Cases of Research and Education Network (REN) Initiatives: BDREN and A New Era in Bangladesh Higher Education

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“Knowledge will forever govern ignorance, and a people who mean to be their own governors must arm themselves with the power which knowledge gives.”

— James Madison

ICT and Universities

- ICT used to be an auxiliary service for universities in the 1990's.
- In 2000's it became an essential limb.
- In 2005 it is becoming the central artery in the running of modern universities.
- Almost all the countries in the world have adopted REN as the centerpiece of their information and communication technology (ICT) plan for higher education.
- Now about 92 countries around the world have REN-- 25+ more are building.
- The concept is marching further forward. Countries worldwide are now forming mega REN alliances of continental proportion with a vision of creating a world community of universities- a grand kiosk of higher education and scholarship.

The Bangladesh Initiative

- **Internet Connectivity is vital for the survival of any modern educational institution.**

- **For Bangladesh we need a fresh thinking about the direction of ICT infrastructure for all our universities.**

- **The objective of this UGC initiative is to provide state-of-the-art internet connectivity to all universities of Bangladesh via establishing an Research and Education Network (REN).**

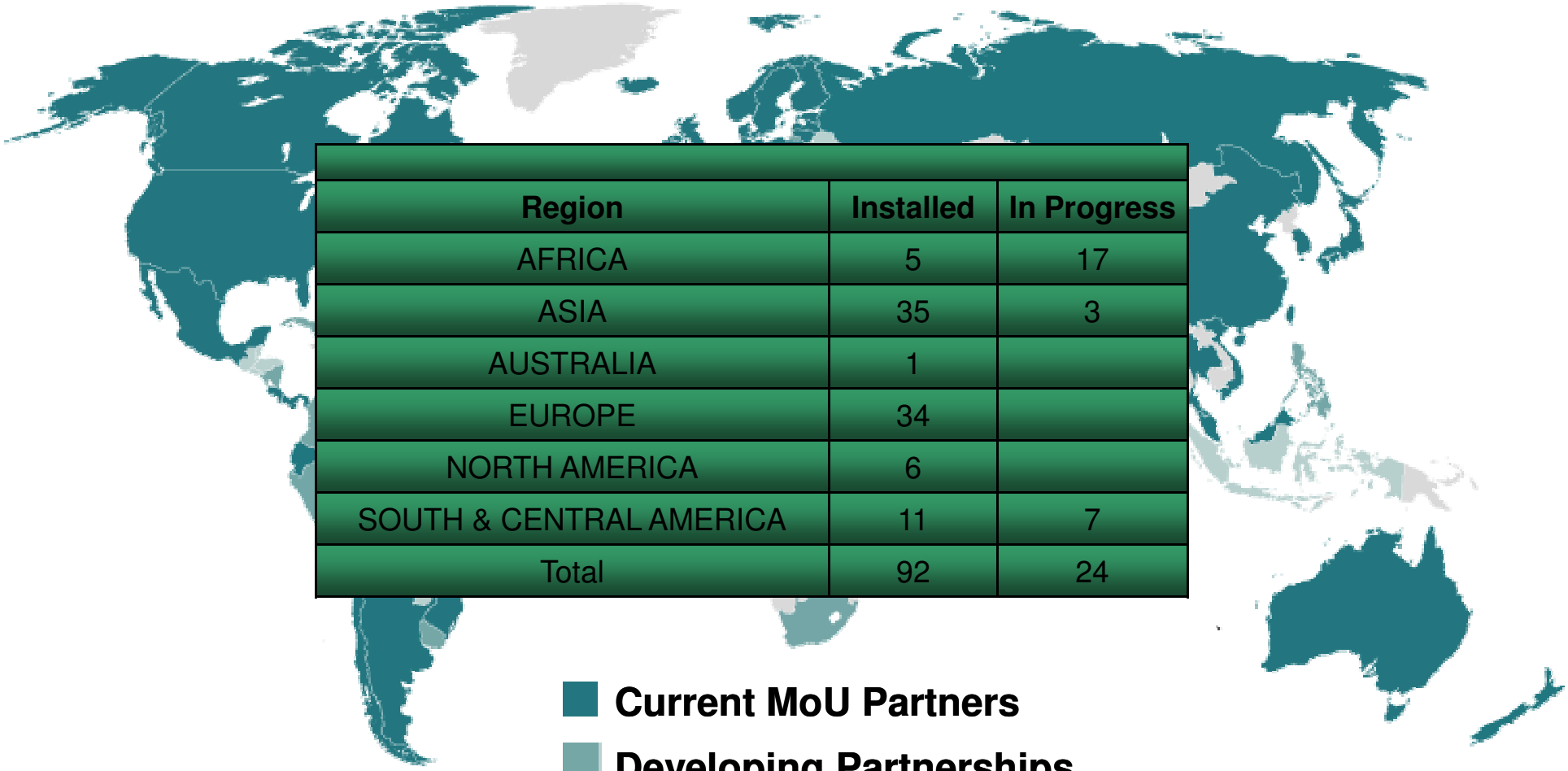
- **The network will be at par with all our neighbors.**

Abstract

- **In a silent revolution (started roughly around year 2000) 100 countries around the world have built advanced Research and Communication Networks (RENs). Now a global dream is being pursued further crossconnecting national RENs creating an unprecedented advanced global REN- aiming towards a global kiosk of innovation and scholarship.**

- **This three part talk presents the progress and state of the emerging Global REN, a glimpse of the new generation applications on the horizon, and their implications for nations- for sure which is poised to change the higher education landscape as we know it today.**

REN A World Phenomenon



Region	Installed	In Progress
AFRICA	5	17
ASIA	35	3
AUSTRALIA	1	
EUROPE	34	
NORTH AMERICA	6	
SOUTH & CENTRAL AMERICA	11	7
Total	92	24

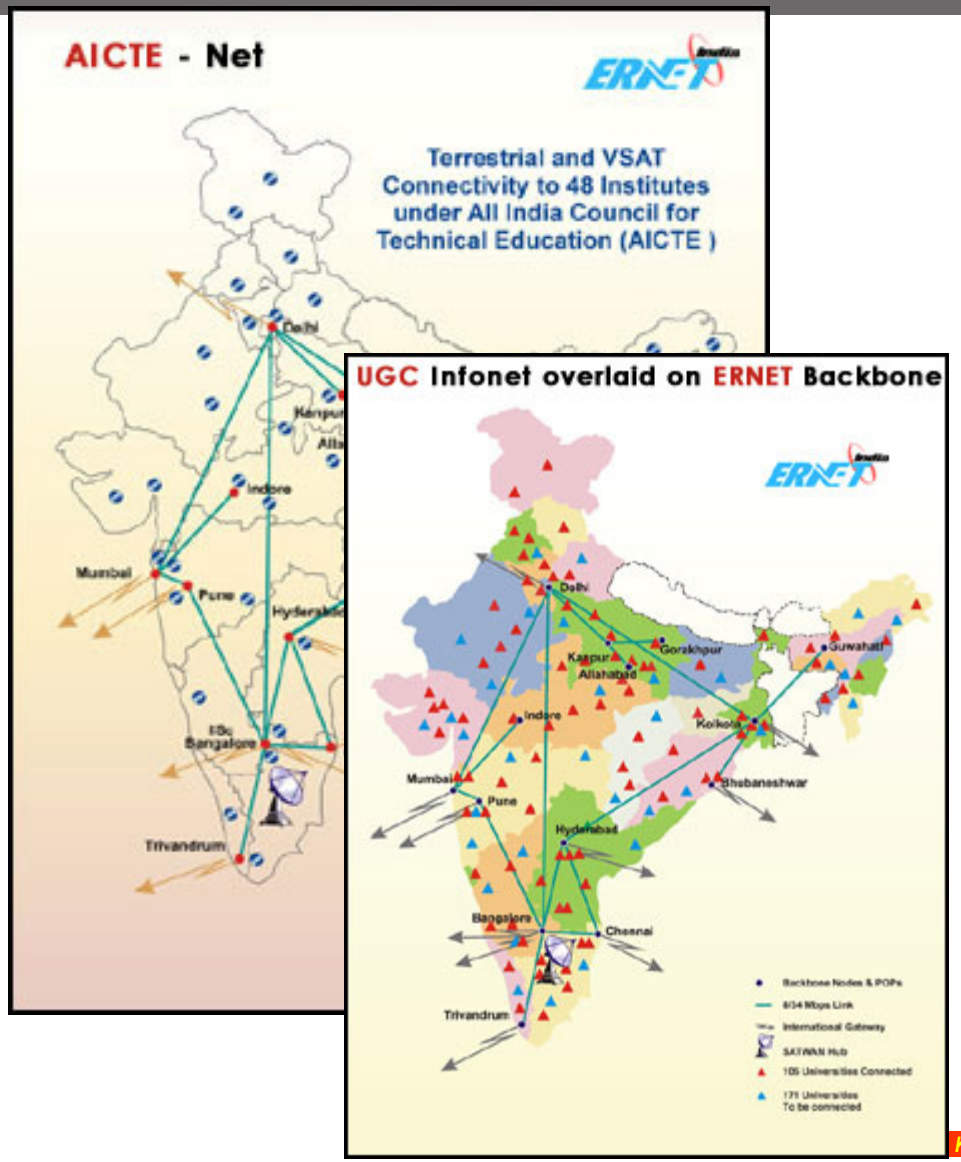
Current MoU Partners

Developing Partnerships

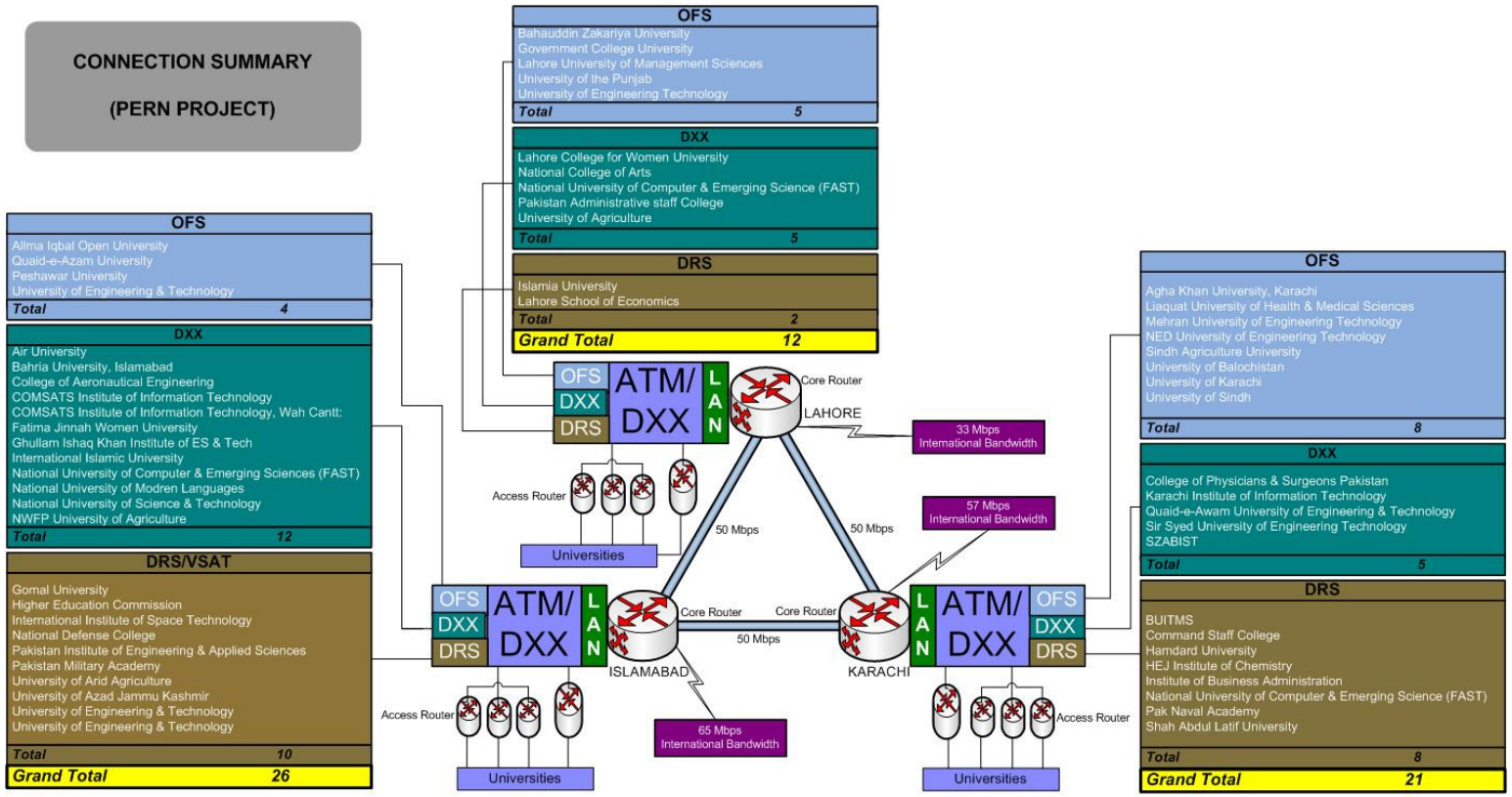
Related Efforts in Formation

ERNET: India

- **Collection of several consortiums over ERNET infrastructure**
  - **UGC-infonet**
  - **AICTE-Net**
  - **Indian Council for Agriculture Research-Net**
- Organizes INFILIB Digital Library.
- Has several other content development projects.



PERN: Pakistan



BATCH	OFS	DXX	DRS	VSAT	GRAND TOTAL
TOTAL	17	22	19	01	59
INSTALLED	17	22	19	01	59
ONLINE	17	22	19	01	59

LEARN: Sri Lanka

- The Lanka Education And Research Network is the NREN (National Research and Education Network) of Sri Lanka, which interconnects Educational and Research institutions across the country.
- The LEARN project commenced in 1990. The first service provided was *LEARNmail*, the first e-mail service in Sri Lanka, which was operated by the Department of Computer Science and Engineering, University of Moratuwa. This service provided educational and research institutions with dial-up e-mail service. This was supported by the Computer and Information Technology Council (CINTEC), and Lanka Academic Network (LAcNet), and maintained by a dedicated group of volunteers in Sri Lanka and abroad.
- The first LEARN network interconnecting three sites with 64kbps links was established in 1994. Since then the LEARN network has grwon rapidly to its current state, interconnecting 24 sites with link speeds ranging from 128kbps to multiple 2Mbps links. The establishment of 2Mbps links to 8 sites with the financial support of Sida/SAREC has been a major milestone in this path.
- LEARN is currently in the process of upgrading the link bandwidths to 16 of its sites to 10Mbps over optical fiber. Several links have already been upgraded, and the remaining links will be upgraded by June 2007. This upgrade was made possible with the World Bank funded IRQUE Project providing funds for 10 of the 16 links.

Where is Bangladesh?

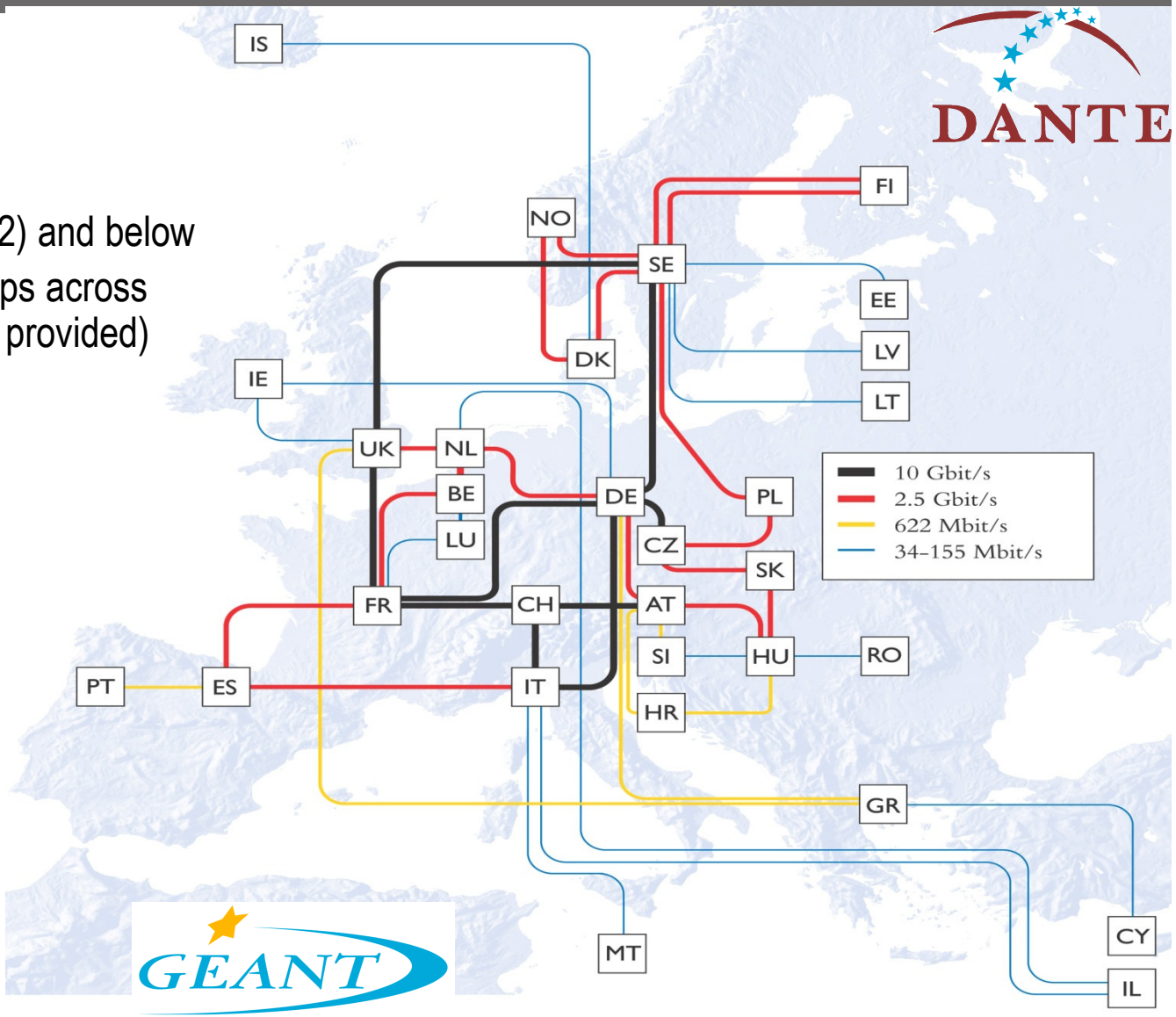
Country	NREN	Status	Ownership, legal status	website	APAN Member
Bangladesh	Bangladesh Research & Education Network (BDREN)	??			
Bhutan	Royal University of Bhutan	active	RUB owned		no
India	Education & Research Network (ERNET)	active	DIT owned, registered soc.	www.ernet.in	primary
Nepal	Nepal Research & Education Network (NREN)	active	Member based, registered nfp	www.nren.net.np	associate
Pakistan	Pakistan Education & Research Network (PERN)	active	HEC Pakistan no sep legal entity	www.pern.edu.pk	primary
Sri Lanka	Lanka Education And Research Network (LEARN)	active	working towards	www.ac.lk	primary

Federation of RENs

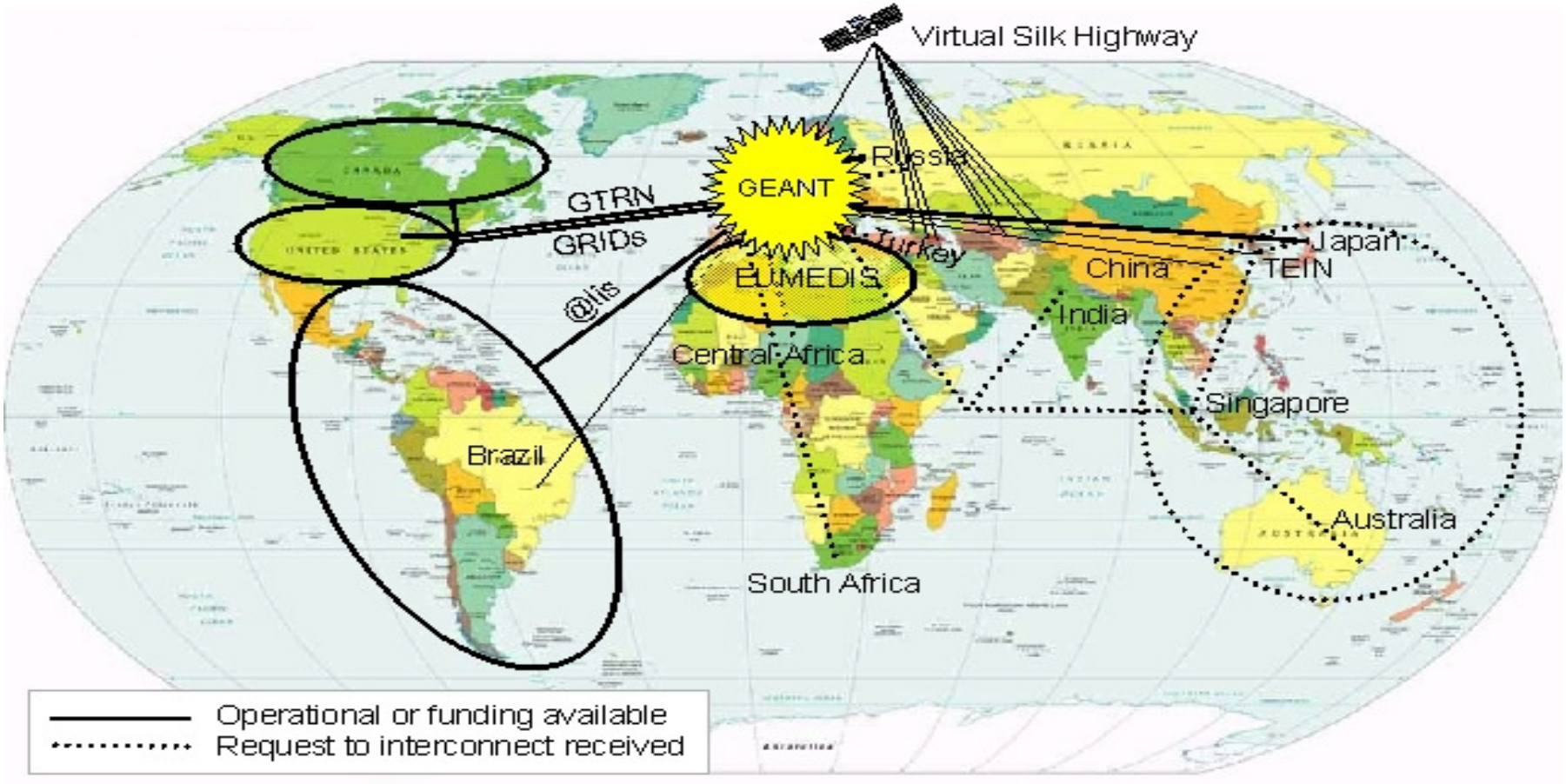
Network	Name	Region	Members
APAN	Asia-Pacific Advanced Network	All Asia	All Asia
TEIN2	Trans-Eurasia Information Network	Asia Pacific	Australia, China, Indonesia, Korea, Malaysia, The Phillipines, Thailand and Vietnum with Europe)
EUMEDCONNECT	Europe and Mediterranean Education Network Connect	Mediterranean	Algeria, Cyprus, Egypt, Israel, Jordan, Lebanon, Malta, Morocco, The Palestainian Authority, Syria, Tunisia and Turkey
Nordunet	The Nordic Internet Highway to Research and Education Networks	Nordic Europe	Denmark, Finland, Iceland, Norway and Sweden
GEANT2	Network for Southeast Europe	All Europe	30 RENS from all Europe
ALICE	America Latina Interconectada Con Europa	Latin America	Argentina, Brasil, Chile, Costa Rica, Guetemala, Mexico, Panama, Paraguay, Peru, Uruguay, Venezuela, Bolivia, Columbia, Hondurus, Nicaragua, Cuba, El Salvador, and Ecuador
ERNESA	The Educational Research Network in East and Southern Africa	East and Southern Africa	Botswana, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe)
ERNWACA	The Education Research Network for West and Central Africa	West and Central Africal	Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Mali, Nigeria, Senegal, Sierra Leone and Togo)

Europe

- 31 countries connecting
- Operated by DANTE
- 10 Gbps core backbone
  - Connectors at 10Gbps(2) and below
- Total of 4x2.5Gbps + 2x1Gbps across Atlantic (DANTE & EuroLink provided)

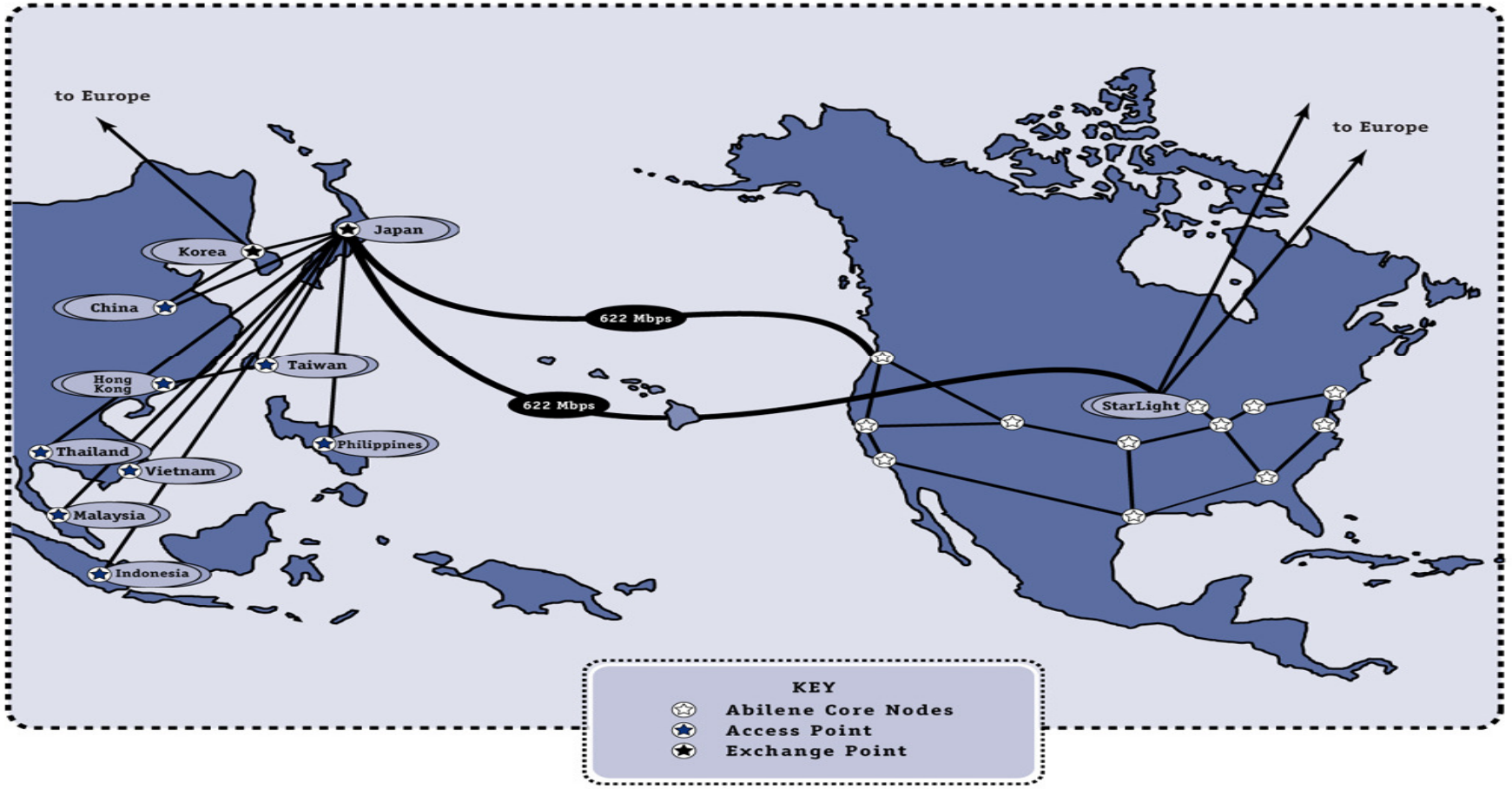


Europe – International connectivity



REF: Report on present status of international connectivity in Europe and to other continents , From SERENATE – Study into European Research and Education Networking As Targeted by eEurope, http://www.serenate.org/publications/d6-serenate.pdf

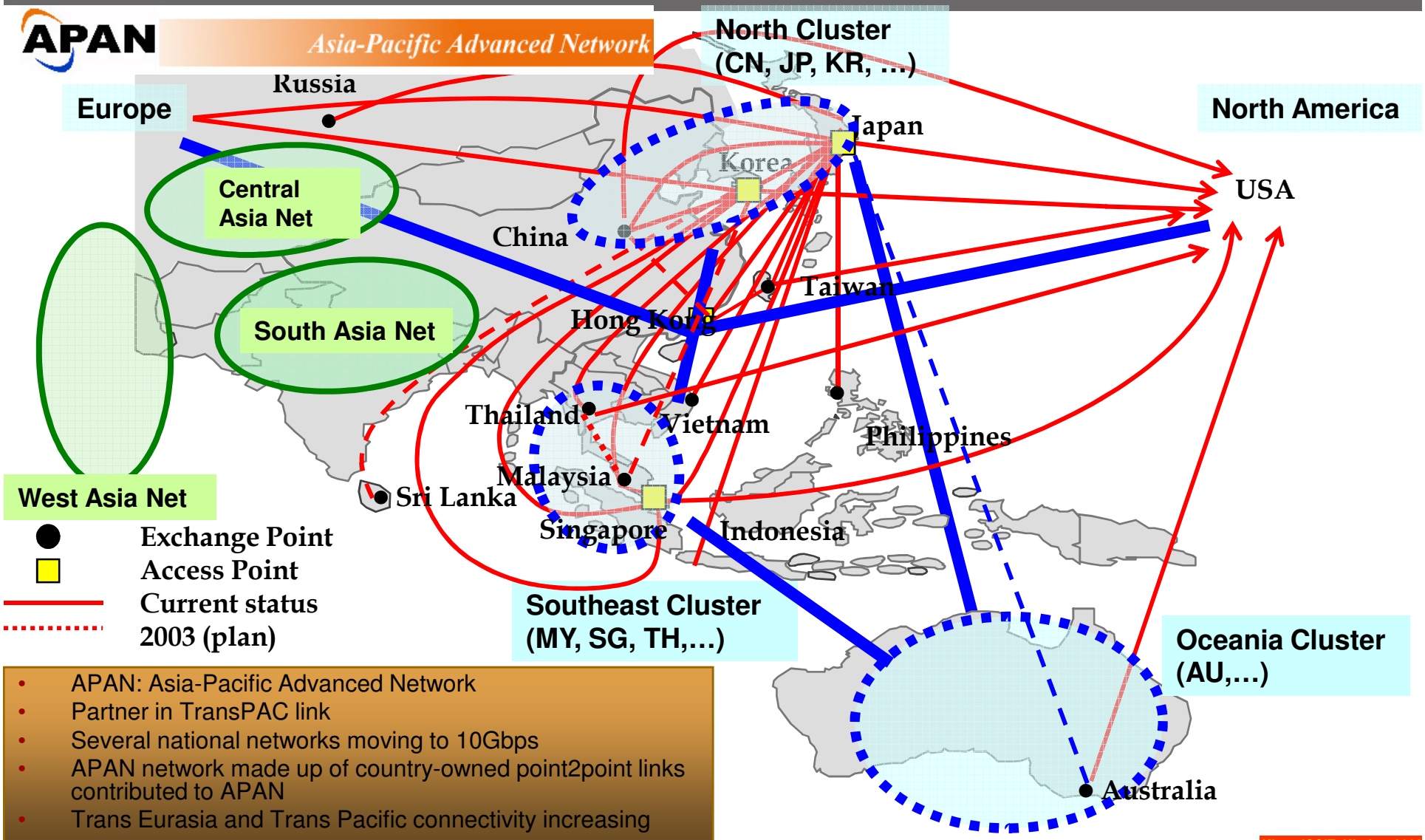
TransPAC



- Connections APAN to US
  - Currently 2xOC12 Tokyo – Seattle, Tokyo - Chicago
  - Upgrading to 2.5Gbps Tokyo – Los Angeles and 2x1GbE Tokyo - Chicago
  - Funded by NSF and Japanese government

SRC: http://www.transpac.org

APAN: Asia Pacific Advanced Network



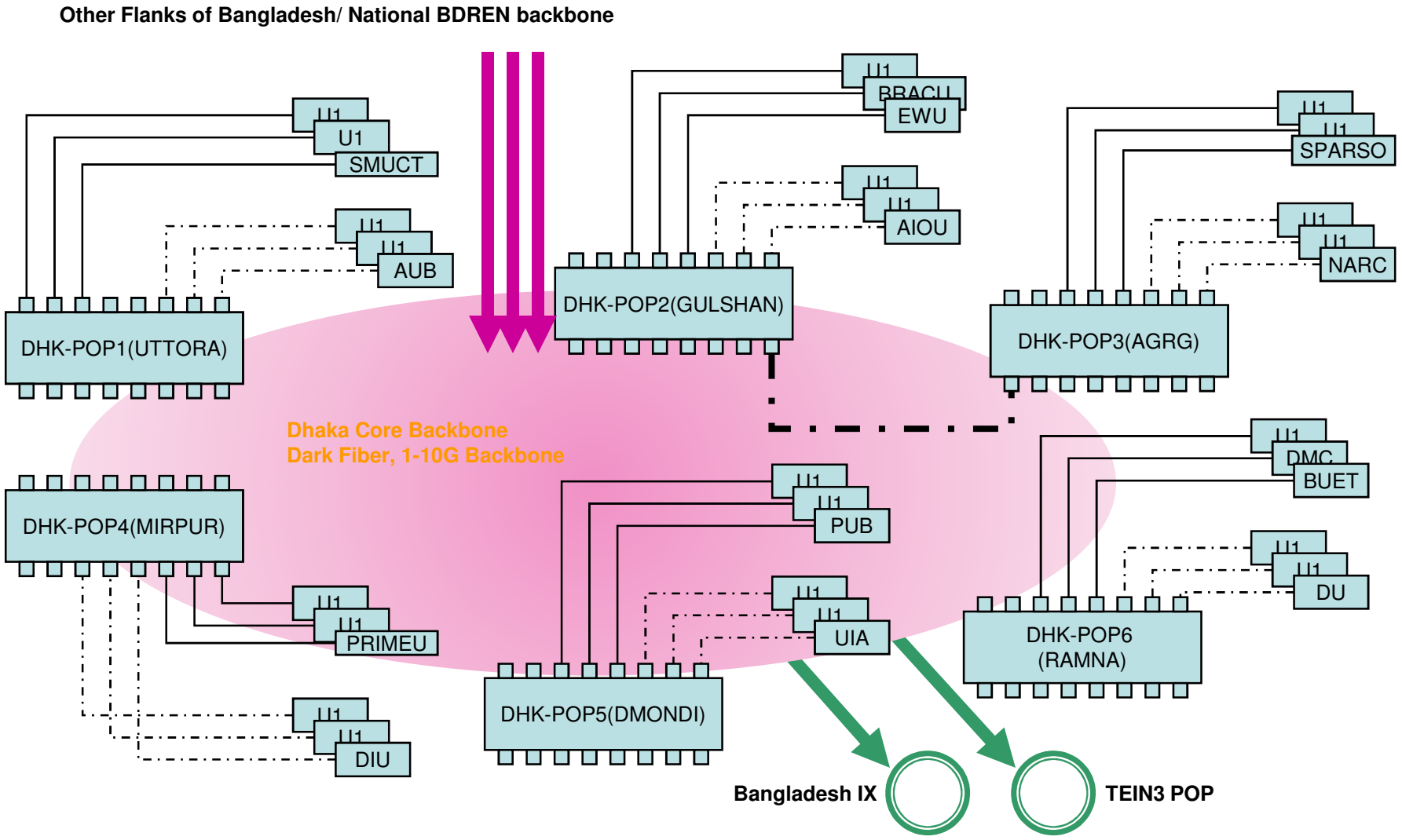
- APAN: Asia-Pacific Advanced Network
- Partner in TransPAC link
- Several national networks moving to 10Gbps
- APAN network made up of country-owned point2point links contributed to APAN
- Trans Eurasia and Trans Pacific connectivity increasing

Bangladesh Research & Education Network

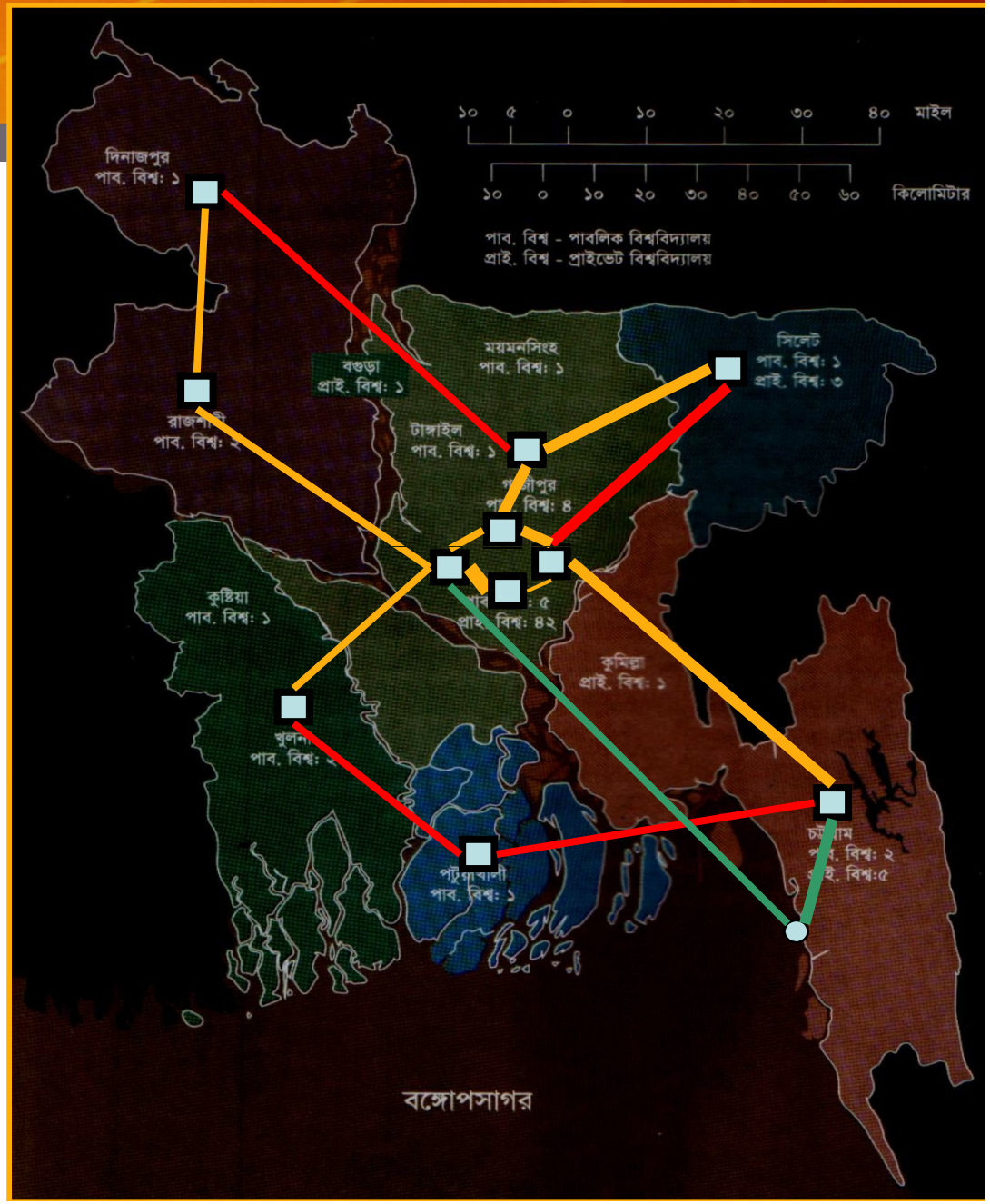
BDREN at a Glance

Participants:	All 26 public universities, all 16 public medical and dental collages, 53 private universities, 30 private medical and dental colleges and selected research institutions.
Current capacity without REN:	0-4 mbps/ university on the average.
Planned REN Capacity:	50-100 mbps university to REN .
Backbone Speed:	1 Gbps- 10 Gbps core.
Estimated 5 year Budget:	$21 million with recurring cost recovery and capital accumulation in equipment and fiber ownership at the end of 5 years.
Technology:	Giga Bit Ethernet, CWDM & switched IP/MPLS
Other Features:	Fundamentally changes countries higher education landscape via ICT competency. Significantly levels off the internal and external digital divide.

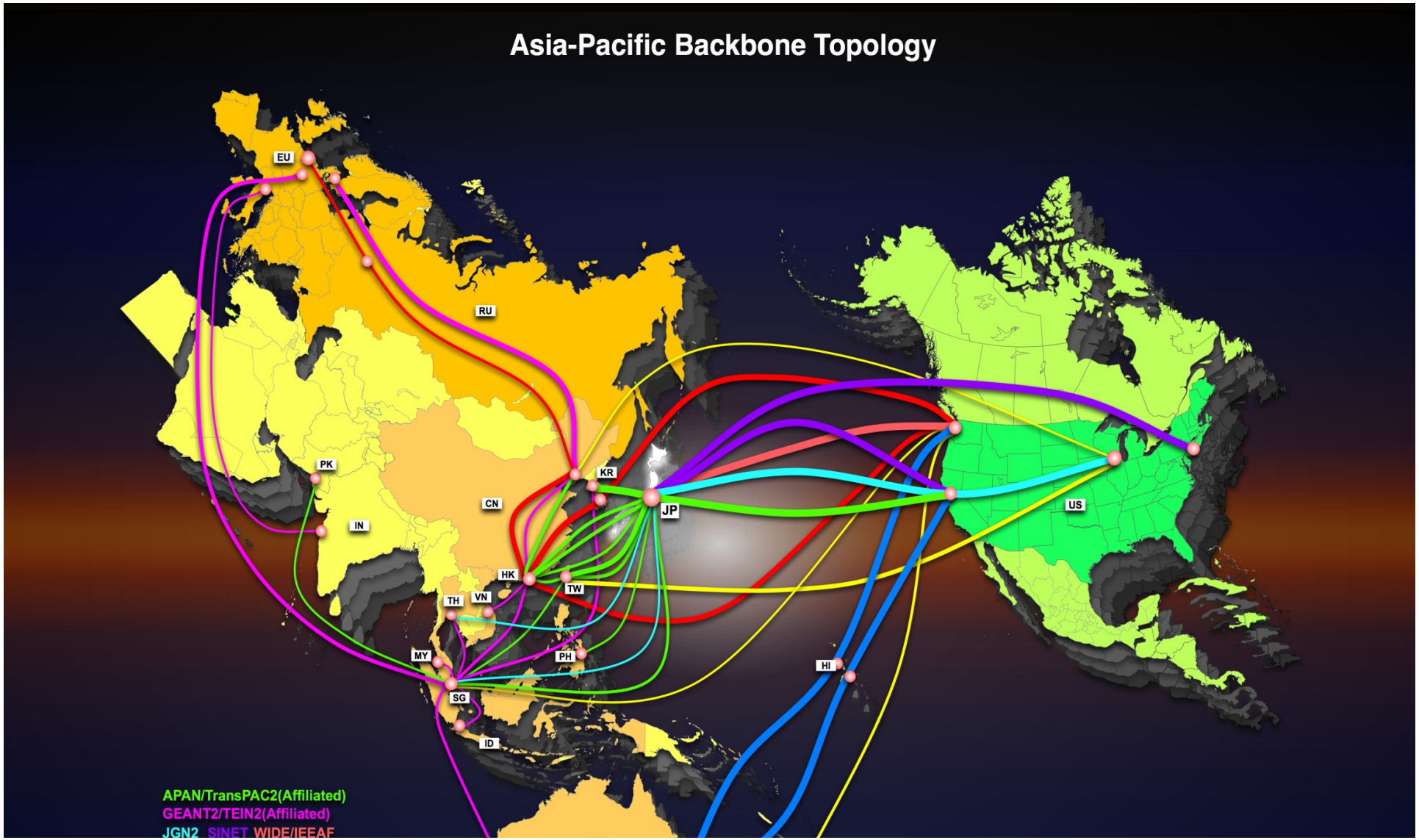
Preliminary Dhaka Backbone (Just a sketch!)



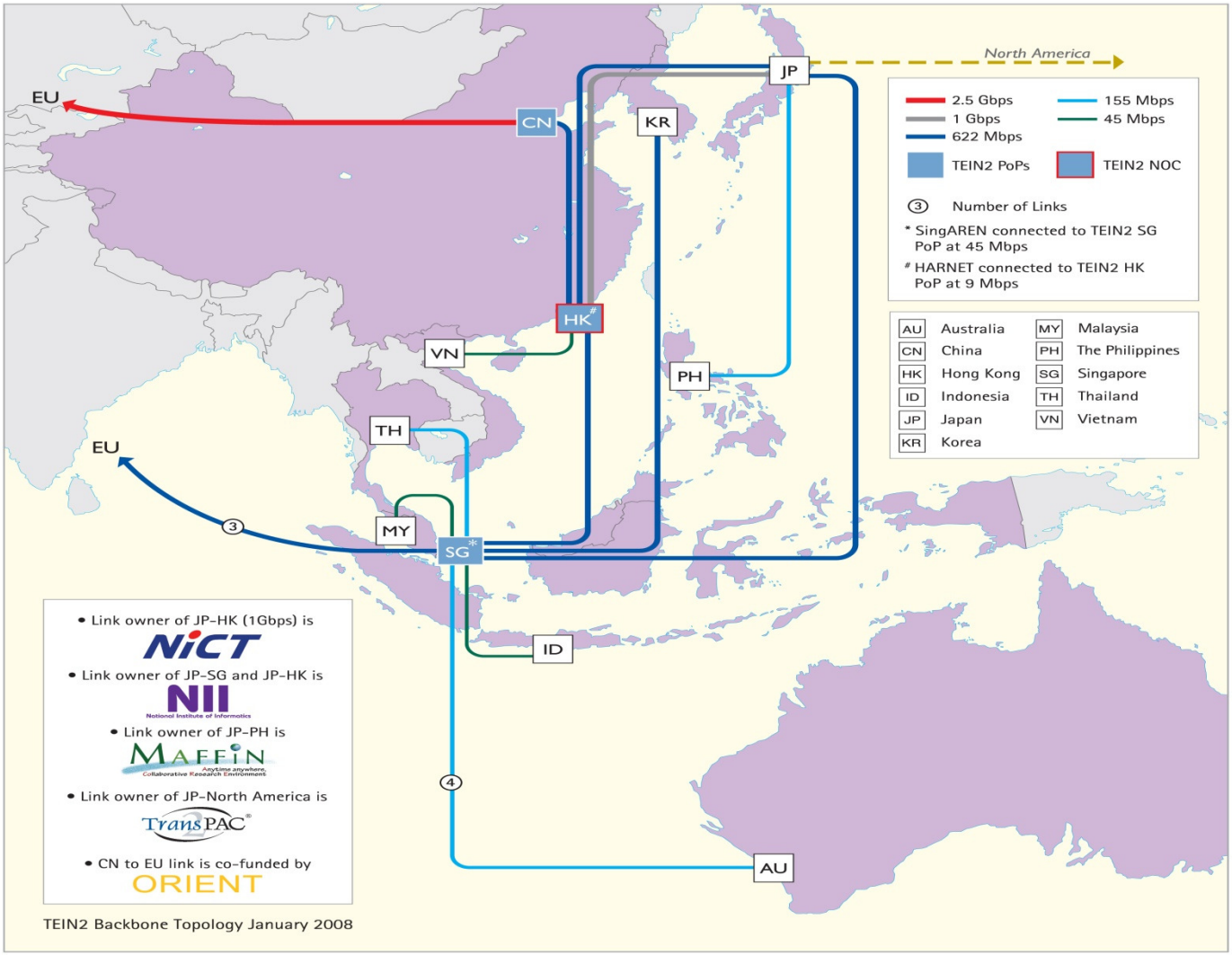
- REN Members
- All 26 public universities.
- All 53 private universities.
- All 16+30 private and public medical & dental colleges.
- Selected research institutions.



International Connectivity: Asia Pacific Backbone



International Connectivity: TEIN2 (South East Asia)

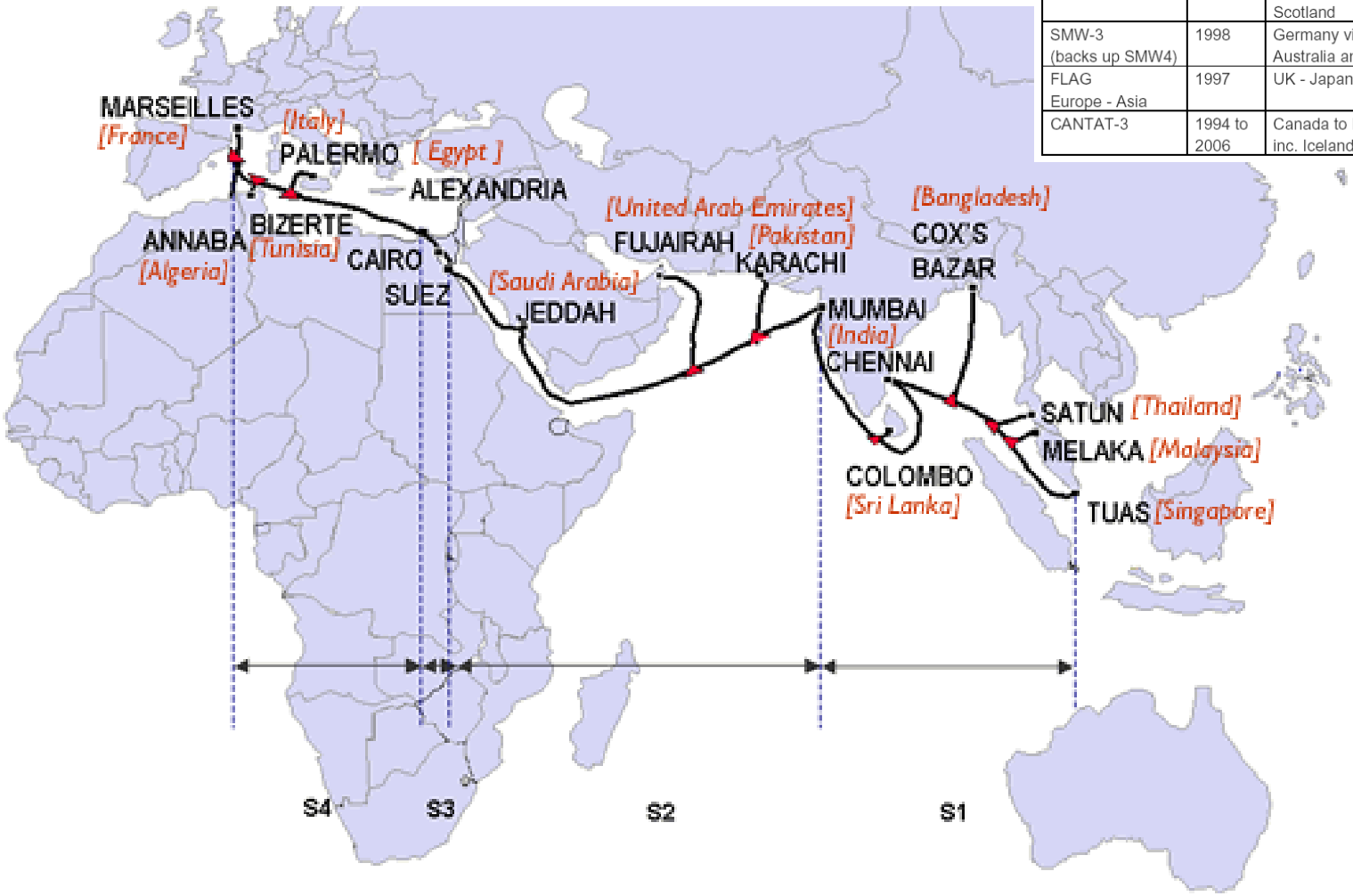


Beneficiaries:
The People's Republic of China (CN)
The Republic of Indonesia (ID)
Malaysia (MY)
The Republic of the Philippines (PH)
The Kingdom of Thailand (TH)
The Socialist Republic of Vietnam (VN
Non-Beneficiaries:
Japan (JP)
The Republic of Korea (KR)
The Republic of Singapore (SG)
Australia (through its NREN AARNet)

South Asia Integration: SEA-ME-WE4

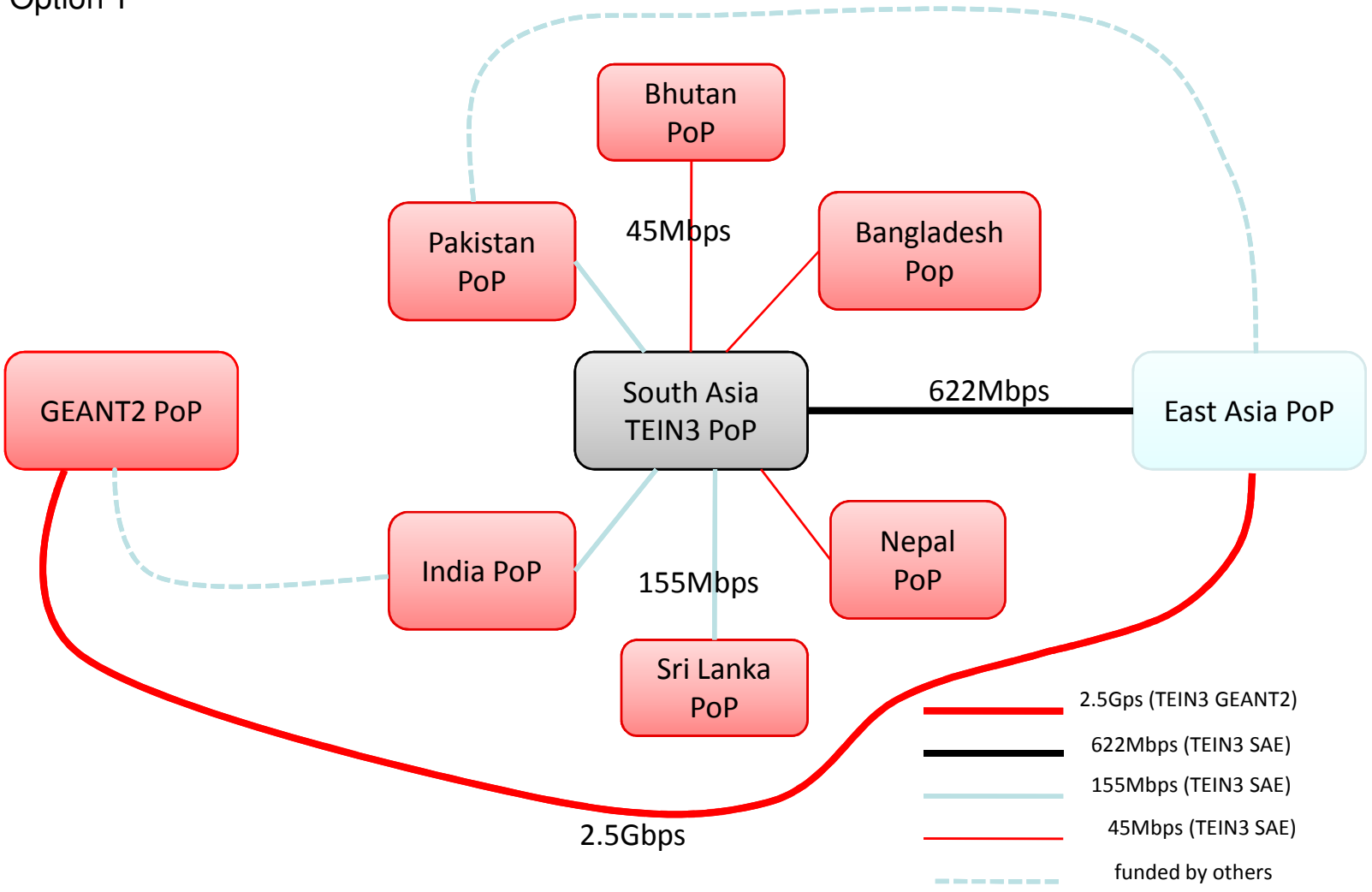
Table 2: Examples of Branched Submarine Cable Systems

Name	Year	Route	Length	Capacity
SMW-4	2006	France-Singapore (UK via terrestrial)	~20,000km	Initial 80Gb/s upgrades to 1,280Gb/s
FARICE-1	2004	Iceland -Faroes - Scotland	~1,400km	20Gb/s before upgrades
SMW-3 (backs up SMW4)	1998	Germany via UK to Australia and Japan	~38,000km	In the range 55Gb/s to 160Gb/s
FLAG Europe - Asia	1997	UK - Japan	~27,000km	In the range 10Gb/s to 80Gb/s
CANTAT-3	1994 to 2006	Canada to Europe inc. Iceland and UK	~7,100km	2fp* 2.5Gb/s regenerated



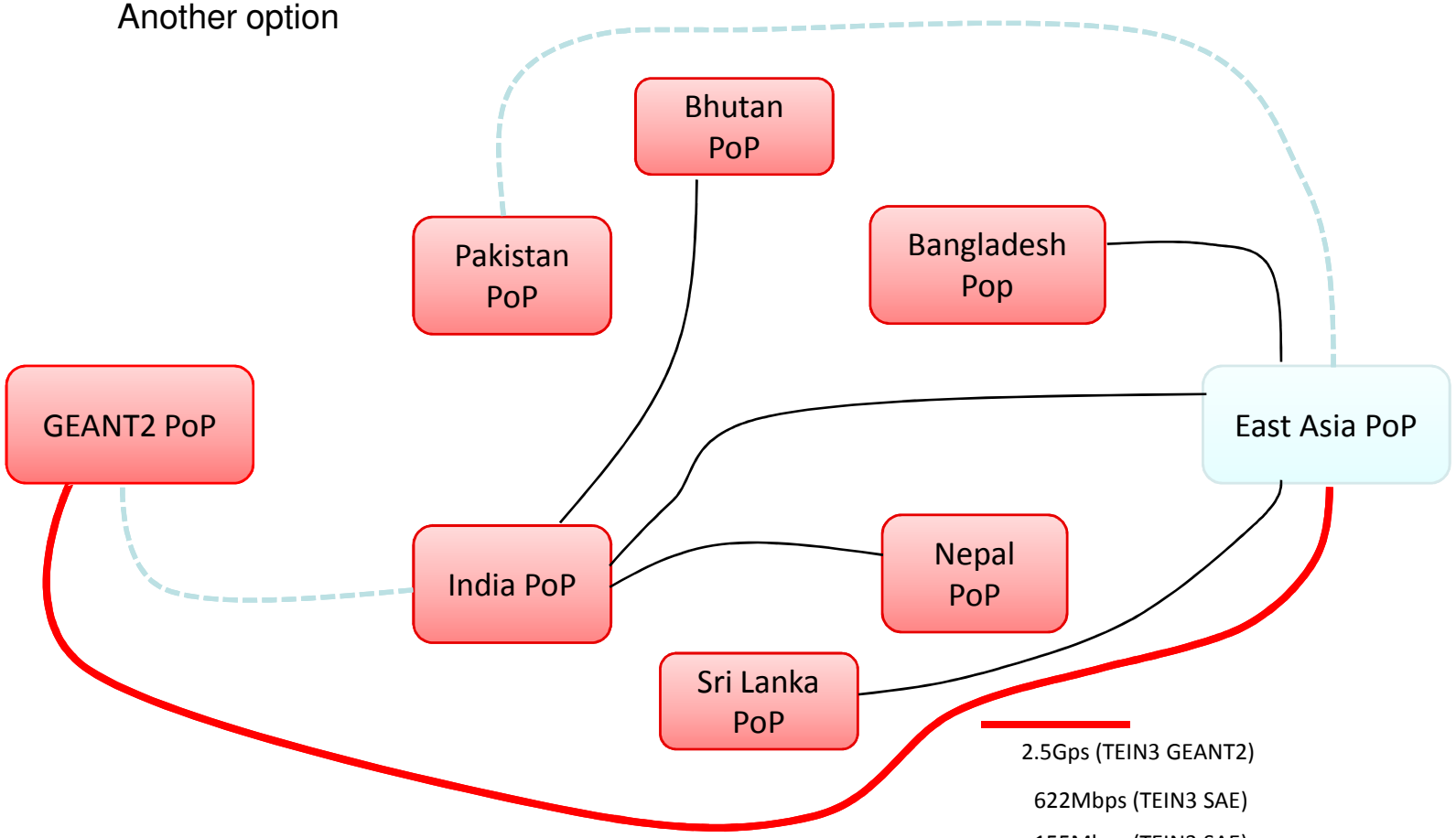
Transeurasia Information Network Initiative
Proposed South Asia Integration Plan [1]

Option 1

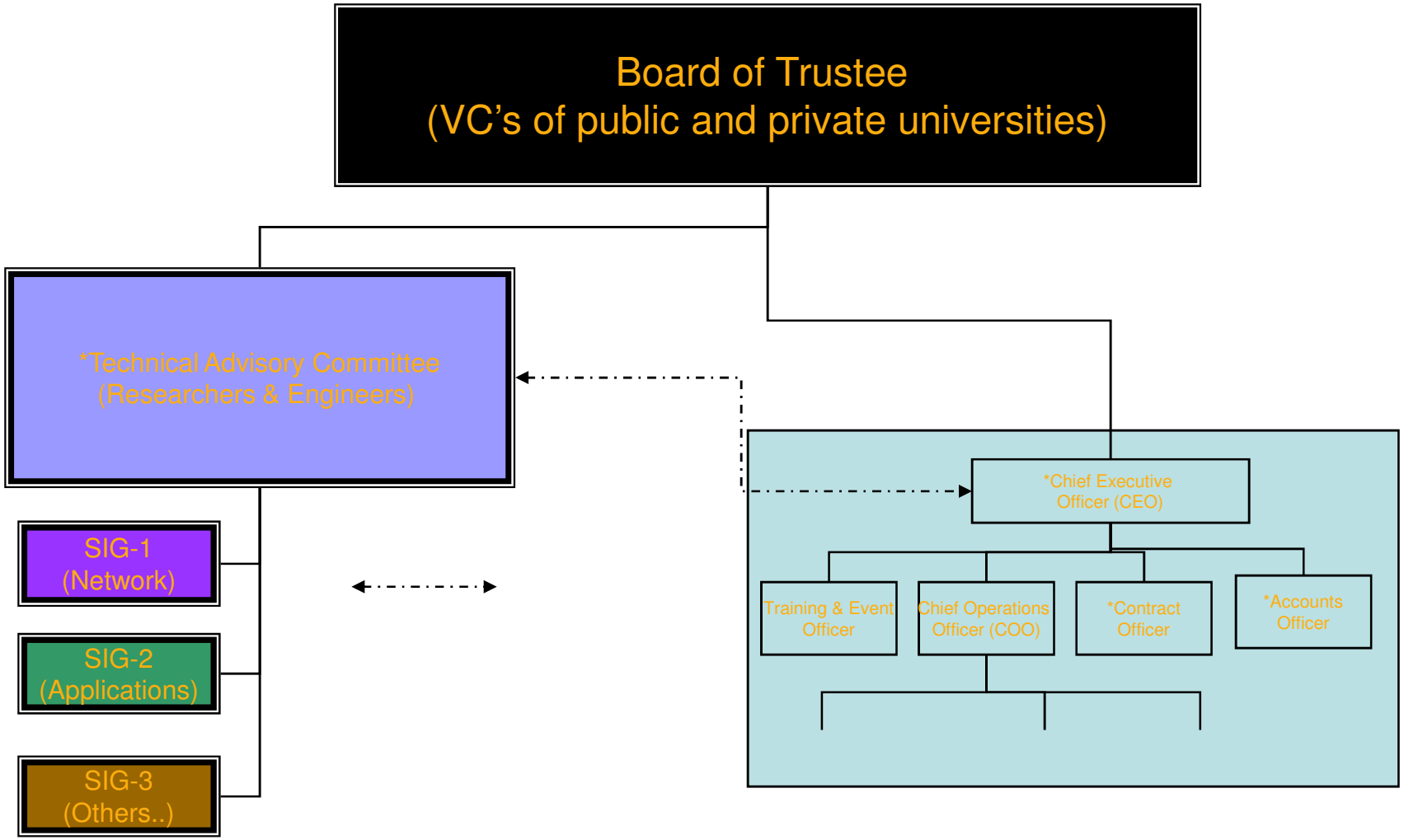


South Asia Integration Plan [1]

Another option



BDREN Consortium



Board or Trustee

Board of Trustee	
Chairperson, UGC	Chairman
Member, UGC	Member
Member, UGC	Member
5 VC*s from Public Universities (By rotation)	Member
3 VCs* from Private Universities (By rotation)	Member
Joint Secretary, Ministry of Education	Member
3 Inductees selected by the other trustees	Members
Chief Executive Officer	Member Secretary

Technical Advisory Committees

Technical Advisory Committee	
Member () UGC	Chairman
5 Representatives from Public Universities	Member
3 Representative from Private Universities	Member
3 Technical Expert Inductees (from SIGs, related industries, or research organizations)	Members
Representative, BTRC	Member
Deputy Director, ICT+BDREN, UGC	Member
Chief Executive Officer	Member Secretary
Chief Operating Office	Member

REN Economics

- Most well run RENs have managed to provide more bandwidth and higher quality internet access at lower cost.
- The saving comes from the following:

- (a) It applies bulk buying power to get better rate from data service providers.

- (b) In addition, the research and educational part of the traffic is carried at no-cost via global RENs between all member universities in the world. Without a REN this part of the traffic has to travel over commodity internet at commercial rate.

- (c) Its non-profit mode of operation.

- RENs routinely receive technology funding to perform advanced ICT experiments and tests.

Typical Funding Model

- A membership subscription to the consortium to cover most recurring costs (Bandwidth, salary etc.)
- Capital investment is provided by public sources (higher education authority, ministry of science & technology, technology funds, ministry of telecommunications, etc.)
- All universities thus benefits from the public capital funding.

Cost Share in RENs

- Members also contribute in kind to keep the costs down- for example the space for NOC, POPs, etc.
- Faculty members, researchers, network engineers from the university community participate and guide the technology direction.
- A valuable research test-bed for pioneering works. Can be used by the faculty members and researchers to test various new technologies, protocols, applications.

Responsibilities shared by the Universities

- Universities them selves must maintain and upgrade their campus network in the light of affordable bandwidth provided by REN.

- Its' not only the campus network, universities must ensure programs so that its' students and faculty can use the high level of internet capacity afforded by the initiative.

Future of Research & Higher Education

- No university, organization, national or regional body can succeed in isolation.
- Advanced Internet will be the key infrastructure component of an University.
- REN is needed to cope up with the advanced applications and systems being deployed/ envisioned by the current world university community. Universities without REN with be increasingly out of touch.
- RENs will enable advanced collaboration between researchers, scholars, research groups in a much more meaningful way across nations breeding new ideas.

Few Issues..

You too might be pondering!

Issue (1)

- **Should we do it Small (with few central universities) or Big (including all)?**

- Should we limit the benefits to Dhaka?
- Perhaps the people outside Dhaka needs connectivity more than those in Dhaka.
- Can BD handle such a big project?
- Economy of scale (worldwide trend).

- Answer: Be **all inclusive** but do phased lighting.

Issue (2)

- **Can we afford to delay it?**

- Bangladesh is already the last to do it in South Asia!
- Still Long way to go…
- Many other critical services (like Digital Library) depends on it and waiting..
- Most RENs are already in 2nd/3rd generation.
- We could have- if we were to start in 2005!

- Answer: Its **already too late!**

Issue (3)

- **Should Private Universities be included?**

- All students- rich or poor, are equal to the country. The society has responsibility to the entire future generation.
- Bulk of the cost is for reaching outside Dhaka. Very few private universities are there.
- Education should reach to citizens living in regional towns. Not the citizens have to travel to Dhaka.

- Answer: Private universities must pass on the saving from this national investment to the students.

Issue (4)

- **Can one university do it?**

- No example exists where one university did that for a country the size of Bangladesh.
- Network by definition needs all's participation- big and small. A network cannot be built out of one member.
- Top universities naturally to assume more leadership and contributed more advanced expertise.

- Answer: Consortium.

Bigger Perspectives (for Policy Makers' Notebook!)

- The Internet penetration in Bangladesh is one of the lowest in the world.
- However, the case of Bangladesh is peculiar. There is fiber abundance- but the vast part of the country is in IT darkness.
- Popularly believed reason is the late arrival of international linkage. Yet after the submarine cable- a much complex reason is now evident. It is the distribution failure within the country.

The Waste

- The current capacity distribution failure within the country is so alarming that data communication prices are 3-5 times higher than its immediate neighbors whereas a public resource like PGCB fiber remains vastly unutilized.

- Bangladesh is apparently an interesting case of artificial “famine” of data communication. The government must act so that fiber assets paid by public money is put to use.

- Fiber itself has a lifetime of 25 years. Any unused capacity is the waste of solemn public investment.

The Opportunity

- A partnership between public fiber owner PGCB and REN can fundamentally change the situation.
- Data communication can be made available at all corners of the country specially to the disadvantaged 80% areas of the country.
- REN is a strategic infrastructure seeding that will assuage the digital divide within the country (divide within divide).
- The PGCB (Dark Fiber)/ BDREN can be one of the seminal partnership for data communication history of Bangladesh.

Conclusions

- It's a technology project of the decade for Bangladesh Higher Education.
- Young generation of faculty and experts should lead the project.
- There are plenty of challenges for every one to contribute and participate.
- Avoid dividing issues such as private vs. public universities, top-vs. new universities. There are bigger national and international battles to win with much bigger payoffs for everyone.

References

1. TEIN3 South Asia Feasibility Study (WP5) Report, David West & George McLaughlin, December 2008.
2. Network MAPS provided by the NRENs.
3. TERENA, Trans European Research and Education Networking Association, Compendium of NRENs, 2008.
4. Heather Boyle & Ana Preston, Internet2, International Overview Document, 2005.
5. World Higher Education Database (WHED), The Int. Association of Universities (IAU), 2004.
6. Can the OhioLINK Mission Be Fulfilled? Providing for 21st Century Information Needs, OhioLink Update, v. 11, no2, Sep. 2005 [web http://www.ohiolink.edu/about/ update/ sep2005.pdf]
7. Worldwide Emergence of Research and Education Networks and a Proposal for Bangladesh, Technical Report TR2006-01-01. Javed I. Khan [web: http://medianet.kent.edu/techreports/TR2006-02-01-UGC-REN-K.pdf]
8. A Global Perspective on University Libraries and a Roadmap for Bangladesh National Digital Library Consortium, Technical Report TR2006-01-03. Javed I. Khan, [web: http://medianet.kent.edu/ techreports/TR2006-02-01-UGC-REN-K.pdf]