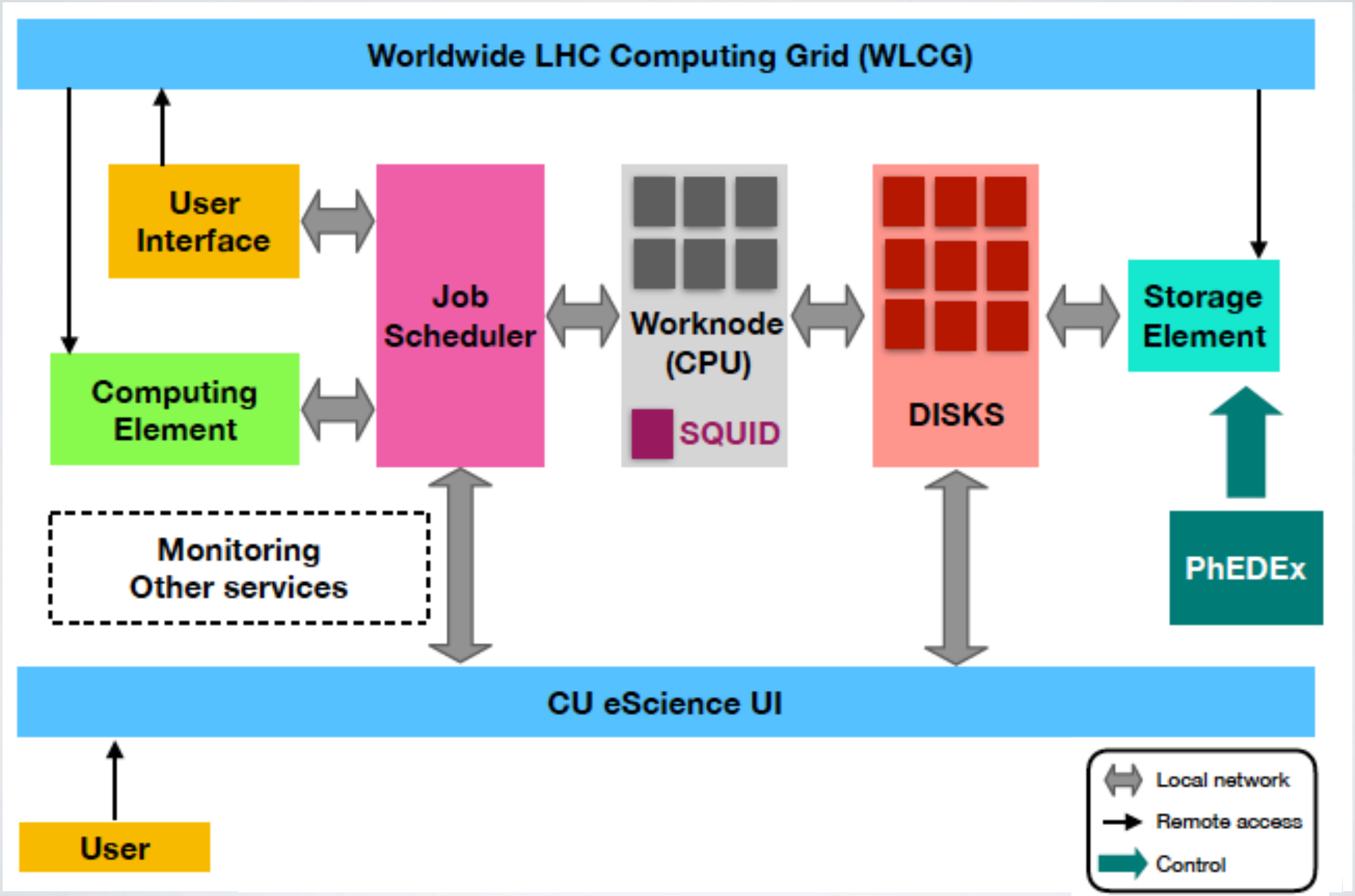


- **448 cores**
- **176 TB**

TO DO


Worldwide LHC Computing Grid (WLCG)
User Interface
Job Scheduler
Worknode (CPU)
SQUID
DISKS
Storage Element
Computing Element
Monitoring
Other services
PhEDEx (Physics Experiment Data Export) maintains the knowledge of data replicas locations and manages data transfers between the sites.
PhEDEx
CMS Tier-2
eScience infrastructure
User
CU eScience UI
Job Scheduler
Worknode (CPU)
DISKS

TO DO


Worldwide LHC Computing Grid (WLCG)
User Interface
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Job Scheduler
Worknode (CPU)
SQUID
DISKS
Storage Element
PhEDEx
Monitoring
Other services
CU eScience UI
User
Local network
Remote access
Control

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SUMMARY

- National e-Science Infrastructure Consortium founded since 2011

- Member of CMS, ALICE, WLCG, etc.

- Successfully established CMS & ALICE Tier-2 in Thailand

- Maintain & upgrade

THANK YOU

고맙습니다