

# TEIN & how to collaborate with it?



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TEIN partners and its networks

TEIN\*CC

TEIN's Activities

- User Applications
- Capacity Building

TEIN collaboration

Next phase (Asi@Connect)

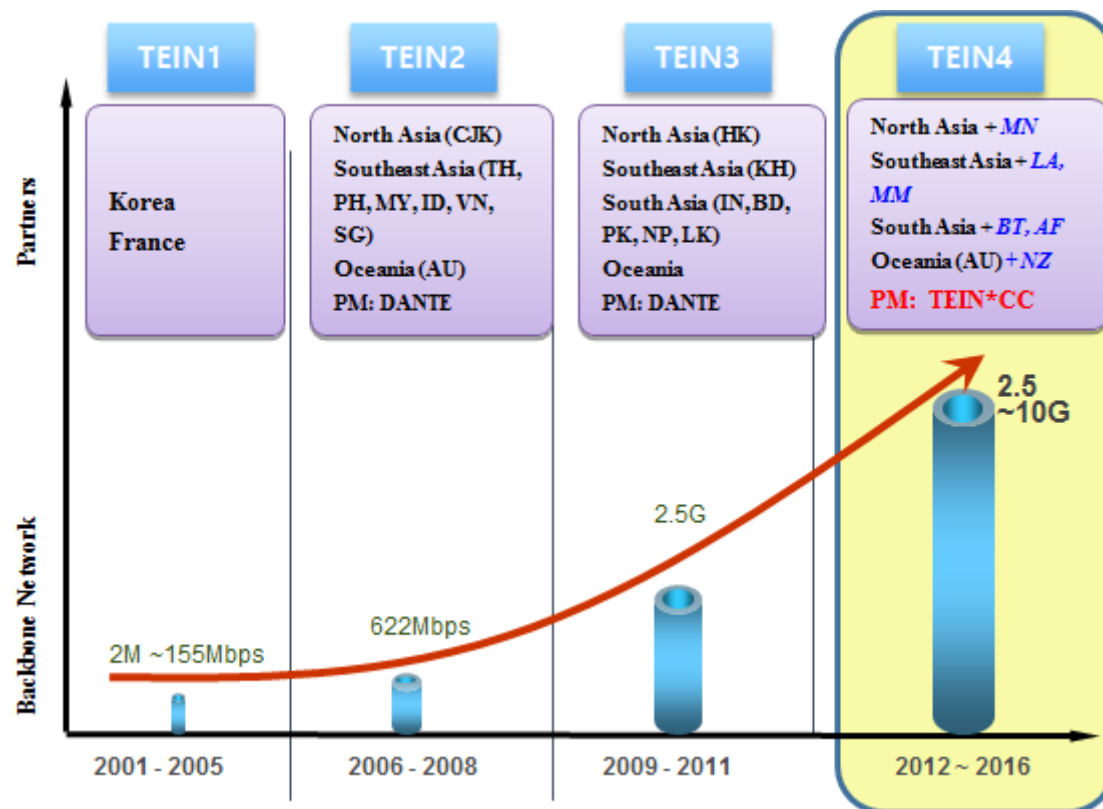
**Jeju Island**

**24 October 2016**

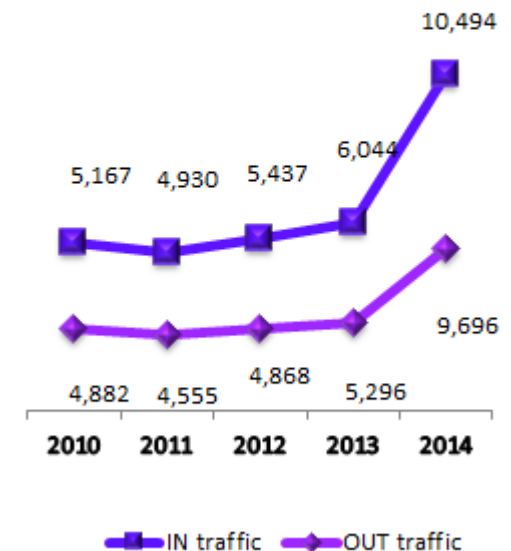
**Patch Lee**  
**TEIN\*CC**

# TEIN (23 countries/economies)

*“Trans-Eurasia Information Network”* is one of the largest Regional **Research and Education Networks** in the world, and it connects intra Asia and between Asia and Europe & the rest with high and dedicated speed



**Yearly TEIN Network Traffic [TB]**



# TEIN (23 countries/economies)



Australia Cambodia Japan Sri Lanka  
Malaysia Nepal Thailand Bhutan Laos Pakistan  
Singapore Hong Kong Bangladesh  
India Indonesia  
China **Afghanistan** **Myanmar** the Philippines Vietnam  
Korea **Mongolia** **New Zealand**

23 Asia Pacific Countries as TEIN partners

20 partners physically networked

*55 million Researchers and Educators connected*

# TEIN Network Topology (as of Aug. 2016)

**TEIN**  
Connecting  
Asia and Europe's  
Research and Education  
Communities  
[www.tein.asia](http://www.tein.asia)

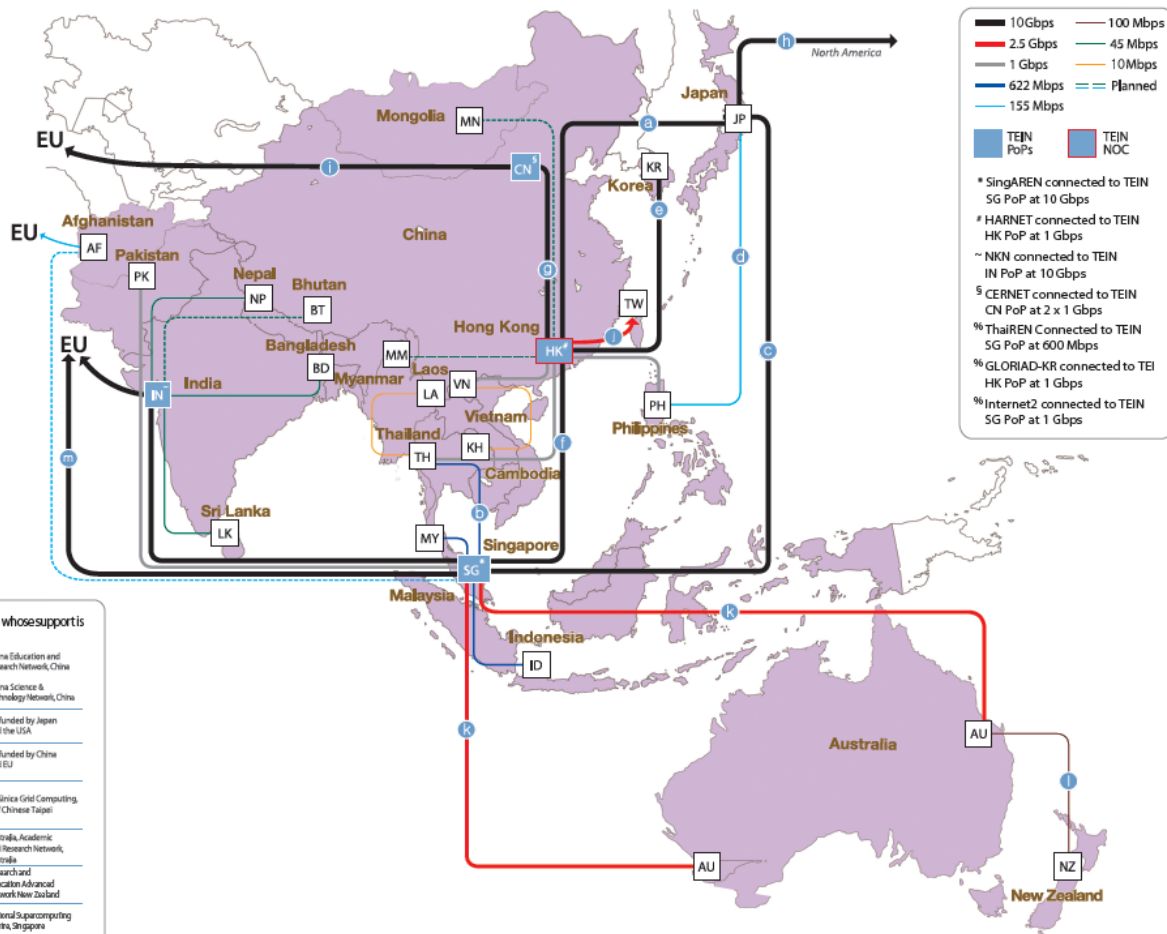
**TEIN Project Partners**

AF Afghanistan	ID Indonesia	NZ New Zealand
AU Australia	JP Japan	PK Pakistan
BD Bangladesh	KR Korea	PH Philippines
BT Bhutan	LA Laos	SG Singapore
CM Cambodia	MM Myanmar	LK Sri Lanka
CN China	MN Mongolia	TH Thailand
HK Hong Kong	MY Malaysia	TW Taiwan
IN India	NP Nepal	VN Vietnam

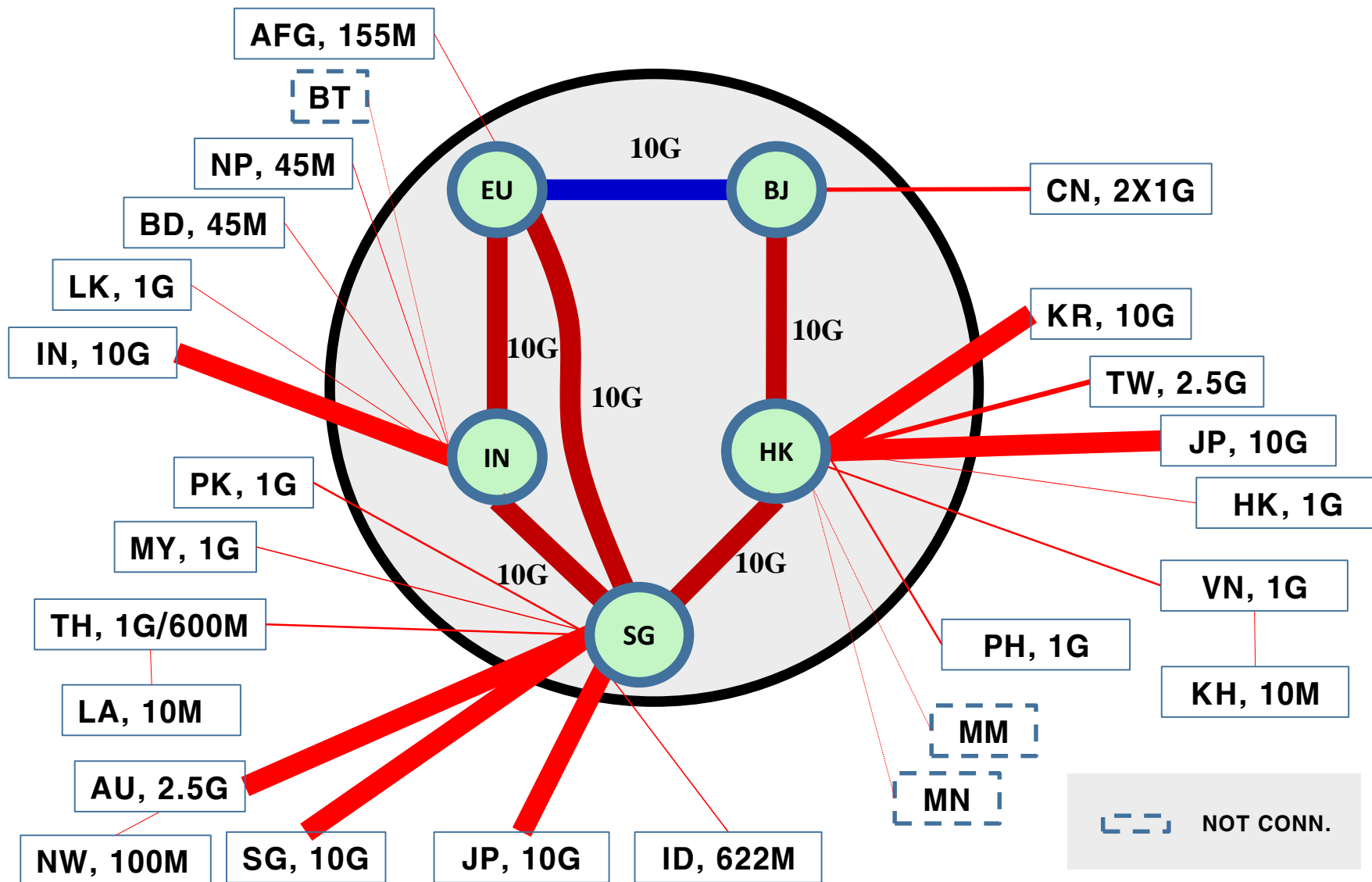
The following links are fully financed/co-financed by the link owners whose support is gratefully acknowledged

a NICT National Institute of Information and Communications, Japan	g CHINA-SEA-REN China Education and Research Network, China
b NICT National Institute of Information and Communications, Japan	h CHINA-SEA-REN China Science & Technology Network, China
c NII National Institute of Informatics, Japan	i TUNIPAC co-funded by Japan and the USA
d MAREIN Ministry of Agriculture, Forestry and Fisheries Research Network, Japan	j ORIENT plus co-funded by China and EU
e NIA National Information Society Agency, South Korea	k ASGC Academia Sinica Grid Computing, Republic of Chinese Taipei
f NIA National Information Society Agency, South Korea	l BARNET Australia, Academic and Research Network, Australia
	m REANZ Research and Education Advanced Network New Zealand
	n National Supercomputing Centre, Singapore

As of August 2016



# TEIN Network Topology (as of Oct. 2016)



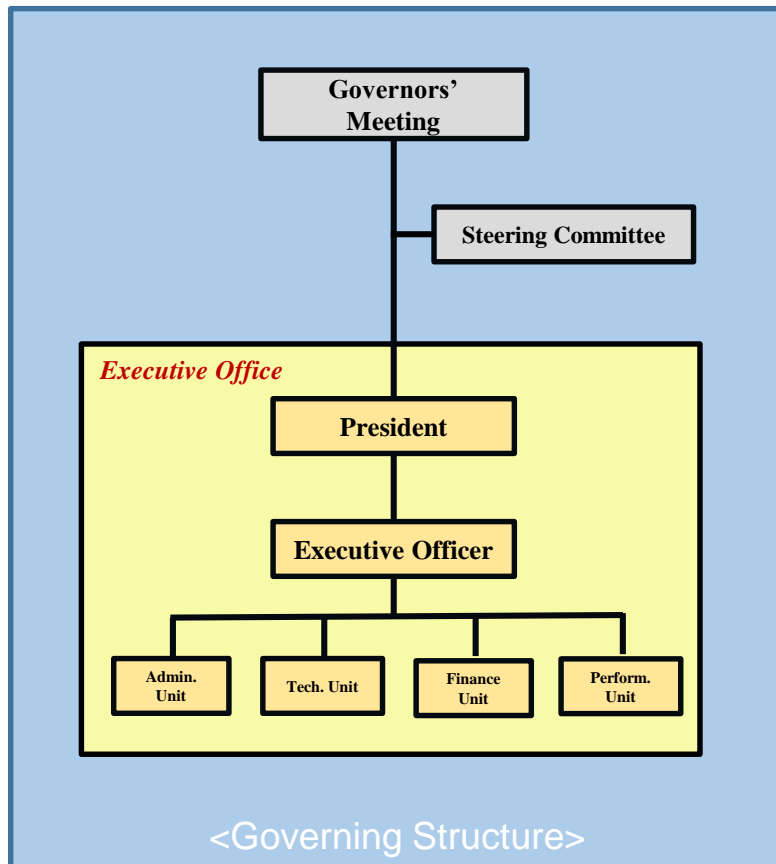
# TEIN – Details on Connectivity



#	CN	NREN	LINK	TEIN4	#	CN	NREN	LINK	TEIN4
1	AF	AfgREN	To GEANT	155M	12	*LK	LEARN	IN – LK	1G
2	*BD	BdREN	IN – BD	45M	13	TH	ThaiREN	SG - TH	1G*/600M
3	BT	DrukREN	-	-	14	*VN	VinaREN	HK - VN	1G
4	KH	CamREN	KH – VN	10M	15	*AU	AARNet	SG - AU	2.5G
5	*IN	NKN	IN – EU/IN - SG	10G/10G	16	*CN	CERNET	BJ - HK	10G
6	*ID	IDREN	SG – ID	622M	17	HK	HARNET	-	1G
7	*LA	LERNET	TH - LA	10M	18	JP	SINET/JGN	SG-JP/HK-JP	10G/10G
8	*MY	MYREN	HK – MY	1G	19	KR	KOREN	SG-HK/HK-KR	10G/10G
9	*NP	NREN	IN – NP	45M	20	SG	SingAREN	-	10G
10	*PK	PERN	SG – PK	1G	21	MM	mmREN	-	-
11	*PH	PREGINET	HK - PH	1G	22	MN	ErdemNET	-	-
					23	NZ	REANNZ	AU – NZ	100M

\* Denotes the link is owned by TEIN\*CC

roles as a *moderator* to *connect people and resources* in the fields of Research and Education all over the world and *facilitates* their collaborations in relevant areas



- Funding Structure for TEIN4
  - ✓ Total Max. 16M EUR for 5 years
  - ✓ EC max. 50% (8M EUR)
  - ✓ Partners the rest 50% (8M EUR)
- European Union is leading major funding authority

## **WP1 Network Procurement and Commercial Management**

- Conduct TEIN4 network tender, TEIN4 NOC tender, Managing TEIN4 PoPs and equipment
- Conducting a feasibility study (Myanmar, Mongolia, .. Etc.)

## **WP2 Promoting and Supporting Applications**

- Support for key applications
- Developing a portfolio of target applications areas for TEIN4 support
- Setting up a TEIN4 user support group to co-ordinate applications support
- Dissemination activities

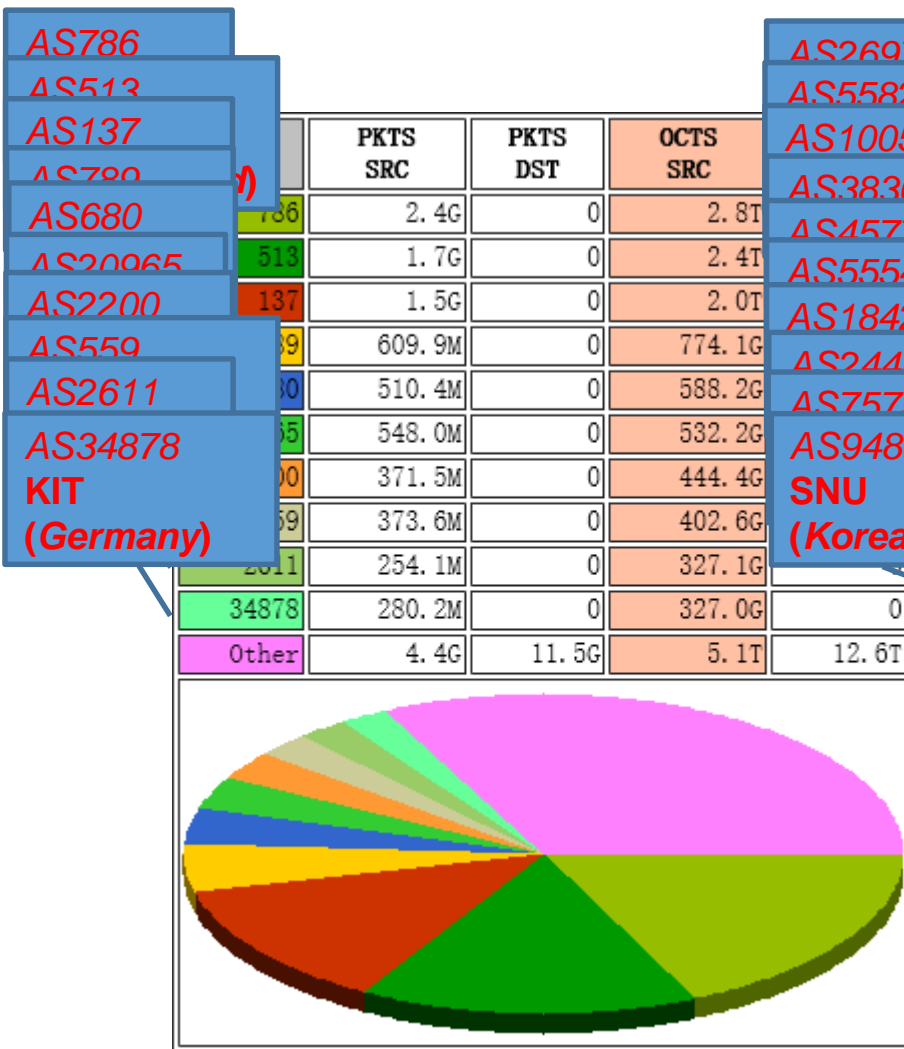
## **WP3 Enhancing Human Capacity and International Collaboration**

- Plan and Support for HRD programs
- Enhancing the cooperation with other parties (ASEAN, APAN..etc) in facilitating R&E developments in Asia.
- Conducting TEIN4 Launch Event

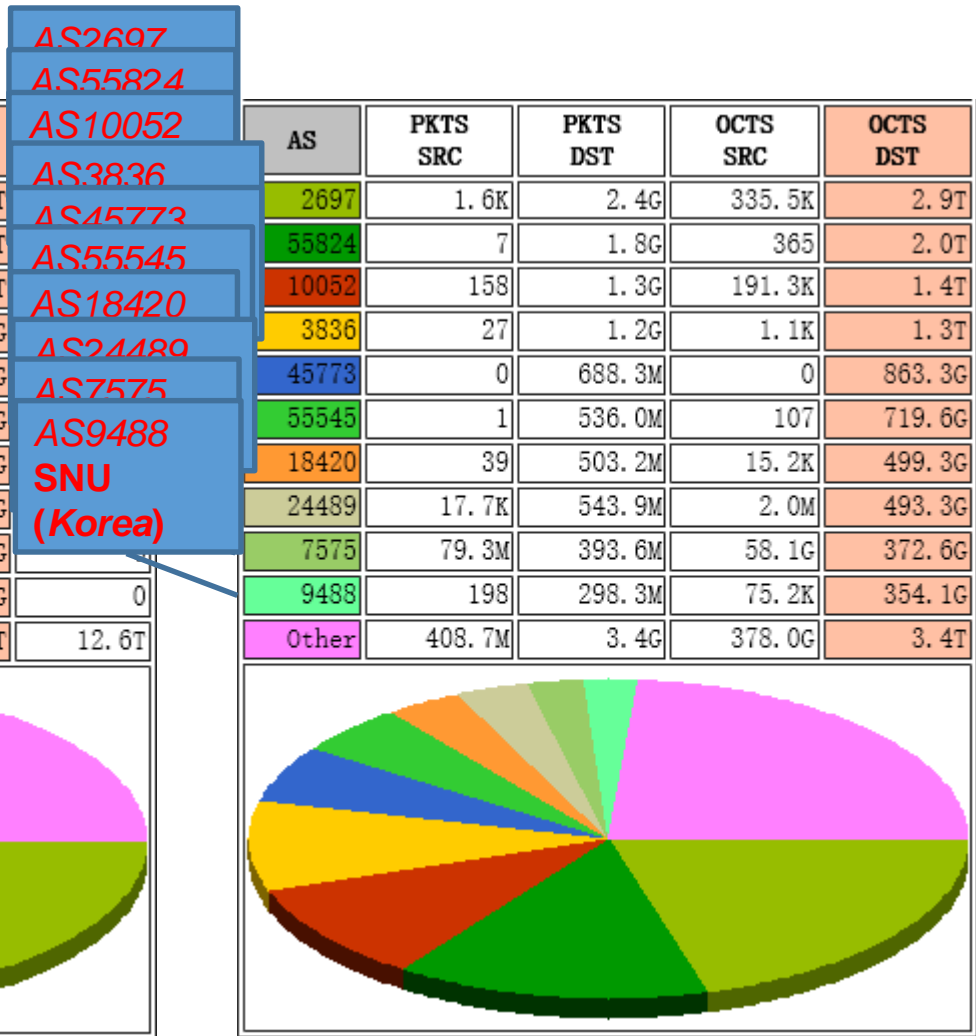


- Promote and Develop a portfolio of target *applications* societally beneficial

# User Applications – Traffic Monitoring



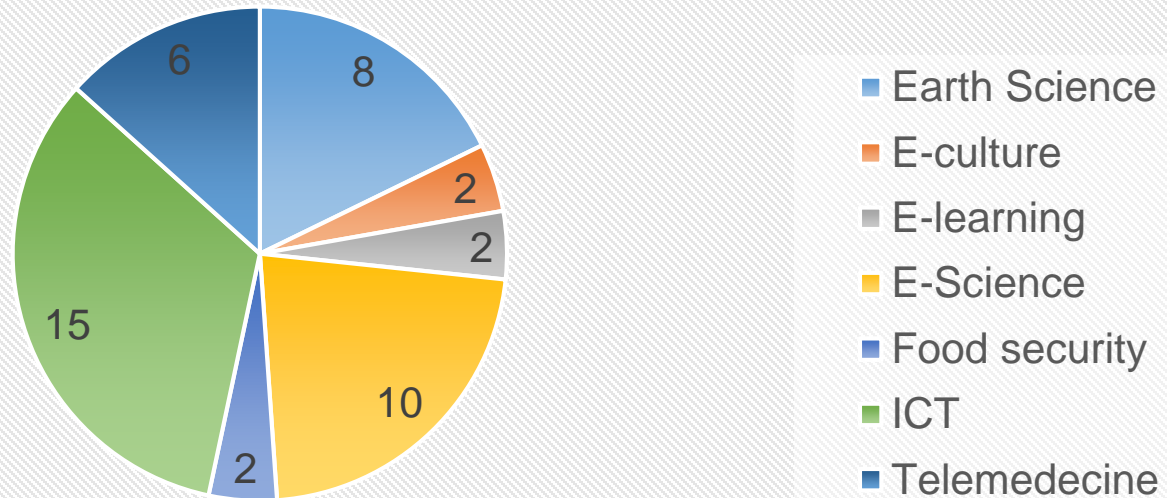
By source AS



By destination AS

# User Applications – Survey Result (2015)

TEIN4 applications by theme (total 45 surveyed)

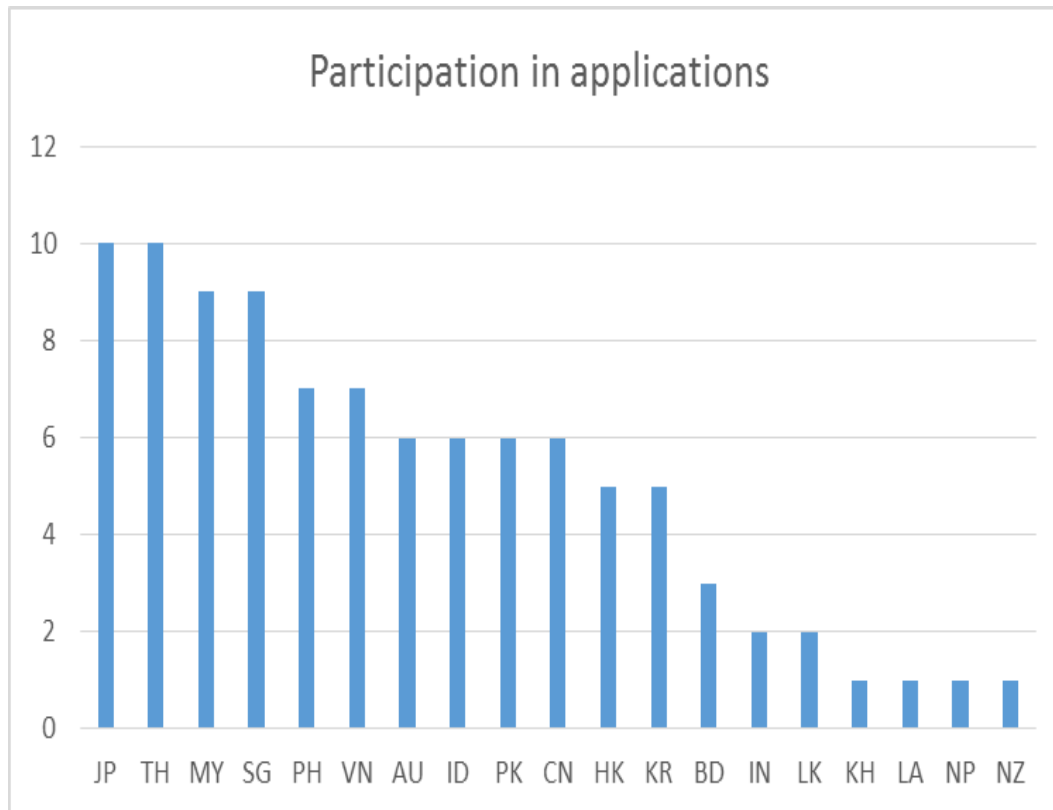


25 out of 45 application projects are ICT and science-based

- Likely to be due to higher technical expertise in these fields
- Scope for encouraging and supporting greater use of TEIN network to support collaboration in broader fields

Source: David West

# Application Workshops – Statistics

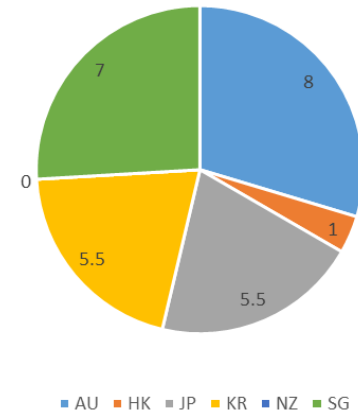


Strong participation: TH, MY, PH, VN, PK

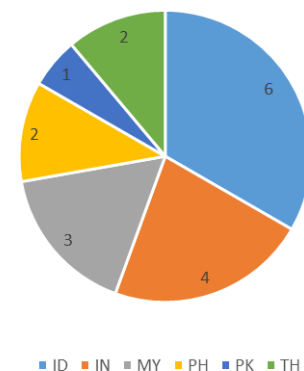
Weak participation: BD, IN, LK, KH, LA, NP

Source: David West

27 lead by 5 non-beneficiary countries....



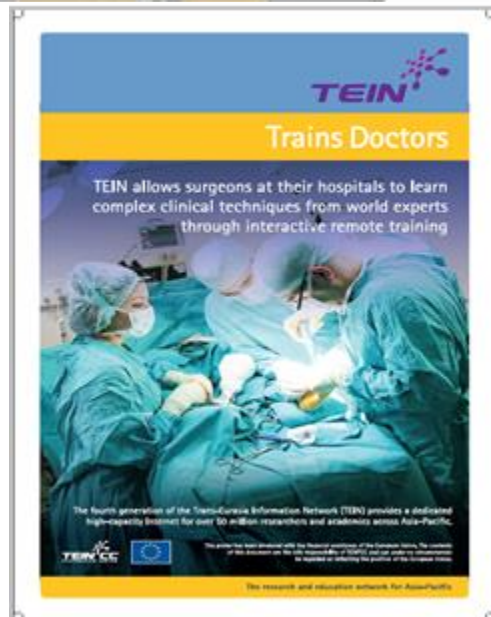
...Remaining 18 lead by 6 of the 13 beneficiary countries surveyed



# User Applications – Tele medicine



- Telecommunication technologies have been used for remote medical diagnosis and patient care for several decades; however, tele-medicine has entered a new phase as advanced network, such as TEIN4, offer unrivalled opportunities especially in the field of medical education



# User Applications – High Energy Physics



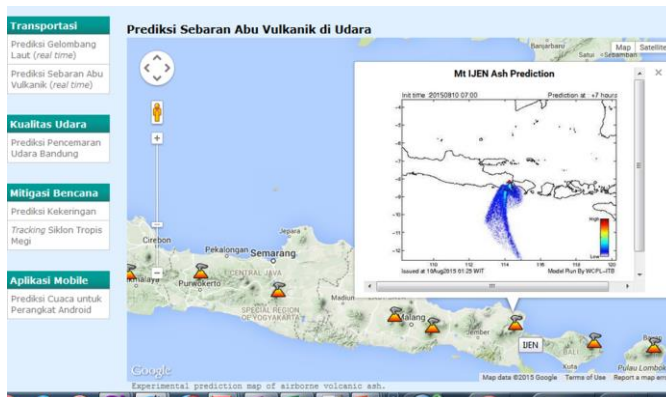
- The TEIN network enables researchers in Pakistan to join the hunt
- Through CERN's Large Hadron Collider (LHC) experiment, the global particle (or high-energy) physics community is helping us better understand the fundamental laws of nature
- Collaboration is at the heart of the LHC project with researchers from across the globe, including those at Pakistan's National Center for Physics (NCP), involved in this ground-breaking experiment.
- TEIN in Asia-Pacific and its European counterpart GÉANT, are essential to underpin this collaboration



## Typhoon forecasting



- GÉANT and TEIN provide a stable and reliable connection between the expertise and high-speed computing capacity of the German weather bureau DWD and the meteorologists at its counterparts in the Philippines.
- Timely transmission of global meteorological data to make local prediction of typhoons.
- Typhoon Ketsana struck Cambodia in 2009.
- **High-speed networking: saving lives by typhoon forecasting**



## Weather Modelling – Indonesia

# User Applications – Tsunami early warning system



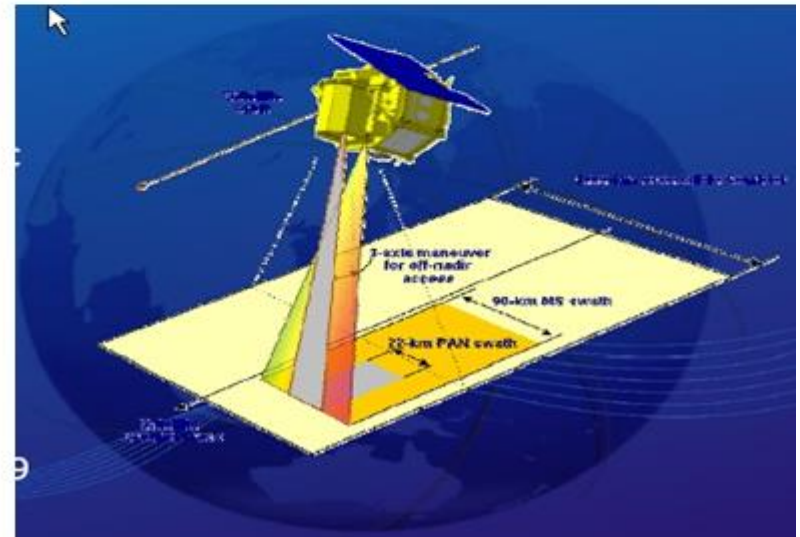
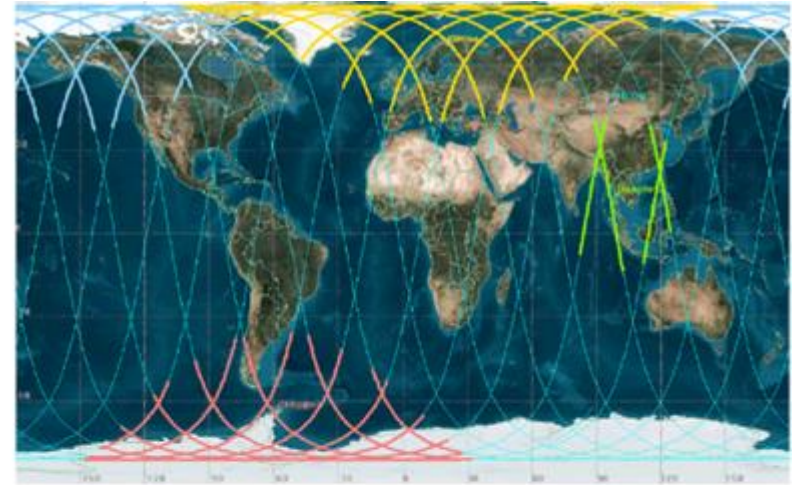
- German-Indonesian initiative is to establish an advanced Tsunami early-warning system for the Indian Ocean, focusing on the highly vulnerable Indonesian coastline. Sensor data is transmitted online to the national center in Jakarta for processing and modelling. Within 10-15 minutes, predictions are available and ready to be sent to warning centers in all Indian Ocean rim countries, as well as to local centers in Indonesia.





# User Applications – Earth Observations

- First Thai Earth Observation Satellite
- Launch 1 Oct 2008 with Polar Orbit ~14/day
- Polar station at Esrange Space Centre, Kiruna, run by Swedish Space Corporation
- Main control, processing & data archive centre run by GISTDA in Bangkok, Thailand.



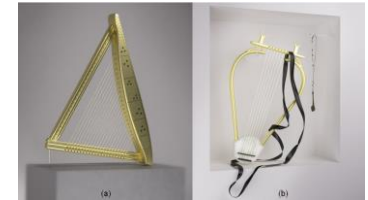
# User Applications – Crop Research

- Work on genes done at the International Rice Institute (IRRI) in the Philippines
- International collaboration to develop resilient, climate-proof crop varieties
- Marker assisted selection used to develop water tolerant enhanced rice
- Applied DNA-sequencing to the genomes of different rice varieties
- Vast genomics datasets created, analyzed, and exchanged
- High-resolution GIS data for
  - Vegetation analysis,
  - Yield forecast,
  - sustainable land,
  - water management



# User Applications – Cyber Performance

- Art Exchange
- Ancient musical instruments on stage in Stockholm (Grids used to reconstruct)
- Dance: Water-stone power symbolism
- Choreographed on traditional Malaysian movements & costumes
- Worked with NRENs on testing the link



Epigonium    Barbiton



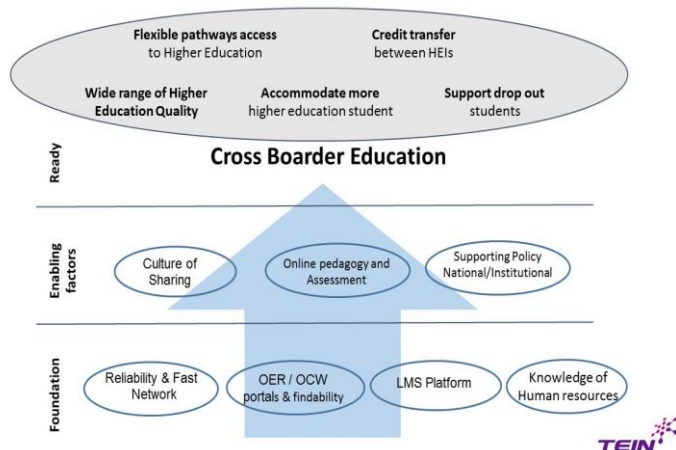
- Performed traditional music for Hong Kong and Korea along with modern dance of Vietnam (APAN42, Aug. 2016)
- Tried to deliver 5G channel sound effect through TEIN networks linking three countries



# User Applications – E learning



- ASEAN Cyber University (ACU) project, which aims to promote the development of higher education in the ASEAN region through Information and Communications Technology (ICT) has been carried out in collaboration with Korea government since September 2011. It is a project for the establishment and the operation of a higher education institution which facilitates to offer and share comprehensive online education services and knowhow in education between the ASEAN Member States and Korea.



- Strengthen Capacity Building
- Deliver customized *programs* on network engineering and operations as well as non-technical areas

# Human Capacity Building – Sample

## អ្នកបង្កើនបច្ចេកវិទ្យាព័ត៌មានប្រទេស ជួបជុំគ្នានៅកម្ពុជា តែករំលែកចំណេះដឹងទាក់ទងប្រព័ន្ធទិន្នន័យក្នុងលំហ

**ក្នុងរូប៖** អ្នកបច្ចេកទេសផ្នែកបច្ចេកវិទ្យាព័ត៌មានជាង២០នាក់ មកពីកម្ពុជា វៀតណាម ថៃ កូរ៉េ ម៉ាឡេស៊ី ឥណ្ឌូនេស៊ី ហ្វីលីពីន មីយ៉ាន់ម៉ា និងឡាវបានចូលរួមសិក្ខាសាលាអន្តរជាតិមួយ ស្តីពីបណ្តាញអប់រំនិងស្រាវជ្រាវតាមរយៈប្រព័ន្ធទិន្នន័យក្នុងលំហ Cloud Computing នៅកម្ពុជា។

សិក្ខាសាលាបច្ចេកវិទ្យាព័ត៌មាននេះរយៈពេលពីរថ្ងៃធ្វើនៅទីស្នាក់នៅភោជនីយដ្ឋាន ភ្នំពេញ ថ្ងៃទី២៣-២៤ ខែសីហា ឆ្នាំ២០១៣ នៅសណ្ឋាគារសាន់វ៉េ។ កម្មវិធីនេះរៀបចំឡើងដោយវិទ្យាស្ថានបច្ចេកវិទ្យាកម្ពុជា (ITC), ក្រសួងអប់រំយុវជន និងកីឡាស្ថាប័ន CamRen, TEIN និងសហភាពអឺរ៉ុប។

លោក អ៊ឹម រដ្ឋាណី អគ្គនាយក ITC និងជាតំណាង CamRen បានឱ្យដឹងថា សិក្ខាសាលានេះមានគោលបំណងតែករំលែក និងផ្លាស់ប្តូរចំណេះដឹង

បទពិសោធន៍ទាក់ទងនឹងប្រព័ន្ធទិន្នន័យ យ៉ាងលម្អិតសាកសួរដែលគេហៅថា Cloud Computing។ លោកអគ្គនាយកសាលាពិសោធន៍បានបញ្ជាក់បន្ថែមថា សិក្ខាសាលានេះគឺជាវគ្គបំប៉នផ្នែកបច្ចេកទេស និងប្រព័ន្ធទិន្នន័យក្នុងលំហ Cloud Computing។ ប្រព័ន្ធនេះមានសារៈសំខាន់សម្រាប់

បង្កើតផ្ទៃដី (Domain) មួយក្នុងលំហអាកាសដូចជា Drop Box។ លោកបានពន្យល់ទៀតថា Domain នេះ ជាផ្ទៃដី ពិសេសសម្រាប់បណ្តាញ Network របស់ TEIN ដែលជាគណៈកម្មាធិការមួយផ្តល់កម្មវិធី និងមេរៀនមួយតាមរយៈប្រព័ន្ធបណ្តាញអុបទិក (Optical Network)

ដែលភ្ជាប់ពីប្រទេសមួយទៅប្រទេសមួយក្នុងពិភពលោក។ លោក អ៊ឹម រដ្ឋាណី បានបន្តឱ្យដឹងថា ប្រទេសកម្ពុជាបានក្លាយជាសមាជិក TEIN កាលពីឆ្នាំ២០១១។ ស្ថាប័នតំណាងនៅកម្ពុជាគេហៅថា CamRen (បណ្តាញអប់រំកម្ពុជាប្រចាំតំបន់)។ CamRen ជាស្ថាប័នអប់រំមួយ

ផ្តោតលើការបណ្តុះបណ្តាលពីធម្មាម (E-Learning) តាមរយៈការស្រាវជ្រាវការសិក្សា និងទាញយកកងសារពីបណ្តាញទិន្នន័យ។ លោកបានលើកឡើងផងដែរថា ការបង្កើត Domain នេះនឹងផ្តល់ឱកាសដល់និស្សិត និងអ្នកស្រាវជ្រាវមានលទ្ធភាពឈរនៅក្នុងកងសារប្រទេសនៅក្នុងសាកលវិទ្យាល័យអង្គការស្ថាប័ននានាក្នុងពិភពលោកពី Cloud Computing។

នៅក្នុងសិក្ខាសាលានេះដែរក៏មានបទបង្ហាញអំពីបច្ចេកទេស ការត្រួតពិនិត្យនិងគ្រប់គ្រងបណ្តាញអំពីការផ្ទុកទិន្នន័យក្នុងលំហ (Cloud Storage) ព្រមទាំងការបង្កើត និងគ្រប់គ្រង OpenStack (គម្រោង Cloud Computing សម្រាប់ផ្តល់ធនធានម៉ូឌុល សេវា)។

សុផល



លោកអ៊ឹម រដ្ឋាណី (ឆ្វេង) អគ្គនាយកវិទ្យាស្ថានបច្ចេកវិទ្យាកម្ពុជា និងជាតំណាង CamRen ថ្លែងក្នុងពិធីបើកសិក្ខាសាលា (រូបខាងស្តាំ)



- ❑ **Active Participation from neighbouring countries**
  - ✓ Indonesia, Laos, Malaysia, Philippines, Thailand, Vietnam
- ❑ **Follow up of the event**
  - ✓ Setup cloud test-bed in each country and connect it through TEIN4

# Capacity Building – Statistics (funded by TEIN\*CC)

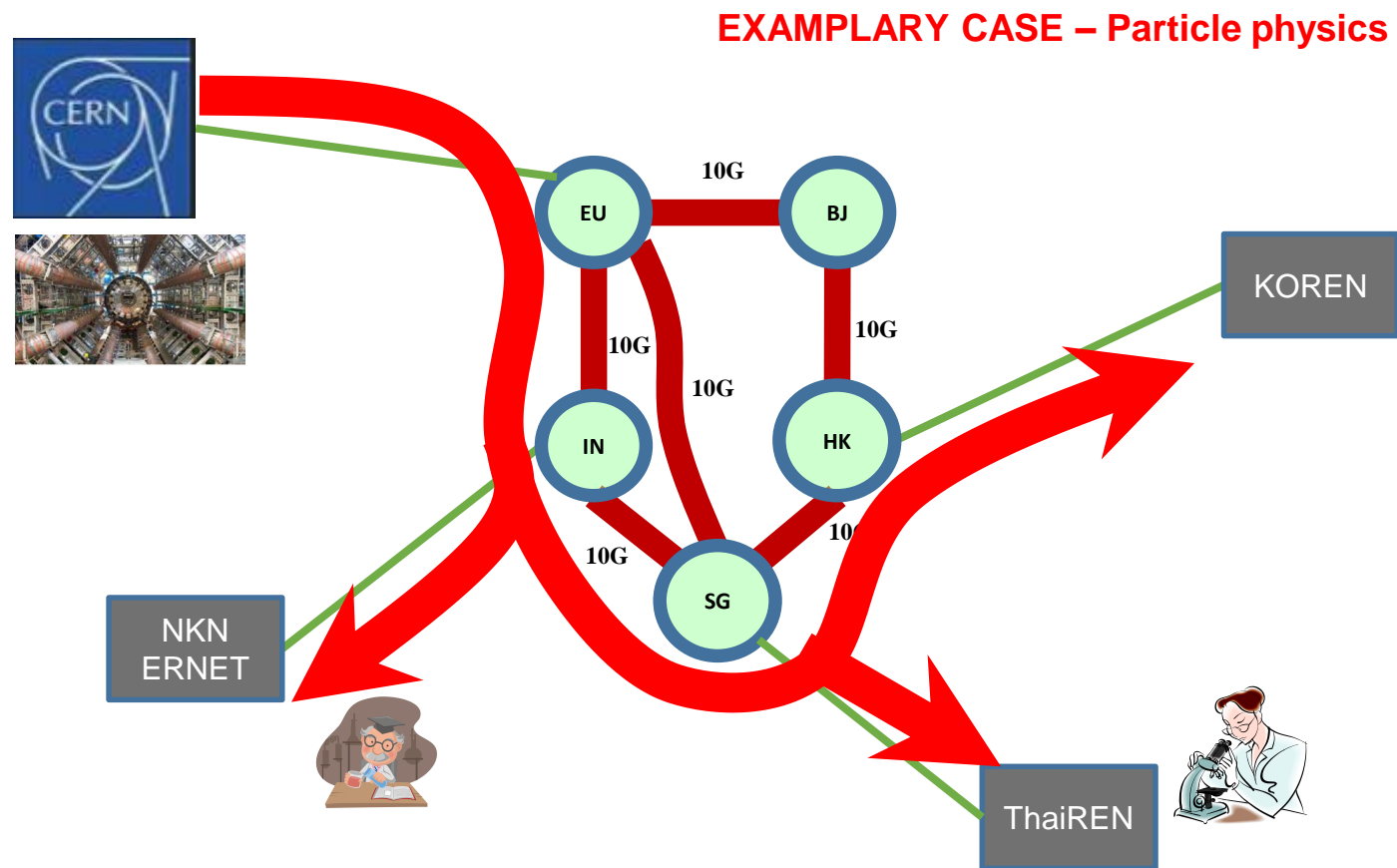


Title	Location	Date
HRD Training - APAN34	Sri Lanka	Aug-12
HRD Training - Network Monitoring and Management Workshop	Thailand	Nov-12
HRD Training - Network Security Workshop	Thailand	Nov-12
Cloud Computing workshop	Vietnam	Dec-12
OF@TEIN Training Workshop	Malaysia	Feb-13
Cloud Computing Technical Application Workshop	Cambodia	Aug-13
TEIN4 Workshop	Myanmar	Oct-13
TEIN4 NOC Annual Workshop	Thailand	Nov-13
Network Management and Monitoring	Bangladesh	Nov-13
TEIN Identity Management Federation Application Workshop	Indonesia	Jan-14
Joint APAN-TEIN Dengue Fever Workshop	Indonesia	Jan-14
TEIN HRD Training (Network Security program)	Indonesia	Jan-14
OF@TEIN Training Workshop	Thailand	Mar-14
Data Management Workshop	Philippines	Mar-14
Cyber Performance	Vietnam	May-14
PerfSONA workshop	Taiwan	Aug-14
TEIN NOC Annual Workshop 2014	Thailand	Aug-14
MPLS Training Workshop	Thailand	Oct-14
bdNOG2 Conference and Workshop	Bangladesh	Nov-14
TEIN4 Next Generation sequencing workshop	Malaysia	Dec-14
TEIN 2nd Advance Identity Management and Federation Workshop	Malaysia	Dec-14
SANOG 25 Workshop	Sri Lanka	Jan-15
High Speed Networking Technology workshop	Cambodia	Jan-15
APRICOT 2015 Workshop	Japan	Feb-15
Joint TEIN-APAN Dengue Fever and Public Health Workshop	Japan	Mar-15
HRD Training Workshop on Designing Basic Campus Network	Bangladesh	Mar-15
OF @TEIN Training Workshop 2015	Vietnam	May-15
HRD Training on Network Security : Vulnerabilities and Management for Campus Network	Bangladesh	Jun-15
TEIN4 Future Internet Workshop 2015	Thailand	Aug-15
TEIN4 2nd Workshop on Next Generation Sequencing and Big Data Analysis	Indonesia	Aug-15
PerfSONAR Training Workshop	Malaysia	Aug-15
TEIN4 Application Workshop Eduroam Training Workshop 2015	Indonesia	Aug-15
TEIN4 Workshop on the Application of Next Generation Sequencing Data Analysis on Pathogens of Tropical Diseases	Indonesia	Sep-15
TEIN workshop for e-learning Feasibility Study	Korea	Sep-15
Telemedicine: Issues and Challenges Workshop	Bangladesh	Oct-15
TEIN4 NOC Workshop	Thailand	Oct-15
Network Monitoring Applications Workshop	Pakistan	Oct-15

- 37 Workshops Aug. 2012 ~ Dec. 2015
- 13 countries hosted
- 330 overseas participants
- Various topics
  - ✓ Telemedicine, eduroam, Identity, e-culture, Dengue fever, etc.



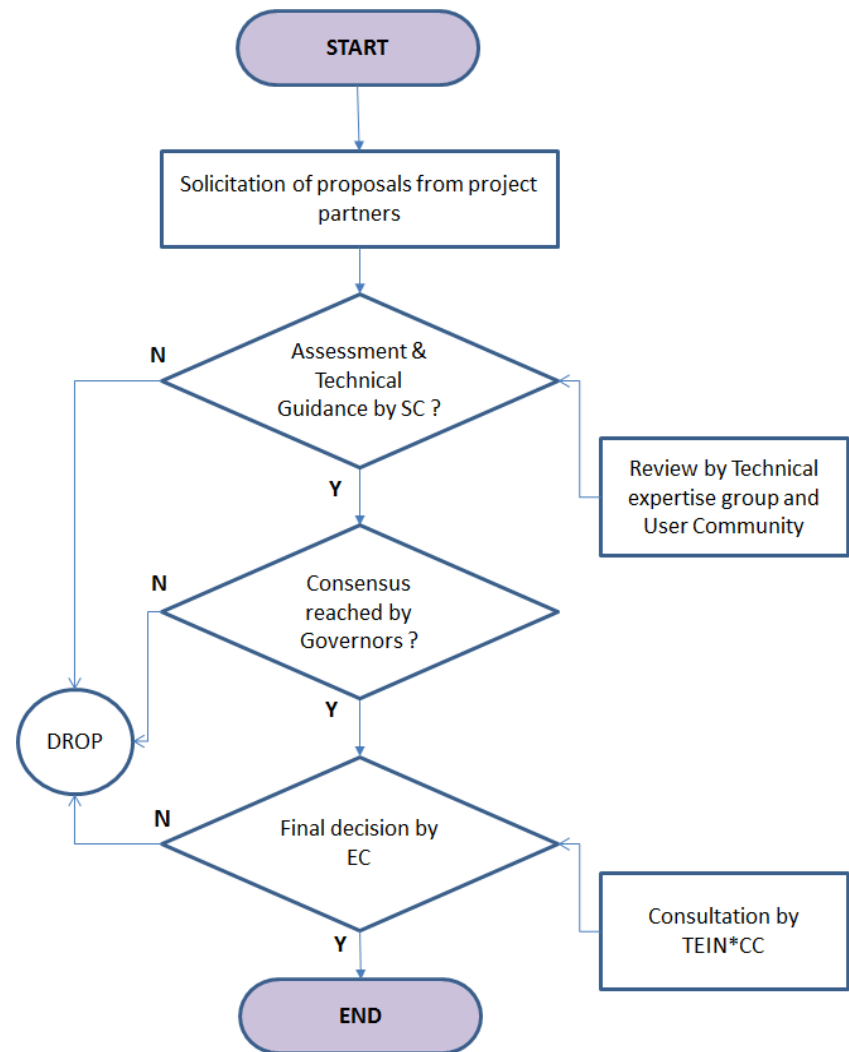
- TEIN as a Delivery media for space weather data
  - ✓ End points should be connected to each country's NRENs





## ● Funding opportunity for Researches

- ✓ Call for Proposals are open at this time (ASAP)
- 12-18 months period
- should have a regional dimension and must benefit by preference the DCI-eligible countries



- ❖ Period: 2017 ~ 2021 (5 years, max. 72 months)
- ❖ Total Budget: 36.8 M EUR (Max. 20M cash funded by the EC)
- ❖ Works to do
  - WP1: Network Procurement and Management
  - WP2: Capacity development of developing country NRENs
  - WP3: Campus Network design and associated capacity development
  - WP4: Deployment of specialized network products, services and applications
  - WP5: Promoting TEIN-enabled research and education collaboration
  - WP6: Helping to bridge the digital divide in developing countries
- ❖ Timeline
  - 25 February 2016, Draft TEIN5 final text
  - 10 March 2016, Internal directorate meeting
  - 25 April 2016, Consultation of various Commission service
  - 28 June 2016, DCI Committee
  - September 2016, Probable adoption by the Commission
  - Oct. ~ Nov. 2016, Grant Contract between the EC & TEIN\*CC

# APPENDIX 1 - Definition



Earth Science – TEIN is transforming climate and weather prediction, especially in regions with poor technical infrastructure. Turning global climate simulations into useful assessments of the impact of particular events on local areas involves a huge amount of data processing, data transfer, and data mining. There are wide gaps in this computing capacity between the developing countries and the advanced industrialized countries. TEIN network will be filling these gaps.

E-Culture – E-culture/Cyber performance refers to live theatrical performances in which remote participants are enabled to work together in real time through the medium of the internet, employing technologies such as chat applications or purpose-built, multiuser, real-time collaborative software. Cyber performance is also known as online performance, networked performance, telematic performance, and digital theatre; there is as yet no consensus on which term should be preferred, but cyber performance has the advantage of compactness.

E-learning – It provides with a very personal and experiential opportunity to learn about the diversity within and between the countries of the Asia region. The high quality low latency performance of the network, such as TEIN, is critical to the success of each engagement as students carefully attune to grammatical and gestural nuances in learning effective communication.

E-Science (High Energy Physics) – The global particle (or high-energy) physics community is helping to better understand the fundamental laws of nature. High speed research networks, such as TEIN in Asia and its European counterpart GÉ ANT, are essential to underpin this collaboration, enabling sharing of the petabytes of data created at the Large Hadron Collider (LHC), allowing physicists to work together, wherever they are based

Food Security – Scientists have collaborated with their colleagues in other parts of the world resilient, “climate-proof” crop varieties, a collaboration that requires high-performance networking for the exchange of vast genomic datasets as well as the transfer of high resolution geographic information system (GIS) data for vegetation analysis and yield forecast..

ICT – There have been many initiatives to explore next generation of the Internet and high performance networks. One of the initiatives has known as the “Future Internet” to meet the ever growing and diverse needs of users. Over the last few years, there were a number of initiatives around the world on Future Internet testbeds, such as US Global Environment for Network Innovations (GENI), EU Future Internet Research & Experimentation (FIRE), who cooperate with TEIN.

Telemedicine – Technology and communications have radically changed healthcare in the Asia region, enabling remote diagnosis and underpinning international collaboration. TEIN enables a new phase of telemedicine by providing the ability to remotely train doctors on the latest medical techniques by streaming high quality live operations and consultations across Asia. This helps to spread best practice, benefits physicians and surgeons in developing countries and is saving many lives.

**Thank you**