



Singapore Advanced Research and Education Network

www.singaren.net.sg

ipv6.singaren.net.sg

By
A/Prof. Bu-Sung Lee, francis

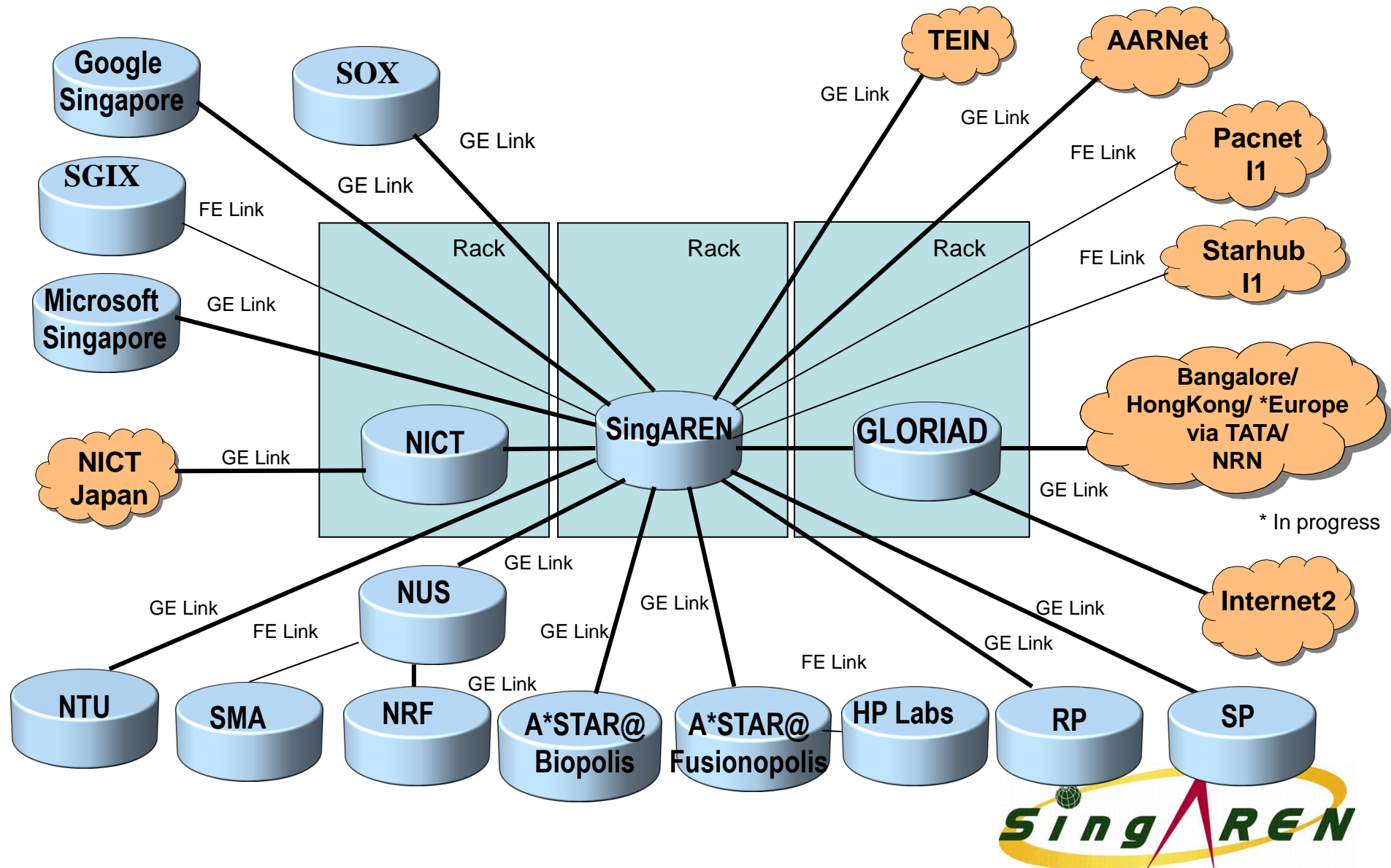


SingAREN: Background

- Started in 1997 as a national project jointly funded by Telecom Authority of Singapore (TAS, now iDA) and National Science and Technology Board (NSTB, now A*STAR)
- Mission
 - Advocate and champion advanced network applications and technology in Singapore.
 - Be the platform of collective representation of the community of research and education networks (REN) in Singapore.
 - Facilitate cost-competitive adoption of advanced Internet technologies for Singapore RENs.
- Provide connectivity to advanced Research & Education Networks (RENs), such as Internet2, TEIN, APAN, GLORIAD etc.
- Re-constituted as not-for-profit self-help community society in 2003 with subscription-based business model.



SingAREN-GIX Connectivity (12 July 2013)



International Connections

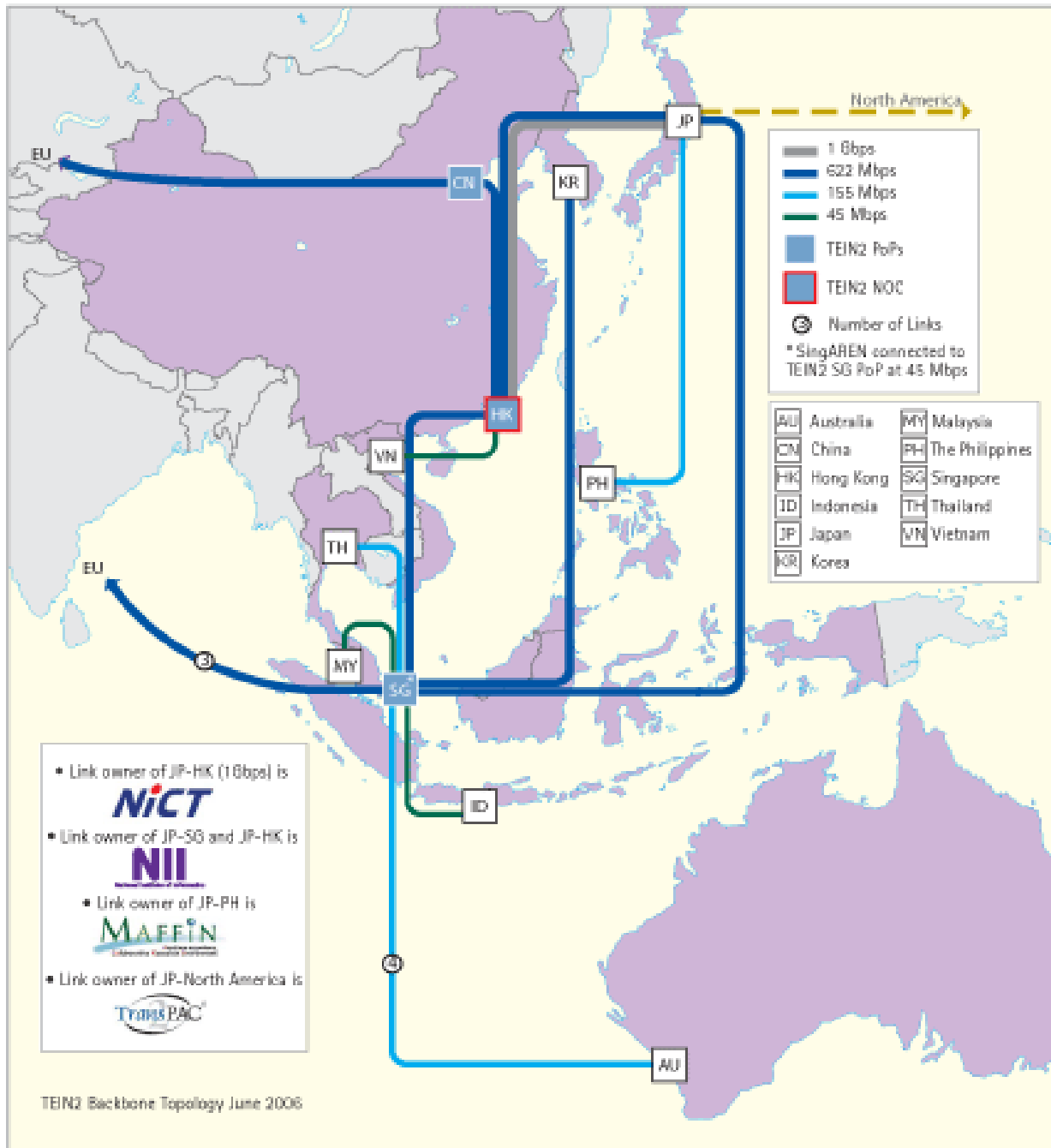
- NICT: 1Gbits/s ⇒ Providing connections to Asia, US
- AARNet: 622Mbits/s ⇒ Providing connections to AU
- TEIN4: 90Mbits/s ⇒ Providing connections to EU, AU, Asia
- GLORIAD: 1Gbits/s ⇒ Providing connections to US, East Asia, IN, EU*
- Internet2: 1Gbits/s ⇒ Providing connections to US(backup)



* Under development

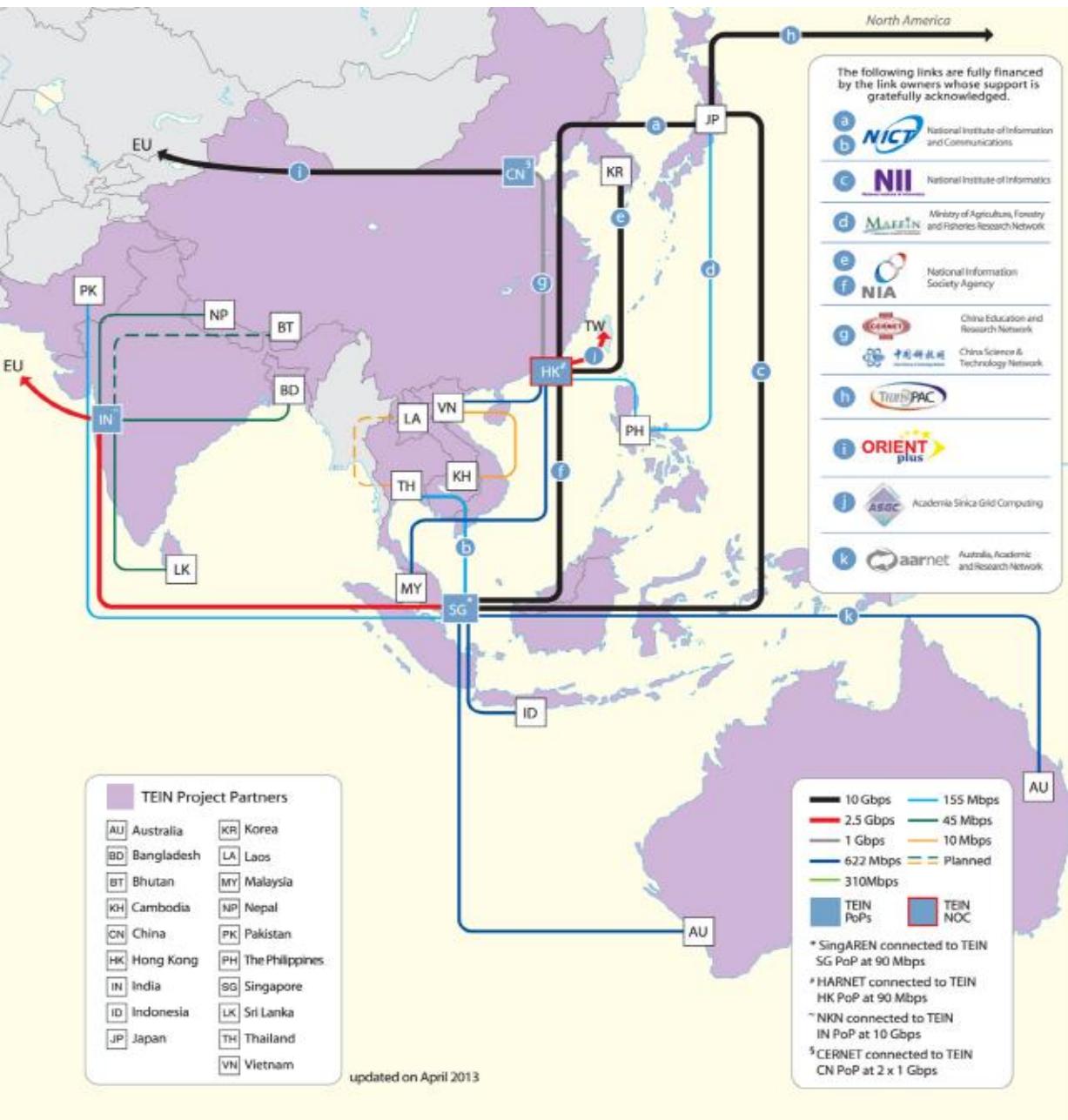


TEIN2- network (2004 – 2007)

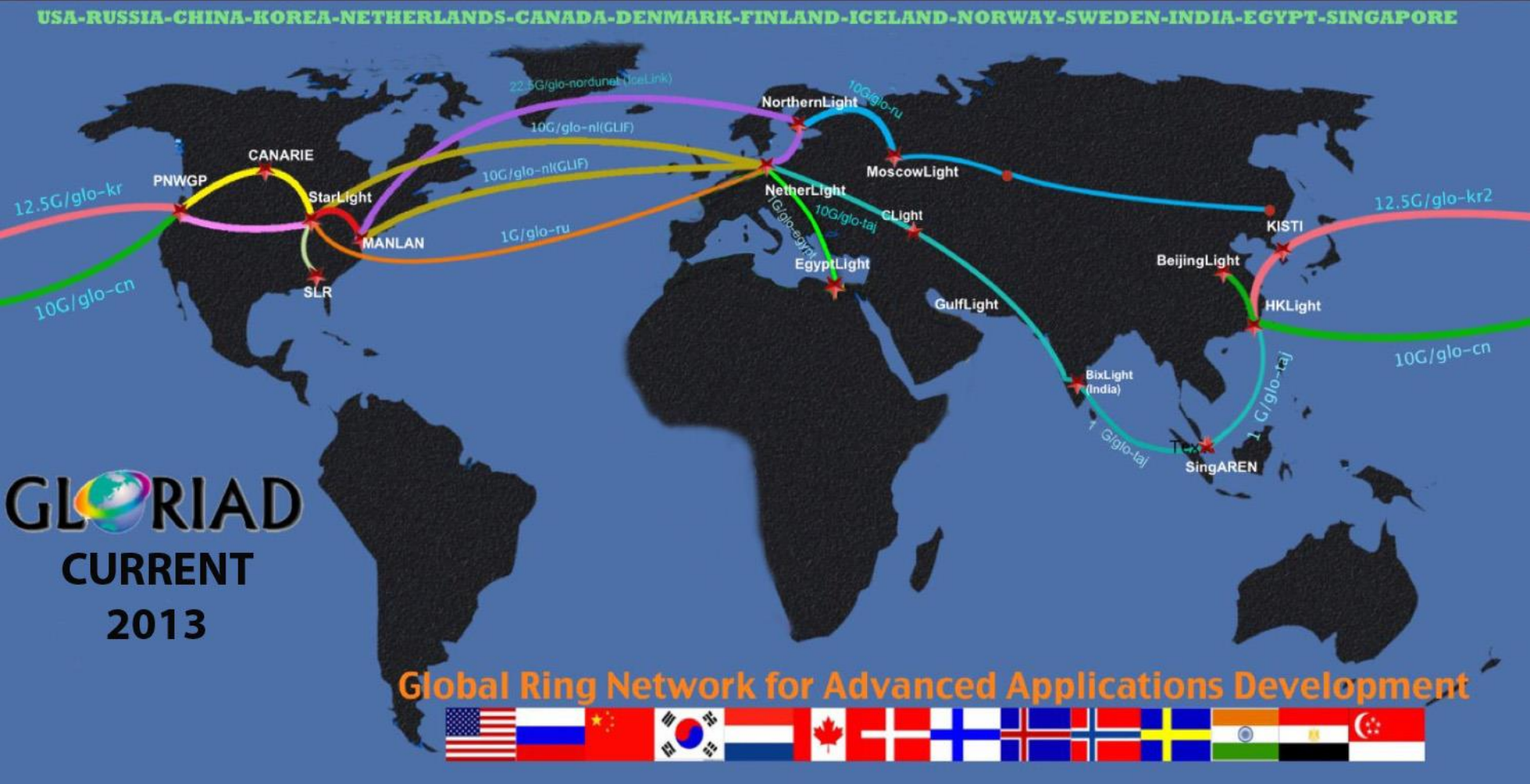


TEIN4 Network (2012-2015)

- Next generation TEIN network
- Managed by TEIN*CC



GLORIAD-TAJ Connection



- 1 Gbps link from Singapore to U.S. and *Europe



SingAREN-Lightwave Internet Exchange (SLIX) Project



SLIX Networking Reception 21 February 2013

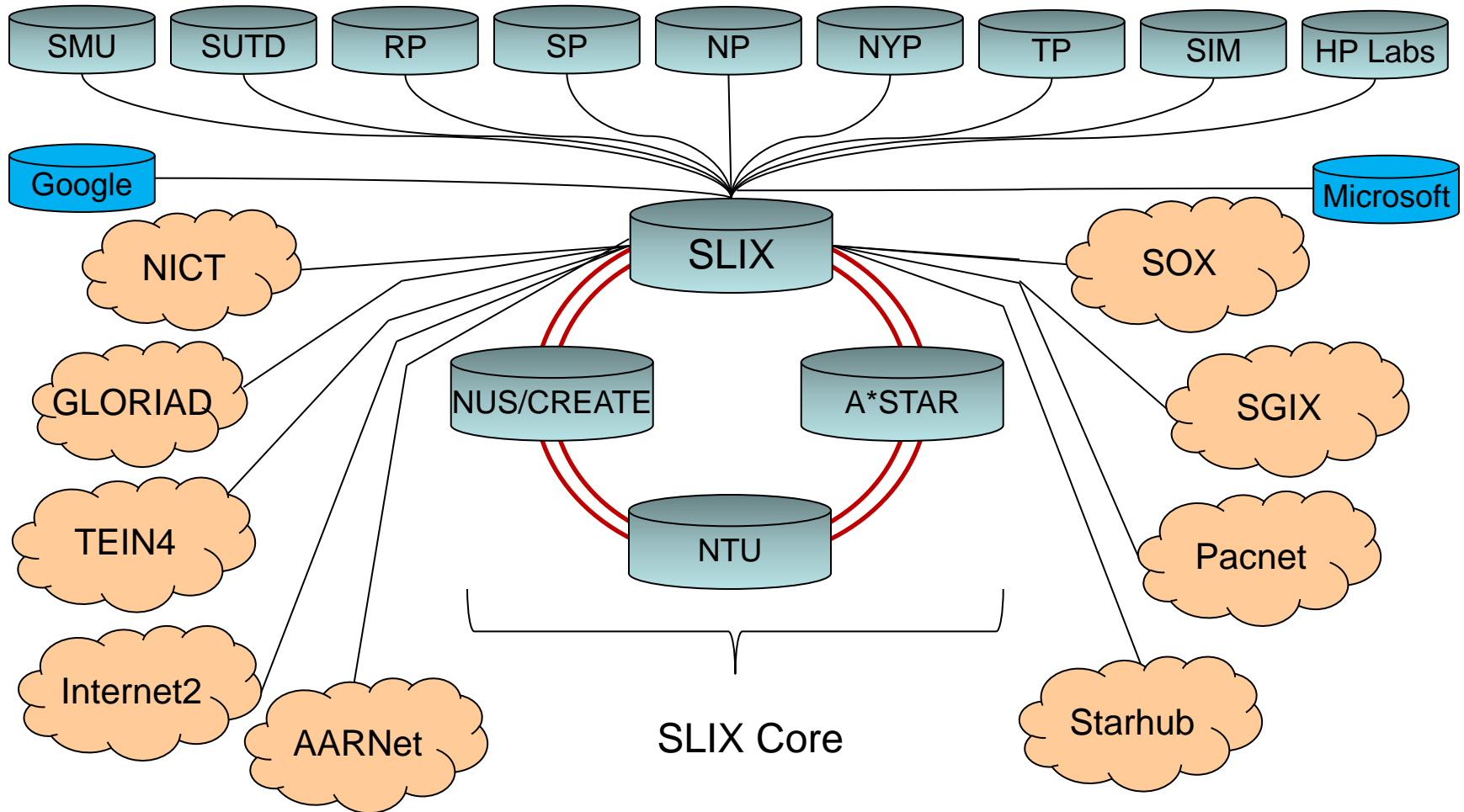


NRF, SingAREN and the SLIX partners
(A*STAR, NTU, NUS) at the SLIX
Networking Reception, 21 Feb 2013

- SingAREN embarks on the SingAREN-Lightwave Internet Exchange (**SLIX**) project, in partnership with A*STAR, NTU and NUS.
- The project is co-funded by NRF for 5 years.



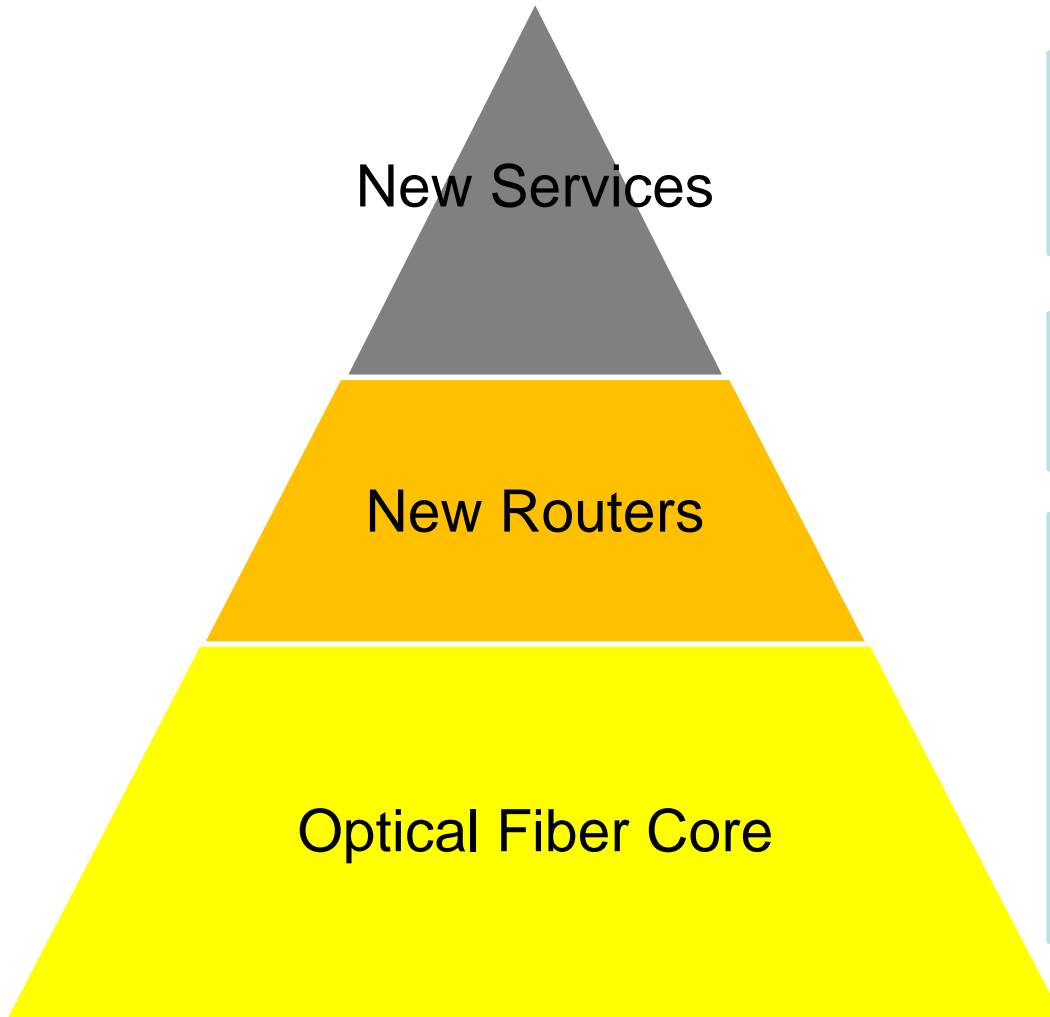
SingAREN-Lightwave Internet Exchange (SLIX)



- SLIX Core forms backbone
- Member/partner connections via FE, 1GE or 10GE



SLIX – Project Overview



New Services

- (1) Local database mirroring with partner provider to minimize multiple downloads from overseas

New Routers

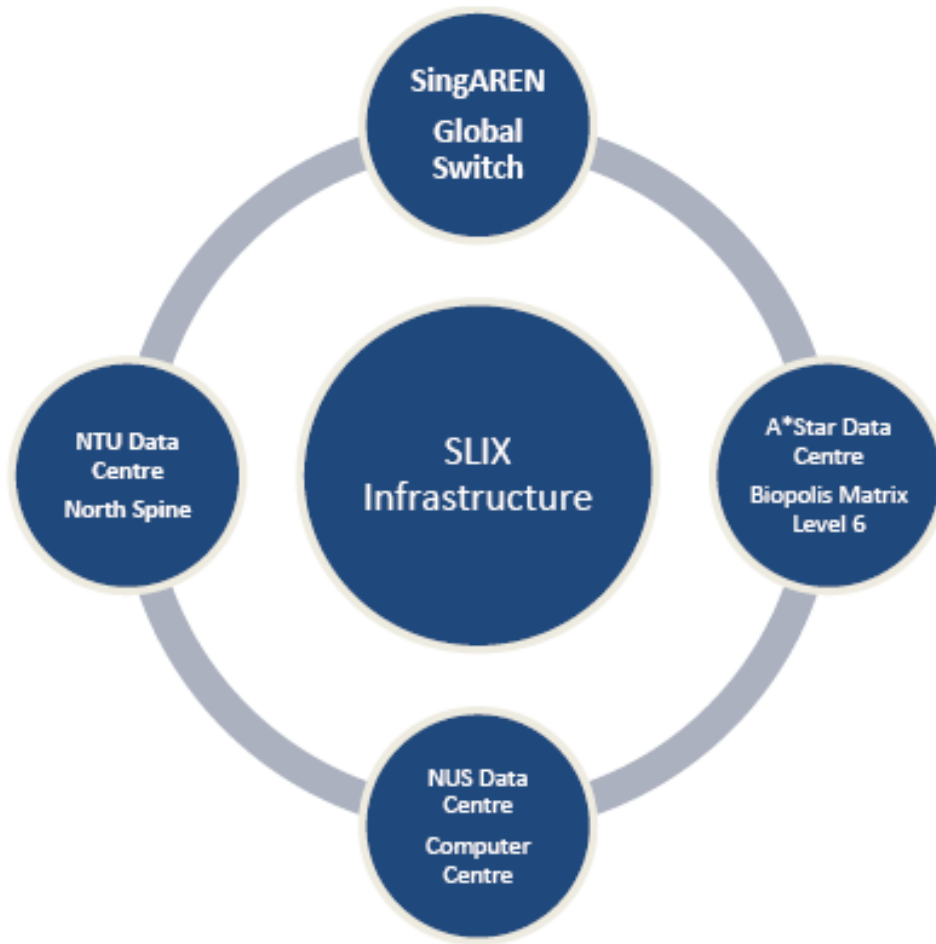
- (1) Increase capacity and incorporate **up to 100G**

Optical Fiber Core

- (1) Connects NUS, NTU, A*STAR and SingAREN (Global Switch).
- (2) Technology-proof fiber core overcomes existing capacity limitations and allows future capacity upgrades
- (3) Long-term leasing to reduce costs, e.g. typically 15 years
- (4) On par with peer R&E networks



SLIX Core Infrastructure

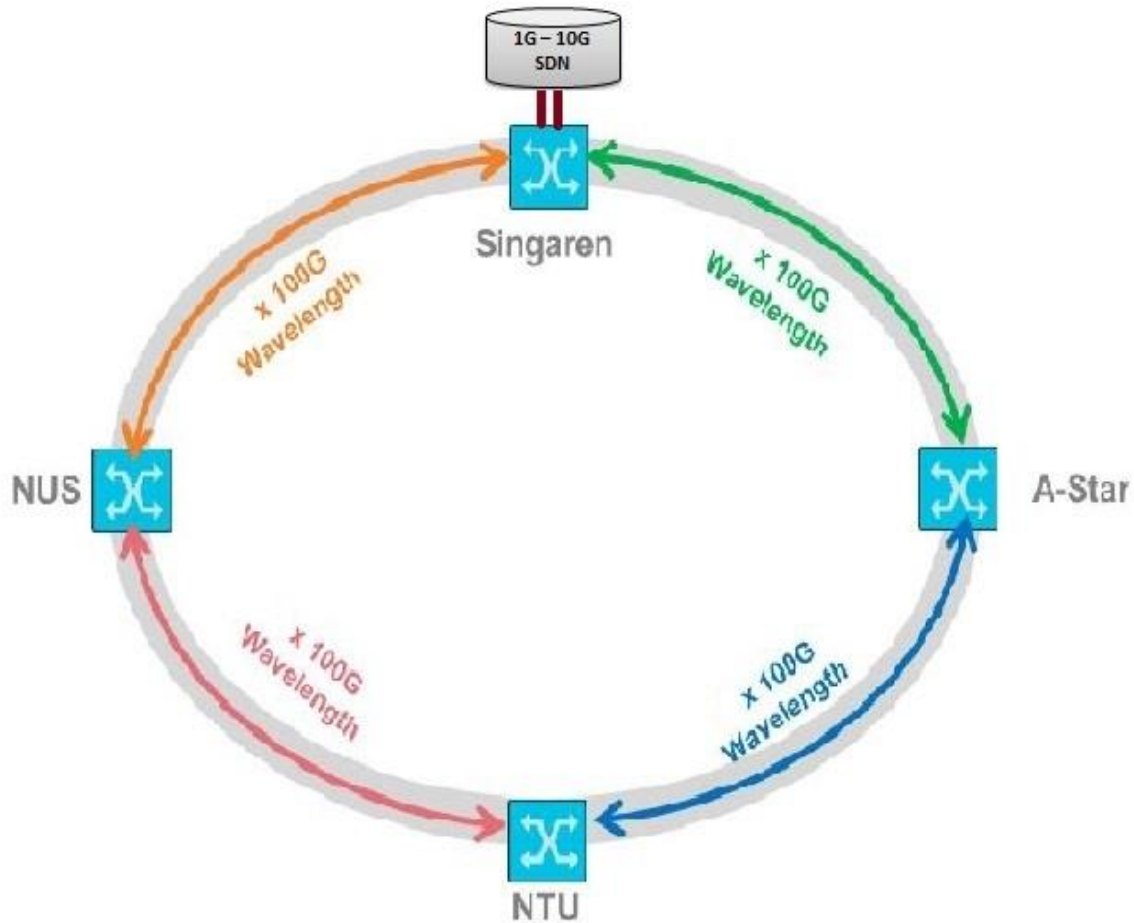


- Mesh Topology
- 8-core Single Mode (SM) fiber cables

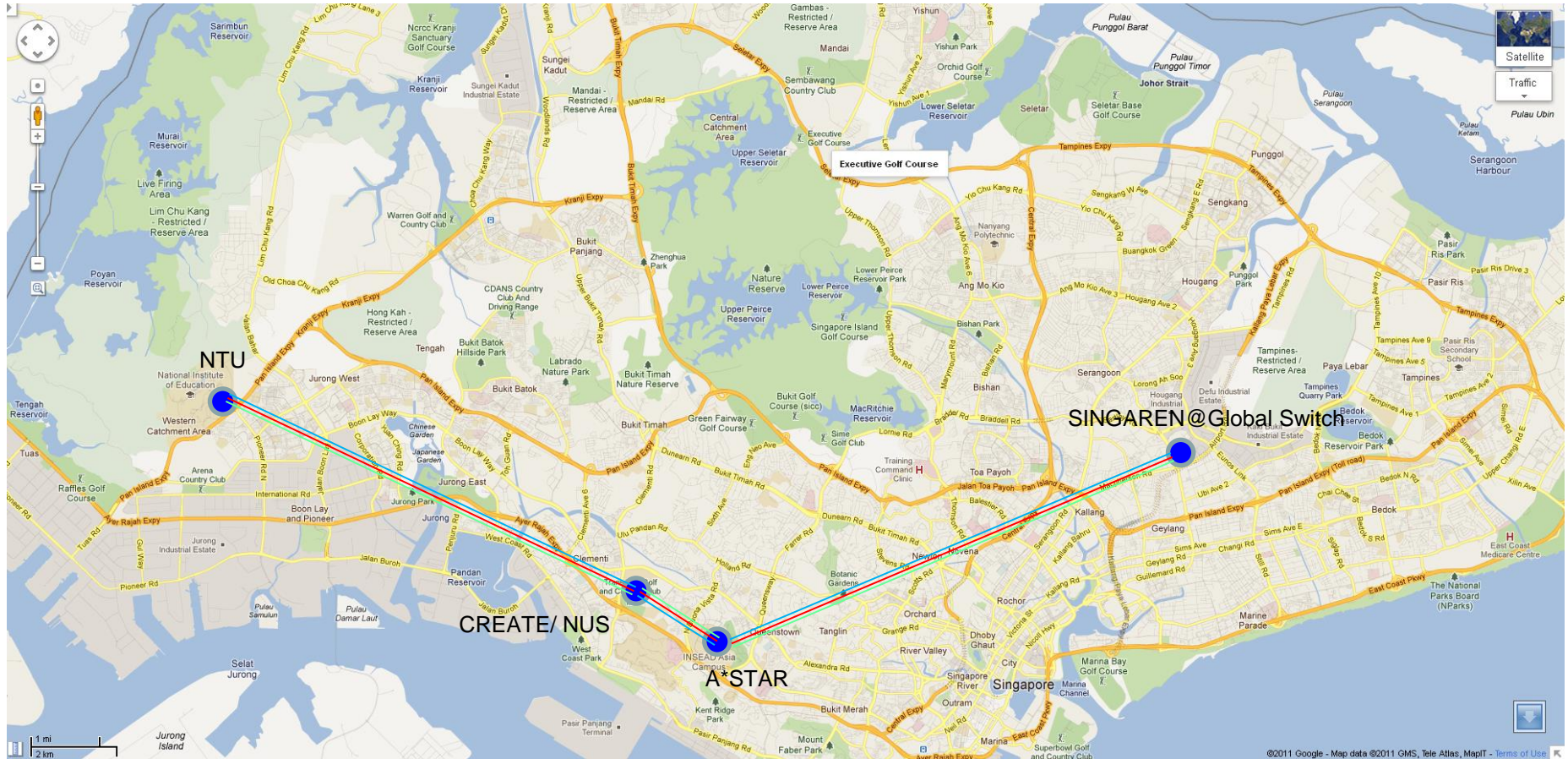
Figure 1.6: SLIX Core Infrastructure





SLIX Core Infrastructure



SLIX – dark fiber and optical switch nodes



-  Dark Fiber
-  Optical Switch node



THE STRAITS TIMES, TUESDAY, 11 DECEMBER 2012, PAGE B12

NTU students get free campus Wi-Fi abroad with new deal

By **GRACE CHNG**
SENIOR CORRESPONDENT

STUDENTS visiting campuses abroad could do without the hassle of trying to arrange wireless Internet access.

For about 40,000 present students, lecturers and other staff from Nanyang Technological University (NTU), this is no longer a problem across much of the globe.

Under a new deal, they have access to free Wi-Fi at educational campuses in 58 countries.

They can surf the Internet, check e-mail and access digital files and folders in 5,000 locations at universities in Europe, Asia, Africa and the United States. They simply use their sign-on names and passwords.

The university has joined eduroam, a global education roaming service which provides free global Wi-Fi hot spots.

Students from overseas universities such as Cornell and Princeton in the US, Britain's Imperial College and the Hong Kong Polytechnic University will be able to enjoy the same benefits when they are in Singapore – so far available only at NTU.

NTU is the first university in Singapore – and South-east Asia – to offer this service.

NTU's chief information officer Tay Kheng Tiong said: "Our students and lecturers won't have to subscribe to overseas data roaming services.

"On the average, it costs about \$20 per megabyte of documents accessed.

A webpage of 1.5MB will cost about \$30. So eduroam will save them money."

Since the university is hoping to send about 70 per cent of each cohort of students to participate in overseas programmes, eduroam will mean substantial savings for the NTU population.

"There's also the convenience factor, added Mr Tay.

"Usually when you want Wi-Fi access from an overseas institution, you've to apply for a user name and a password and get the laptop configured to work in that hot spot. With eduroam, all of this disappears."

The service went online last week. It is also available to all NTU alumni as long as they use the same us-

er name and password that they used while at the university.

The university spent \$8,000 for additional network equipment to link up to eduroam.

Eduroam was made possible by SingAren (Singapore Advanced Research and Education Network), which champions advanced network applications and technology use for tertiary institutions here.

SingAren's president, Associate Professor Francis Lee, said that the service will also be offered to other universities and polytechnics here.

SingAren has a connection to eduroam's network in the US and Europe. NTU connects to eduroam via this network.

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Where can I eduroam?
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Where can I eduroam?

Having started in Europe, eduroam has gained momentum throughout the research and education community world wide and is now available in 60 territories world wide.



- [Andorra](#), [Armenia](#), [Australia](#), [Austria](#), [Azerbaijan](#), [Belarus](#), [Belgium](#), [Brazil](#), [Bulgaria](#), [Canada](#), [Chile](#), [Croatia](#), [Cyprus](#), [Czech Republic](#), [Denmark](#), [Estonia](#), [Finland](#), [France](#), [Germany](#), [Greece](#), [Hong Kong](#), [Hungary](#), [Iceland](#), [Ireland](#), [Israel](#), [Italy](#), [Japan](#), [Kenya](#), [Korea](#), [Kyrgyzstan](#), [Latvia](#), [Lithuania](#), [Luxembourg](#), [Macau](#), [Macedonia](#), [Malta](#), [Moldova](#), [Montenegro](#), [Morocco](#), [The Netherlands](#), [New Zealand](#), [Norway](#), [Peru](#), [Poland](#), [Portugal](#), [Romania](#), [Russia](#), [Serbia](#), [Singapore](#), [Slovenia](#), [Slovakia](#), [South Africa](#), [Spain](#), [Sweden](#), [Switzerland](#), [Republic of China](#), [Thailand](#), [Turkey](#), [United Kingdom](#), [United States of America](#)



New Member



The changing eco-system of NREN

- Globalisation of education



Lee Kong Chian School of Medicine

A joint medical school by Imperial College London and Nanyang Technological University, Singapore



Campus for Research Excellence and Technological Enterprise(CREATE)

Top Research Institutions in the World



The changing eco-system of NREN

- Global Collaborative research

NRF Overseas Partners

ETH, Switzerland

Massachusetts Institute of Technology
(MIT), USA

National Science Foundation (NSF), USA

Technical University Munich (TUM)

Technion-Israel Institute of Technology

Hebrew University of Jerusalem

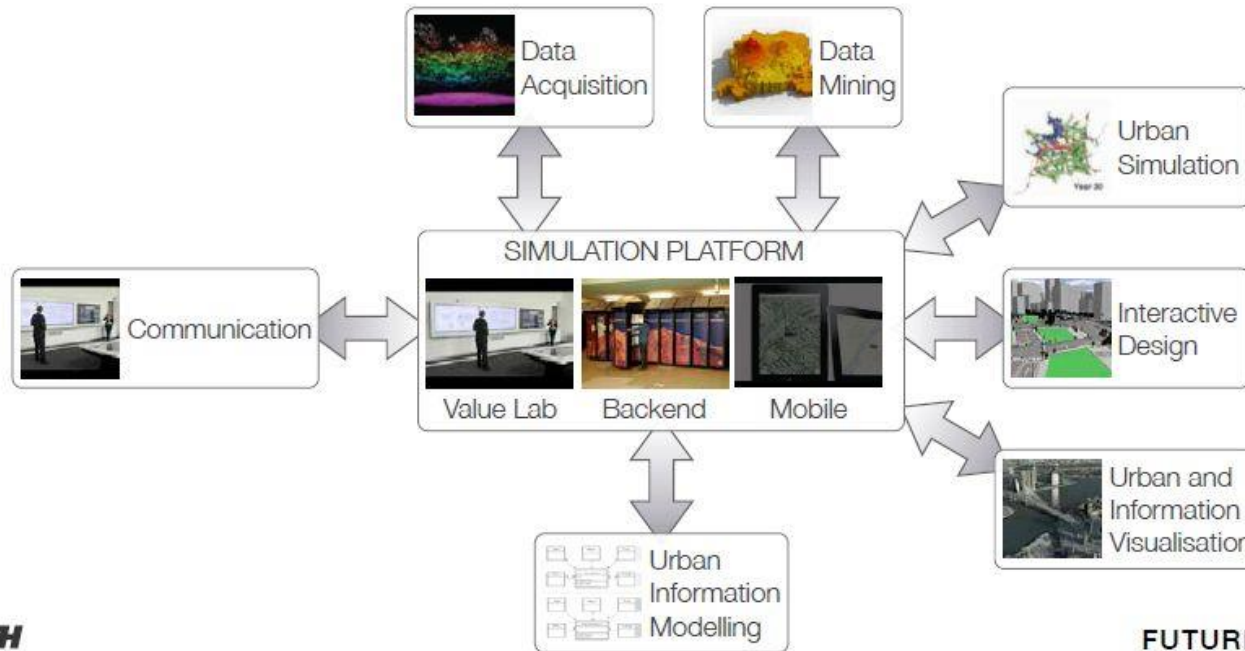
University of California, Berkeley

Ben-Gurion University of the Negev

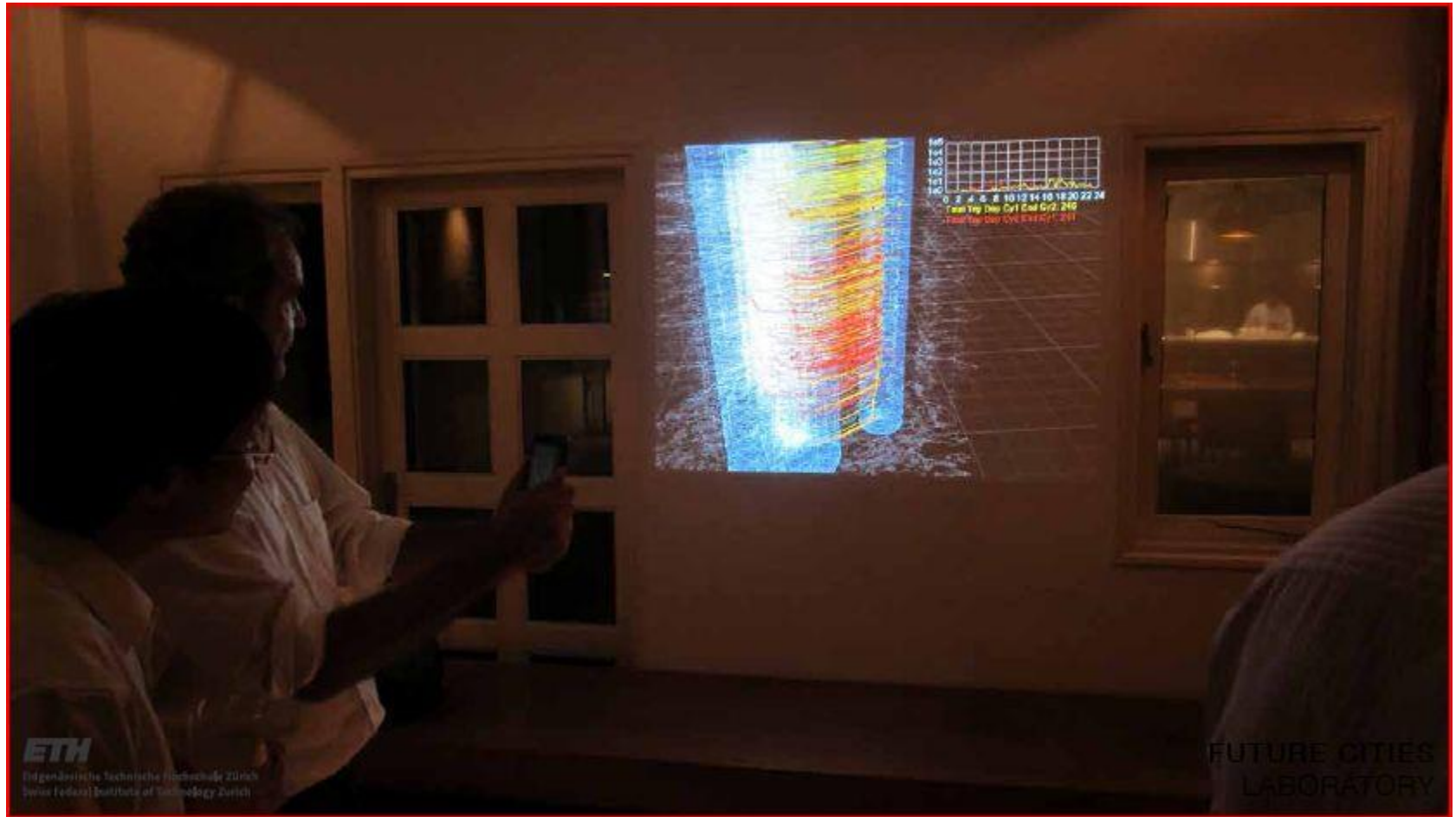


ETH Future City Lab

SERVICE AND RESEARCH AREAS



ETH – Visualisation project



Thank You

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