



Singapore Advanced Research and Education Network

www.singaren.net.sg

ipv6.singaren.net.sg

Background

- **Singapore Advanced Research and Education Network (SingAREN)** facilitates the cost-competitive adoption of advanced Internet technologies that benefits Singapore's research and education community.
- Connected to advanced Research and Education Networks, such as GLORIAD, Internet2, TEIN, APAN.
- The networks are dedicated for Research and Education (R&E) activities, such as E-Learning, video-conferences and access to research databases across international boundaries.
- Members consist of Institutions of Higher Learning, Government and network industry players.

SingAREN Members

Universities



Polytechnics



Government & Industries



International Partners



APAN
Asia Pacific Advanced Network



GLORIAD
Global Ring Network for Advanced Applications Development



TEIN3 / TEIN4 (*TEIN4 is managed by TEIN*CC*)
Trans-Eurasia Information Network



DANTE
Delivery of Advanced Network Technology to Europe



Internet2
U.S. Advanced Networking Consortium



AARNET
Australia's Academic and Research Network

International Partners



CANARIE

Canada's Advanced Research and Innovation Network



NICT

National Institute of Information and Communications Technology,
Japan



NLR

National Lambda Rail, U.S.



ASCC

Academia Sinica Computing Centre, Taiwan



NORDUnet

Nordic Infrastructure for Research & Education



KAREN

Kiwi Advanced Research and Education Network, New Zealand



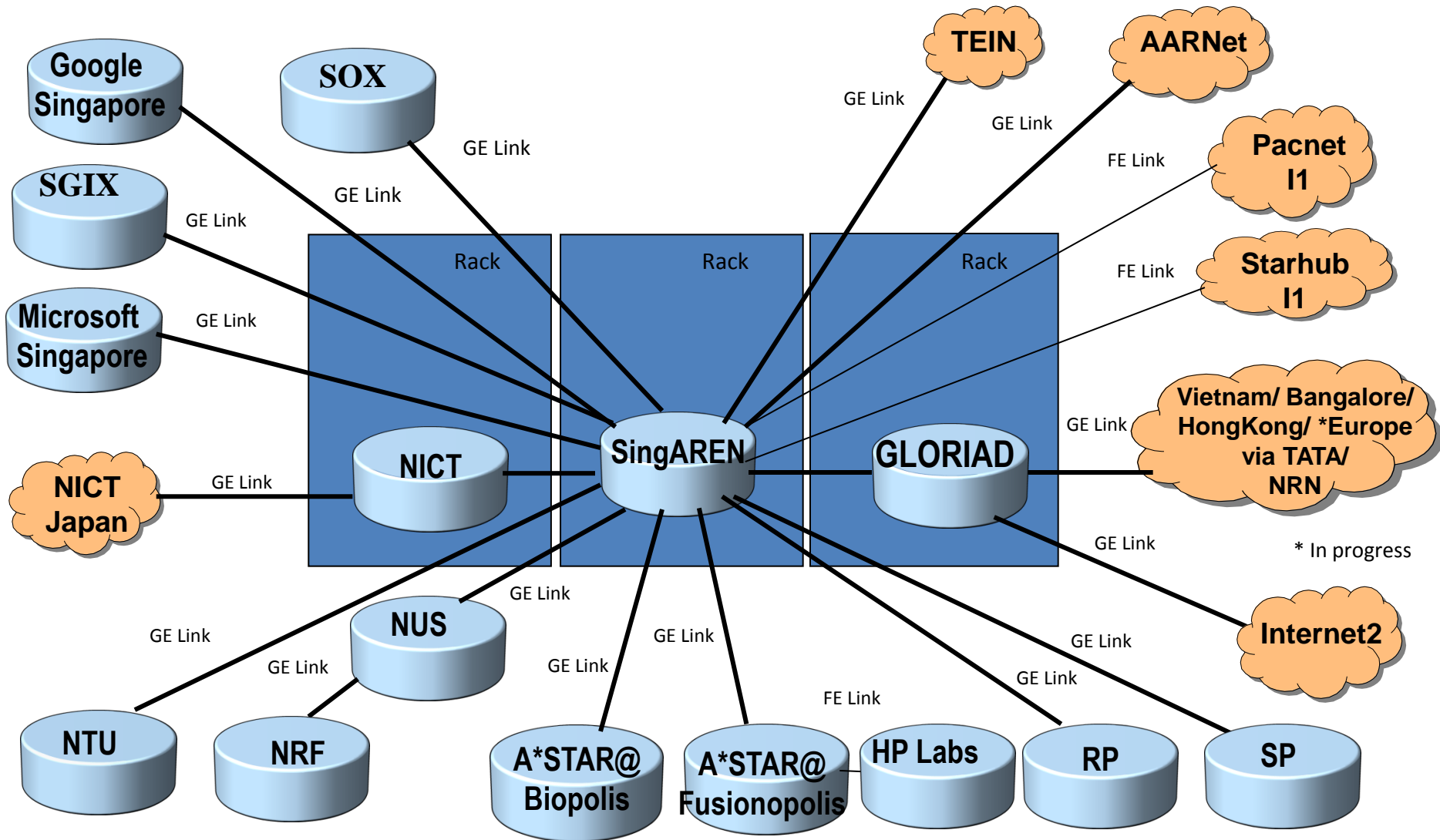
SURFNET

Advanced Research and Education Network, The Netherlands

SingAREN Gigabit Internet Exchange (SingAREN-GIX)

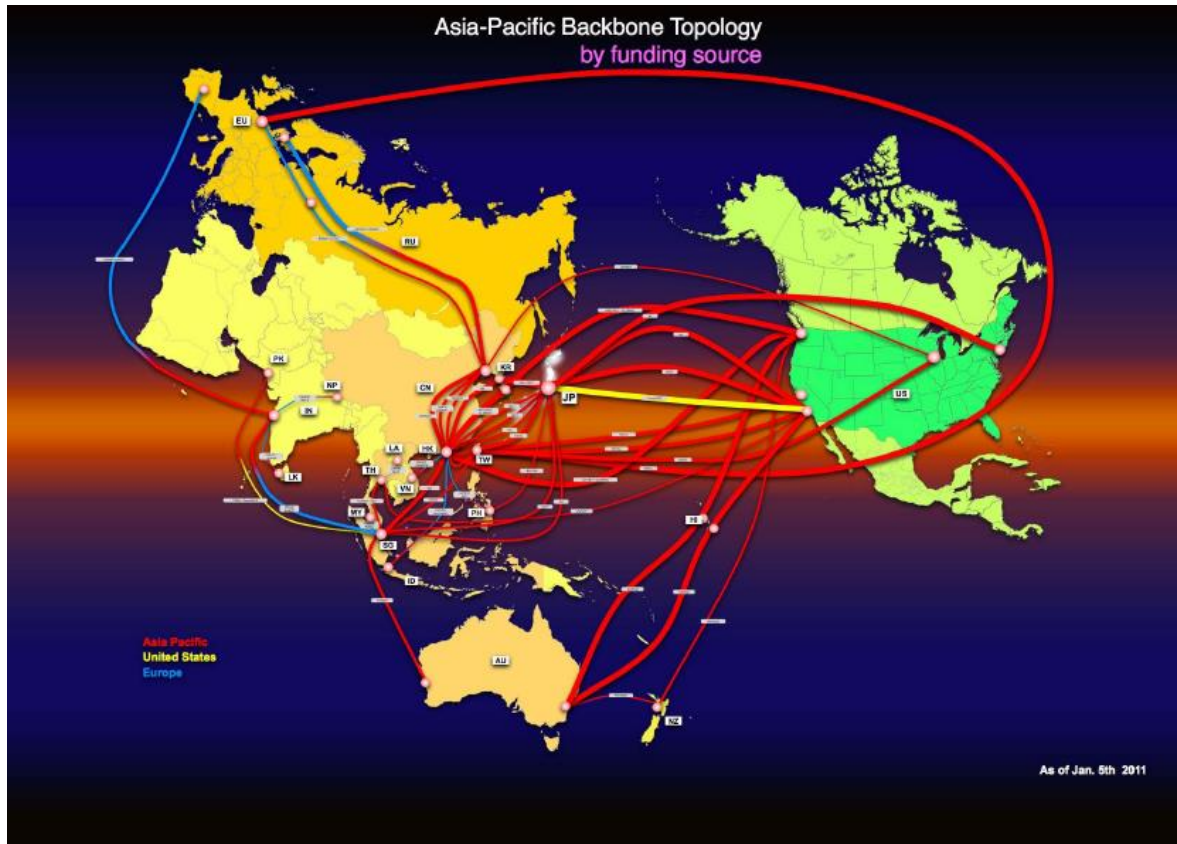
- Single point of presence – Iconic presence for Singapore
- GE (Gigabit Ethernet) based network with 1 Gbits/s links
- Multiple direct international routes
- Resilient due to multiple paths to Asia, Oceania, Europe & USA
- Open exchange and transit policy
- IPv6 ready

SingAREN-GIX Connectivity (1 Aug 2013)



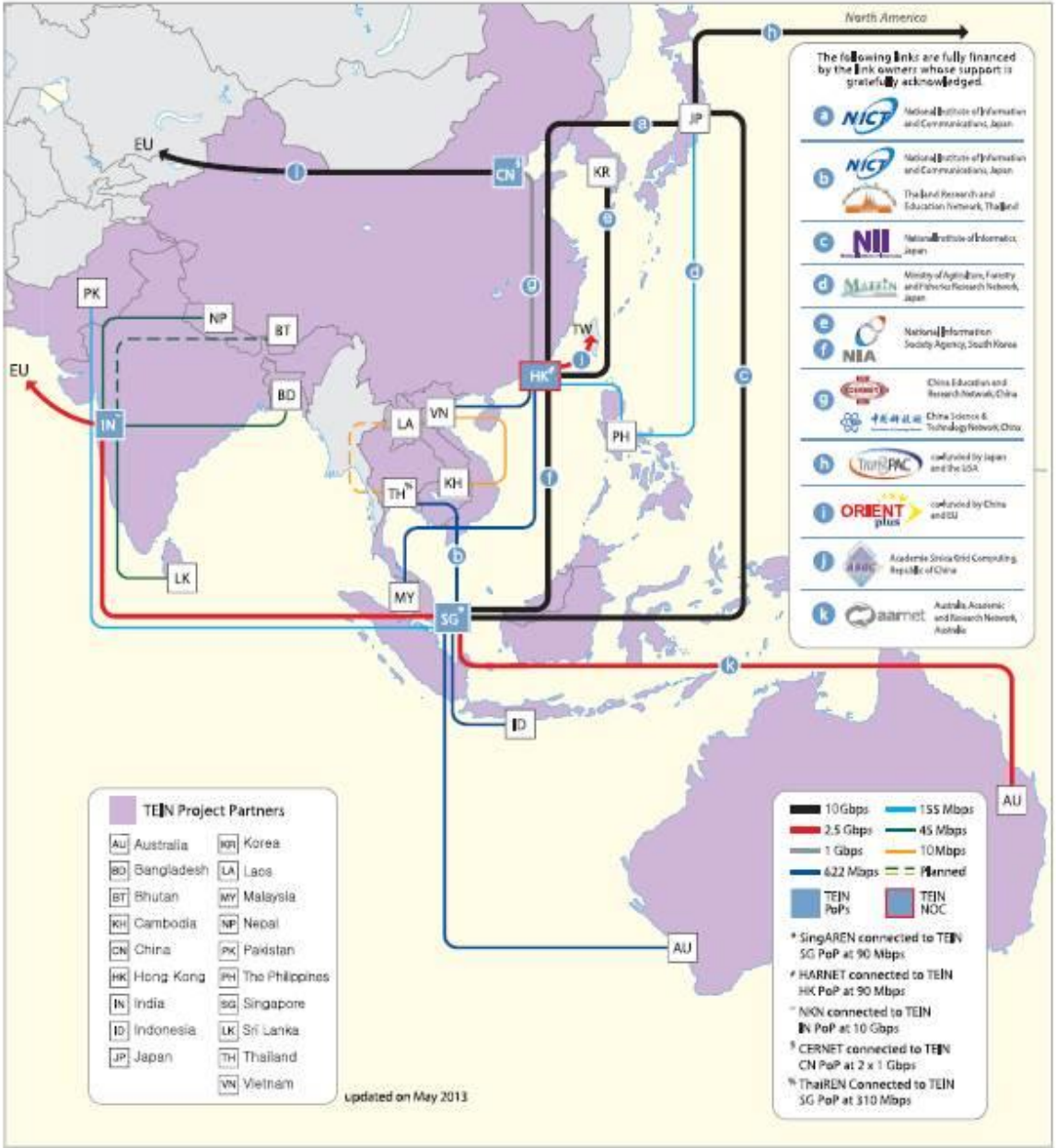
International Connections

- NICT: 1Gbits/s ⇒ Providing connections to Asia, US
- AARNet: 622Mbits/s ⇒ Providing connections to AU
- TEIN3: 90Mbits/s ⇒ Providing connections to EU, AU, Asia
- GLORIAD: 1Gbits/s ⇒ Providing connections to US, East Asia, IN, EU*



* Under development

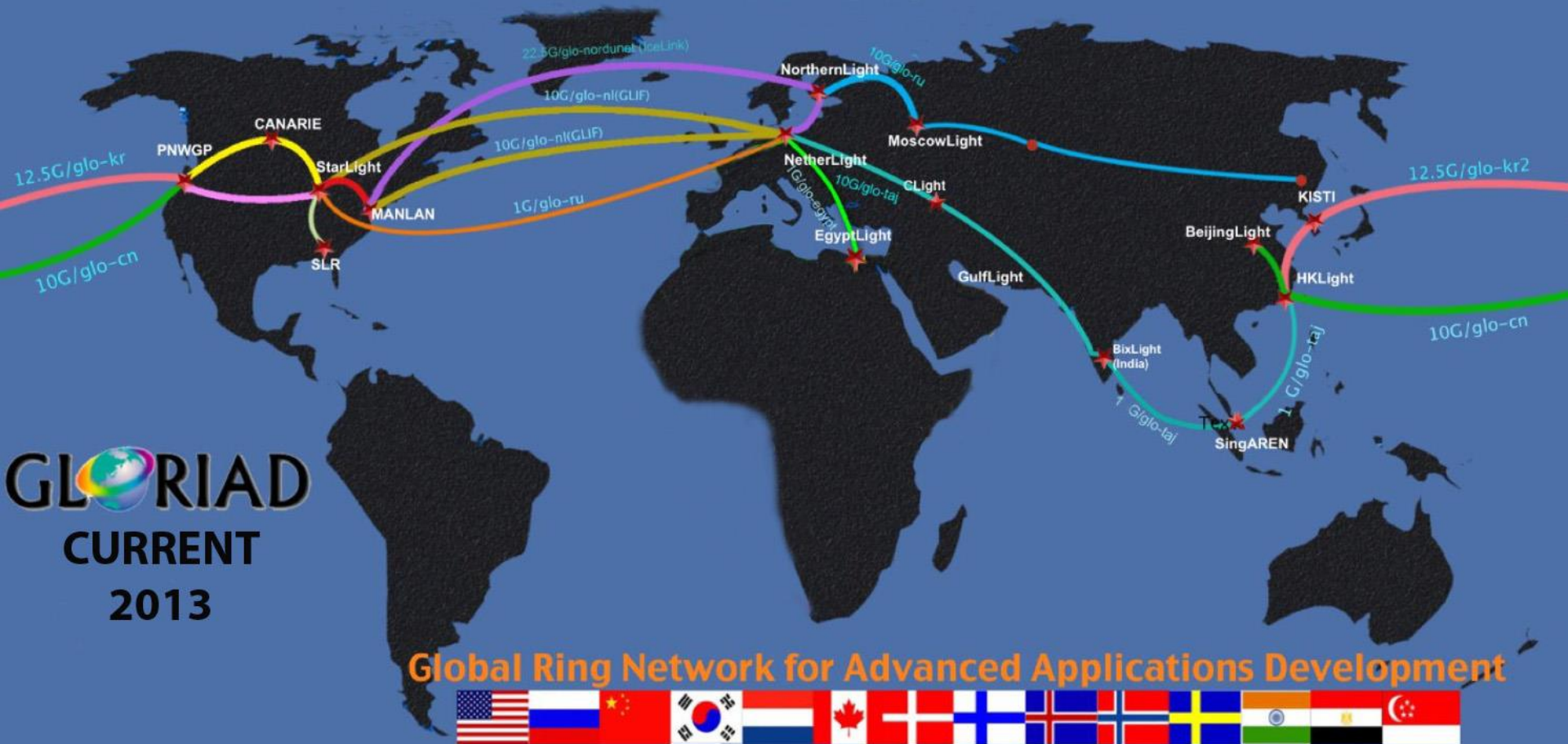
TEIN4 Network



- Connects 45+ million users from 8,000+ research and academic centres to Europe and the rest of the world
- TEIN PoPs at China, Hong Kong, India and Singapore
- NOC in HK

GLORIAD-TAJ Connection

USA-RUSSIA-CHINA-KOREA-NETHERLANDS-CANADA-DENMARK-FINLAND-ICELAND-NORWAY-SWEDEN-INDIA-EGYPT-SINGAPORE



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

** in progress*

Current and Future Projects

Current :

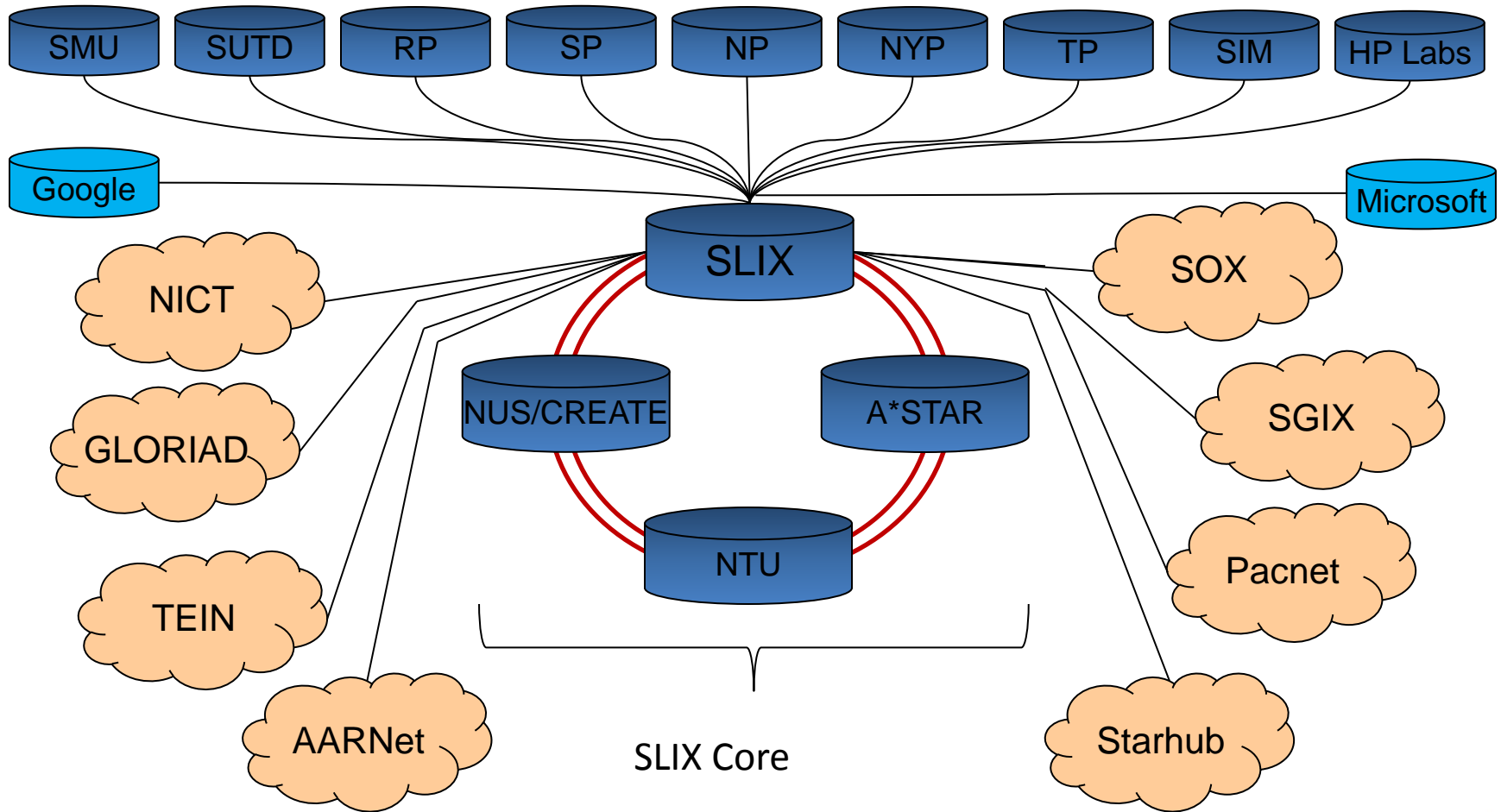
- SingAREN-Lightwave Internet Exchange
- eduroam
 - >> 3 institutions have enabled eduroam (NTU, NUS, SMU)
 - >> Proposal for SingAREN to be a regional eduroam TLS

Future :

- CloudStor
- enum registration request for SingAREN

SingAREN-Lightwave Internet Exchange (SLIX) Project

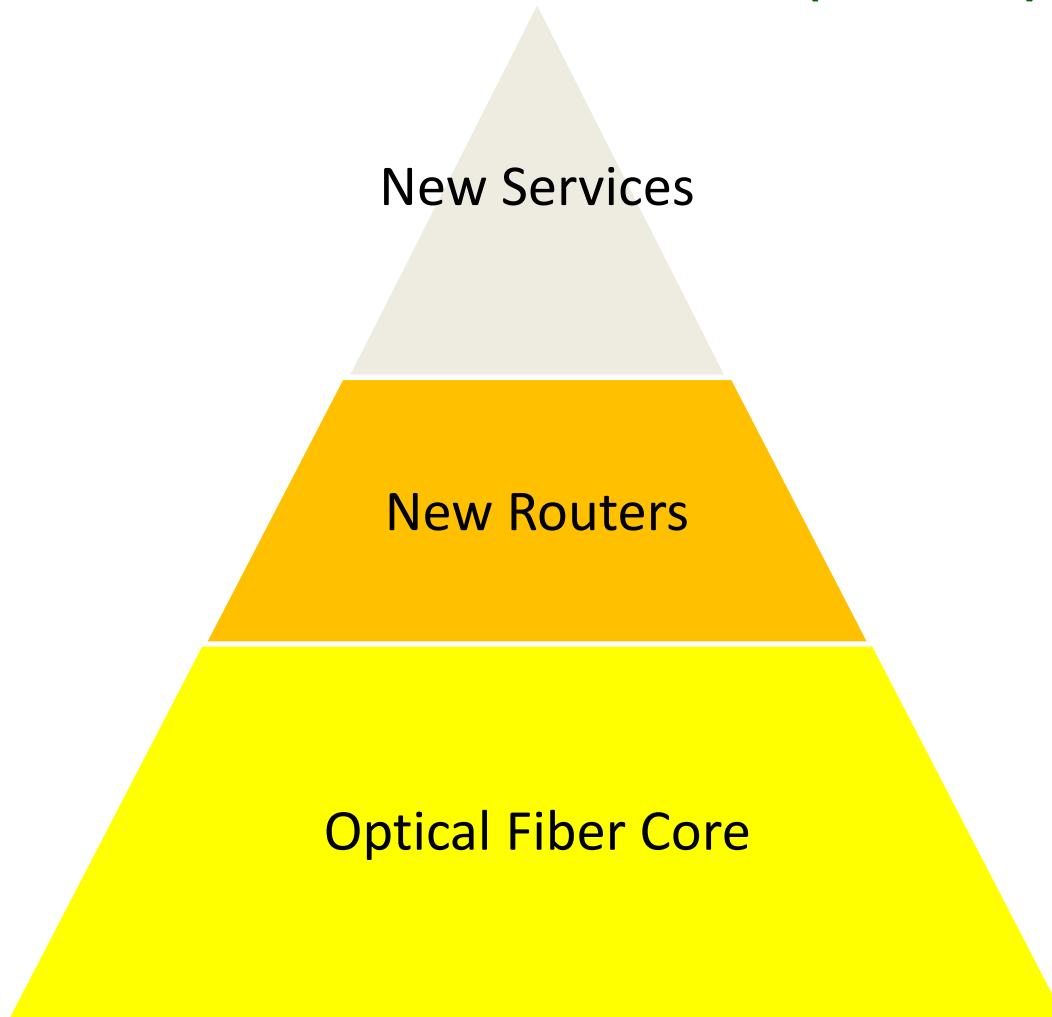
SingAREN-Lightwave Internet Exchange (SLIX)



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



SingAREN-Lightwave Internet Exchange (SLIX)



New Services

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

New Routers

- (1) Increase capacity and incorporate minimum of 10GE (10 Gbits/s) connection

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

Events by SingAREN



13th Annual Global LambdaGrid Workshop 2 – 4 October 2013





SingAREN 10th Anniversary Celebration

19 July 2013



SLIX Networking Reception *21 February 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.

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

Tutorial: Trema openflow software stack

10 April 2013

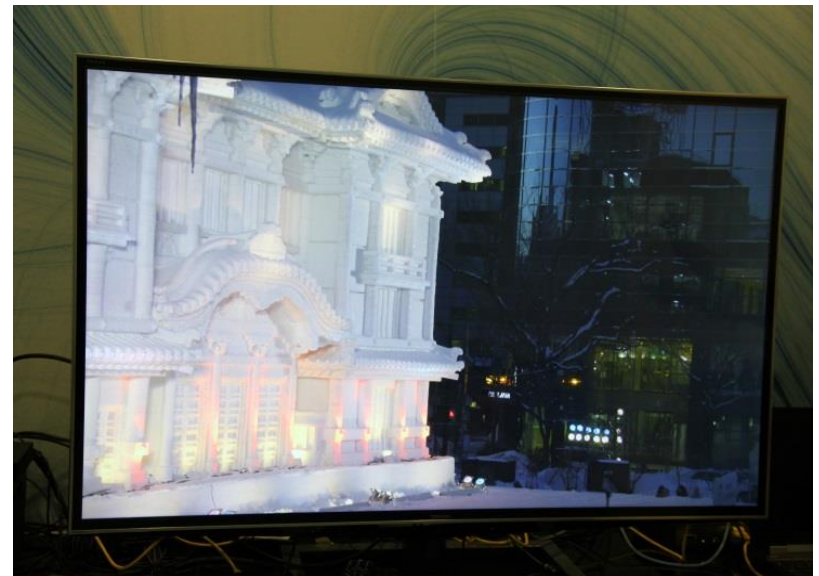
- Instructor: Mr Zoebir Bong, Nanyang Technological University.
- Participants from NUS, NYP, I2R, A*CRC gained hand-on knowledge on Openflow and the use of Trema as a controller for switches.



Broadcast of Sapporo Snow Festival

6 Feb 2013

- NICT, I2R (A*STAR) and SingAREN collaborated for the broadcast of Sapporo Snow Festival 2013 at STARHome, I2R, Fusionopolis.
- NICT conducted the international IPTV experiment over its IPv6 research network, Japan Gigabit Network-eXtreme (JGN-X).



Routing: BGP Multihoming - IPv4 & IPv6 Workshop

17 – 19 Oct 2012

- Instructor: Mr Gaurab Raj Upadhaya, Limelight Networks.
- Participants gained valuable knowledge on advanced configuring functions and policies for Internet routing.



Medical Education (Video-conference)

1 Aug 2012



- SingAREN supported NUH and NTU's participation in a medical video-conference. The medical practitioners shared their knowledge through live surgery and teaching.
- SingAREN collaborates with APAN Medical Workgroup to promote the use of advanced network technology in the medical profession.

Research and Collaboration

Campus for Research Excellence and Technological Enterprise (CREATE)

Research hub for international research universities, including **ETH** (Switzerland) and **TUM** (Germany)

Bioinformatics Center (BIC), NUS

BioMirrors server - provide massive Bioinformatics data to users locally

A*STAR Computational Resource Centre

Download genomic databases for researchers e.g. Genome Institute of Singapore

Thank you