



# **ASGC Activities Update**

**Hsin-Yen Chen**

**ASGC**

**LHCONE/LHCOPN meeting**

**Taipei**

**13 Mar. 2016**



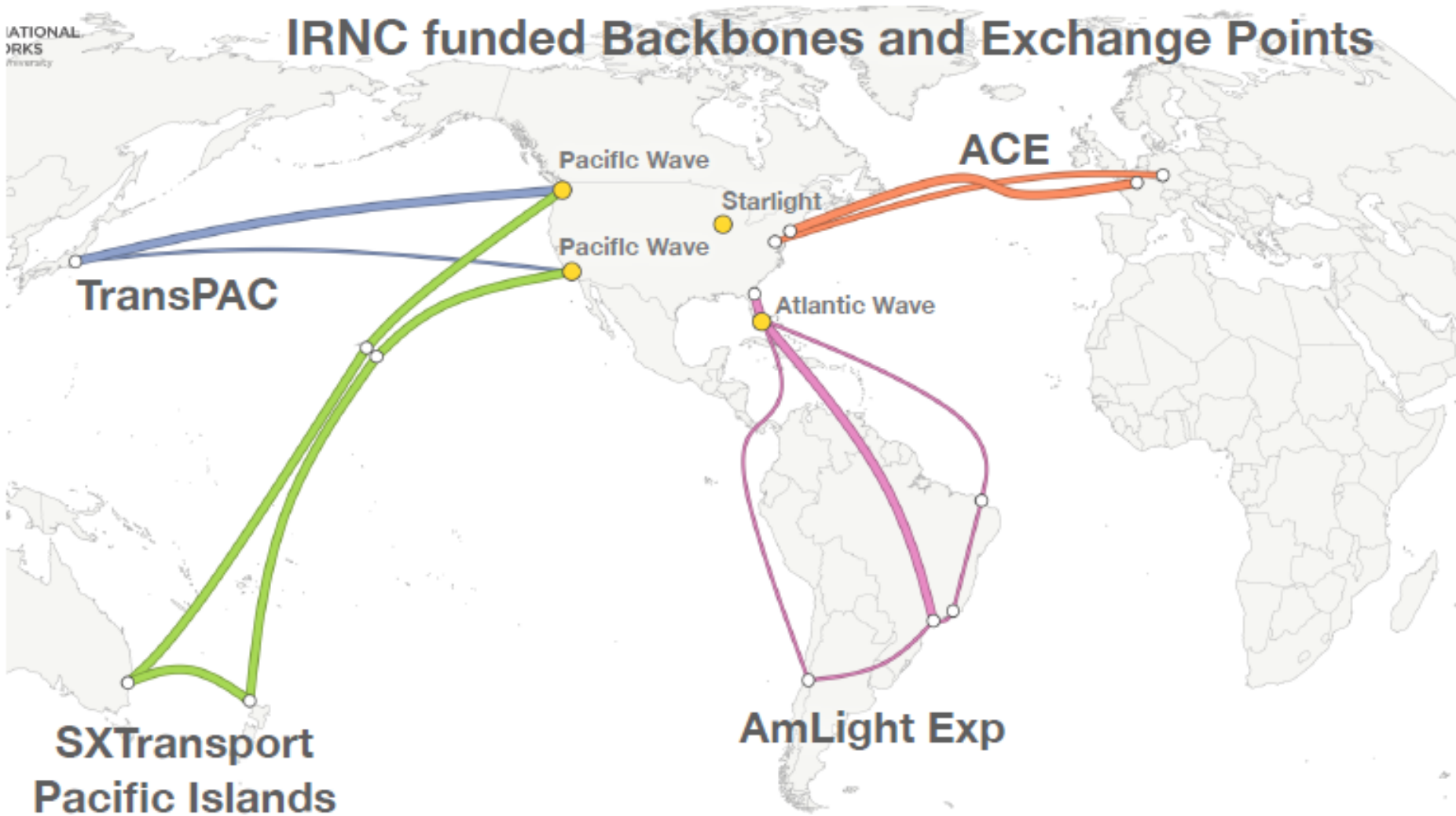
# Asia R&E Infrastructure



# What's new in APAN 41

- Three transpacific 100Gbps R&E were activated
  - JP-US TransPAC 4 circuit funded by the US NSF
  - SG-US ACA 100 circuit in collaboration between Internet2, SigaREN and A\*STAR
  - KR-US 100G circuit by KISTI
  - JP-US 100G circuit by SINET
- There are new 10Gbps planned to be deployed
  - TW-HK (deployed)
  - KR-HK (deployed)
  - SG-UK (deployed)
  - PH-HK; PH-US

# IRNC funded Backbones and Exchange Points



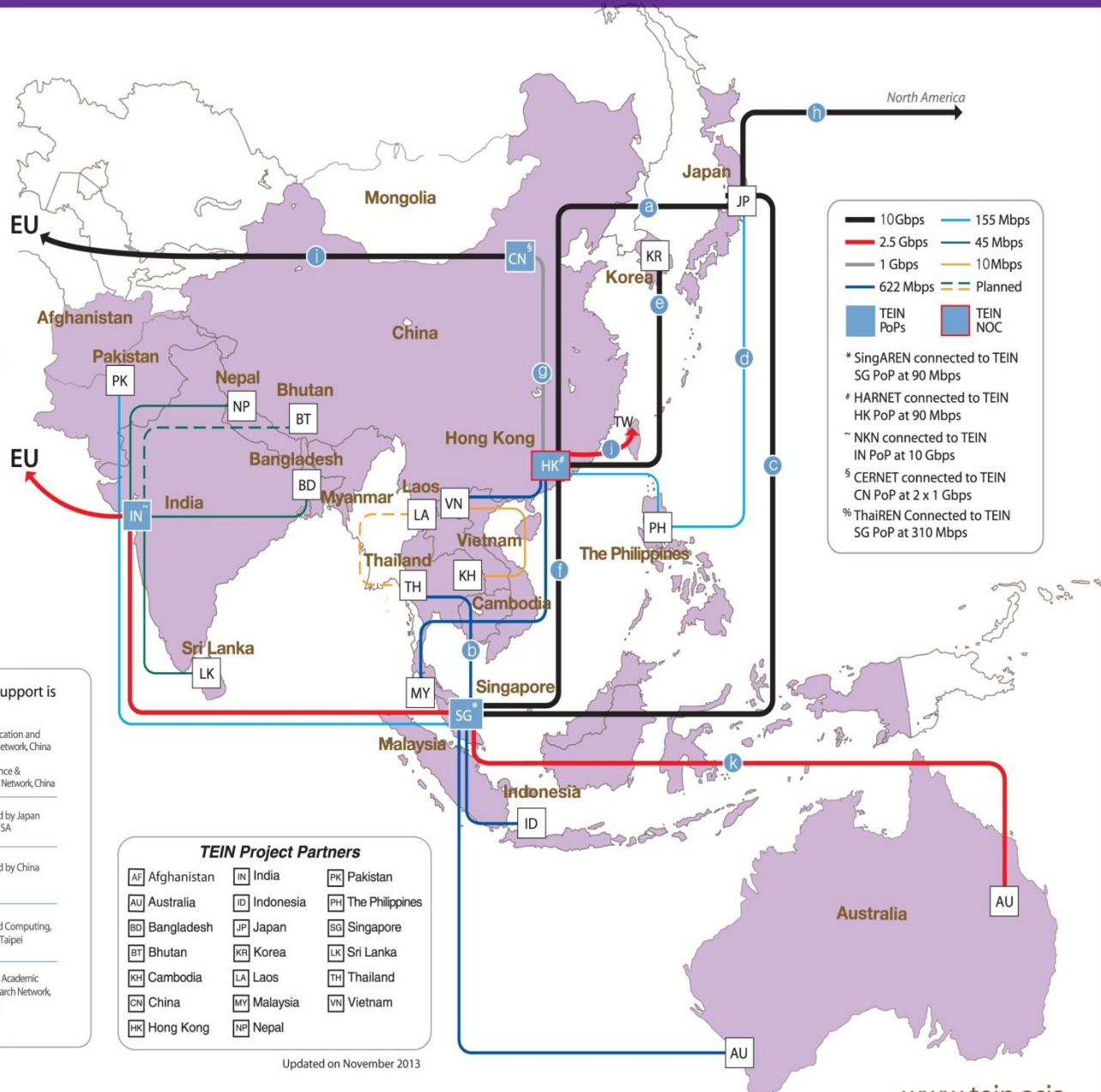
# Asia R&E Network backbone

Asia-Pacific Backbone Topology





# Connecting Asia and Europe's Research and Education Communities



The following links are fully financed by the link owners whose support is gratefully acknowledged.

**a** National Institute of Information and Communications, Japan

**g** China Education and Research Network, China

**b** National Institute of Information and Communications, Japan

**g** China Science & Technology Network, China

**c** National Institute of Informatics, Japan

**h** co-funded by Japan and the USA

**d** Ministry of Agriculture, Forestry and Fisheries Research Network, Japan

**i** co-funded by China and EU

**e** National Information Society Agency, South Korea

**j** Academia Sinica Grid Computing, Republic of Chinese Taipei

**f** National Information Society Agency, South Korea

**k** Australia, Academic and Research Network, Australia

Updated on November 2013



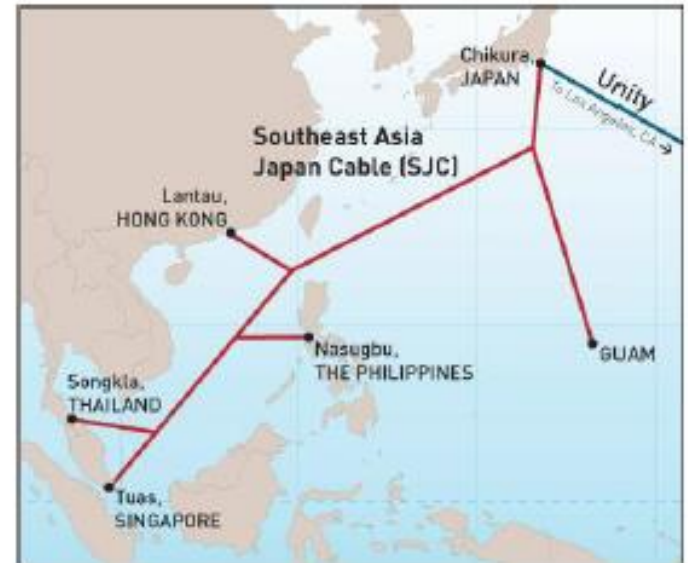
# What's new on the subsea cable scene?

- MOANA cable: NZ to Hawaii via Samoa, 20Tbps, RFS 2018, Alcatel as supplier. A Cook Island – Samoa link with Samoa as hub planned.
- Samoa – Fiji cable with IDB funding; RFS March 2017. Will connect to Southern Cross.
- PLDC (Pacific Light Data Communications): direct HK-USA cable. Launch May 2018.
- ASC (Australia Singapore Cable): linking Perth is reactivated. Launch date early 2018.
- On the transatlantic side: activation of Hibernia Express, first new transatlantic cable in twelve years!
- Liquid Sea: Liquid Telecom project linking the African West Coast from South Africa to the Gulf. 20-30Tbps capacity. RFS 2018.
- Eulalink: Portugal- Brazil: 30Tbps; work will start in April 2016. The EU is investing US\$25 million through Géant and RedClara through the BELLA project. (Building Europe link to Latin America).

# Cable status early 2016

## Transpacific

- **PC-1** (Pacific Crossing): 8.4Tbps design capacity
- **JUS** (Japan – US): 9Tbps
- **TGN-P** (Tata Pacific): 15.36Tbps
- **TPE** (Trans Pacific Express): 3.2Tbps
- **AAG** (Asia America Gateway): 8Tbps
- **UNITY**: 12Tbps
  - RFS: April 2010
  - Google is partner





# New Transpacific cables coming

- **FASTER**
  - Japan-US
  - Design Capacity: 60Tbps
  - RFS: Q2 2016; Google is partner
- **SEA-US**
  - Indonesia - Philippines – US – via Guam and Hawaii
  - Design Capacity: 20Tbps
  - RFS: Q4 2016
- **NCP: New Cross Pacific**
  - Will connect China, Japan, South Korea, Taiwan and the United States
  - Design capacity; 80Tbps; Microsoft is a partner
  - Supplier: TE Subcom
  - RFS: Q4 2017

# Cable status early 2016

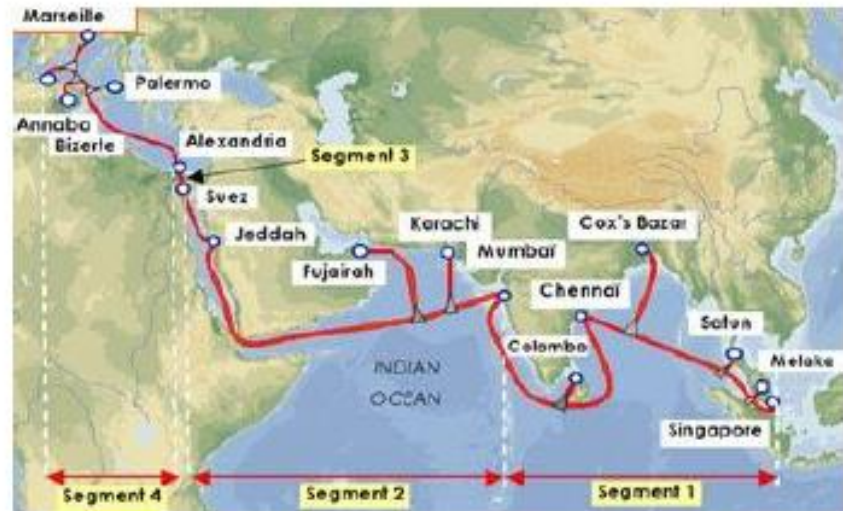
## Asia-Europe

- **SMW-4** (2005 RFS; 6.48Tbps potential capacity)
  - Upgrade from 40 to 100Gbps completed in March 2015 using Mitsubishi.
- **IMEWE** (2010; 9.6Tbps)
- **TGN-EA** (20011; 8Tbps)
- **FLAG FALCON** (2006; 6Tbps)
- **EIG** (2012; 2.88Tbps)
- **MENA** (2013; 4.8Tbps)
- **EPEG** (2012; 3.2Tbps)

# Two new Asia-Europe cables for end 2016

- **SEAMEWE-5**

- RFS : November 2016
- Design capacity: 24Tbps
- Suppliers: NEC and Alcatel
- 17 partners



- **AAE-1**

- RFS: Q4 2016
- Design capacity: 40Tbps
- Suppliers:  
TE Subcom and NEC



# cable status early 2016 intra Asia

- **APCN-2:** 10.56Tbps potential capacity
- **C2C:** 30.55Tbps
- **FNAL:** 42.52Tbps
- **TGN-IA:** 9.6Tbps
- **ASE:** 19Tbps
- **APG:** 54.8Tbps
  - RFS: 2016; Facebook is co-owner



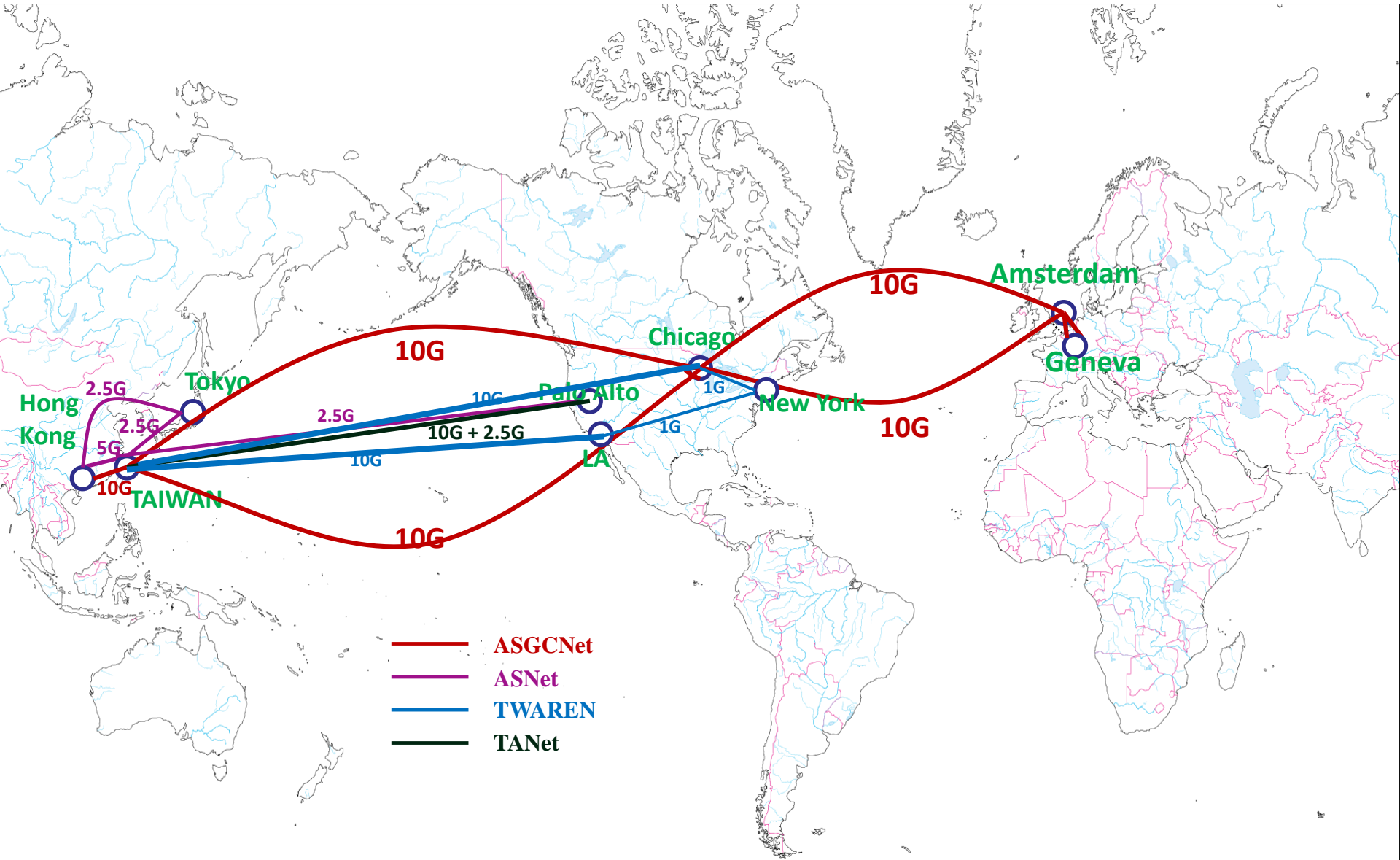
- **SJC (SE Asia Japan):** 28.8Tbps RFS was June 2013
  - Links Brunei, China, Hong Kong, Japan, Singapore and the Philippines, option to connect with Thailand.
  - Upgraded by 6.5Tbps in May 2014 and a further 3.6Tbps by November 2015.
  - Connects into UNITY to cross the Pacific.
- **MCT: Malaysia-Cambodia-Thailand**
  - RFS: end 2016
  - Supplier: Huawei



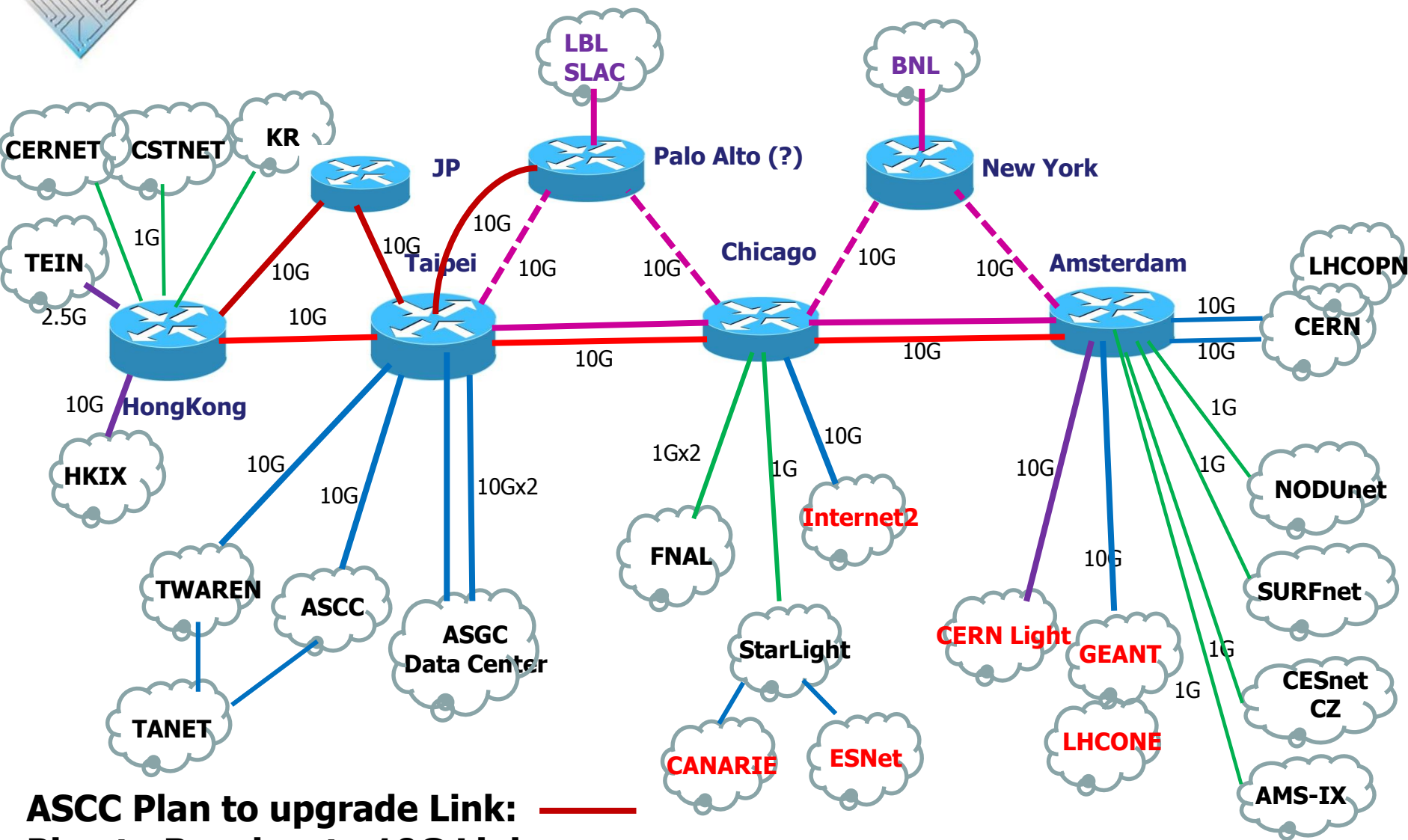
# Taiwan Infrastructure



# TAIWAN Global R&E Network

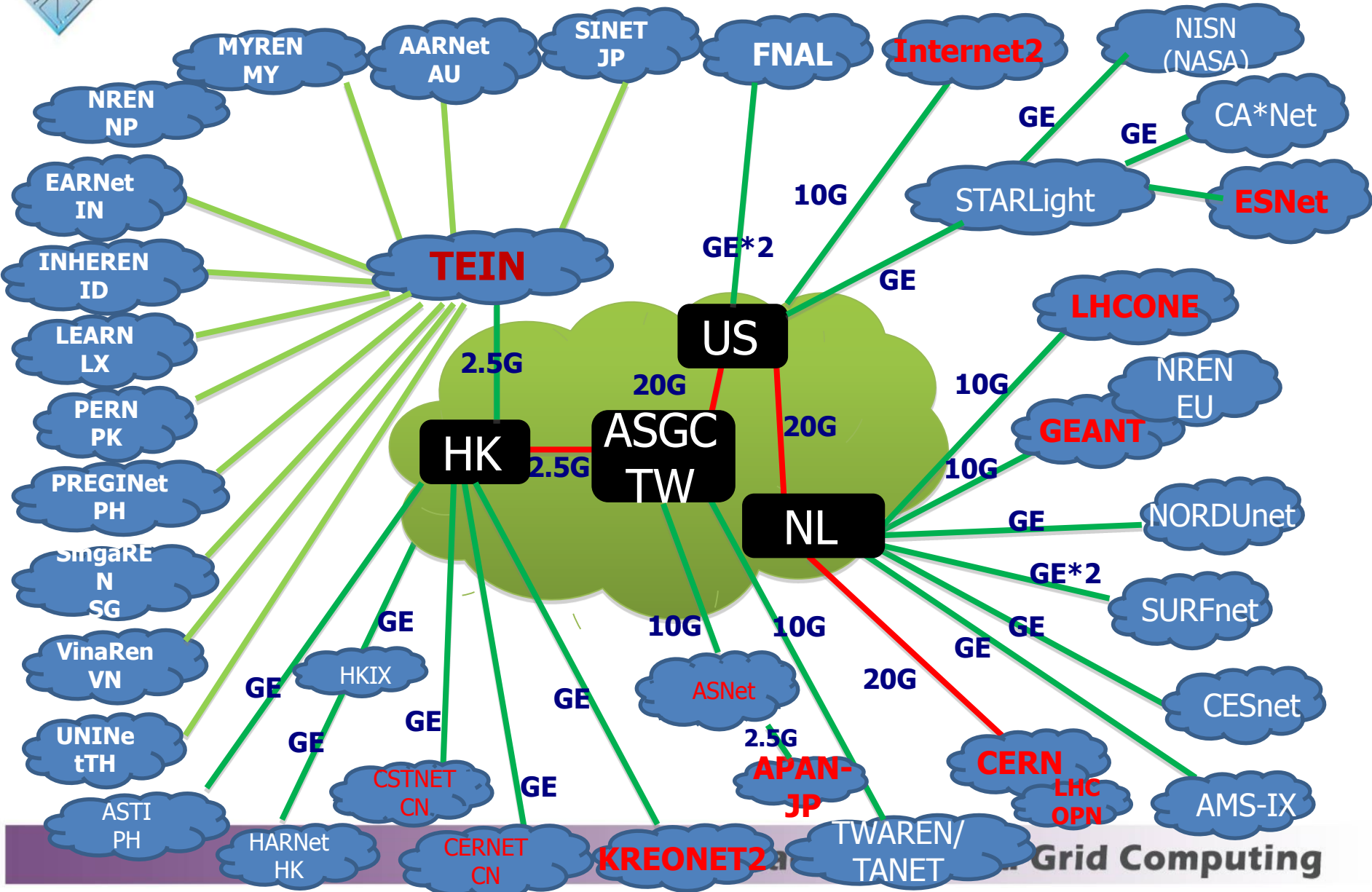


# ASGCNet International Network





# ASGC e-Science Global Network



Grid Computing

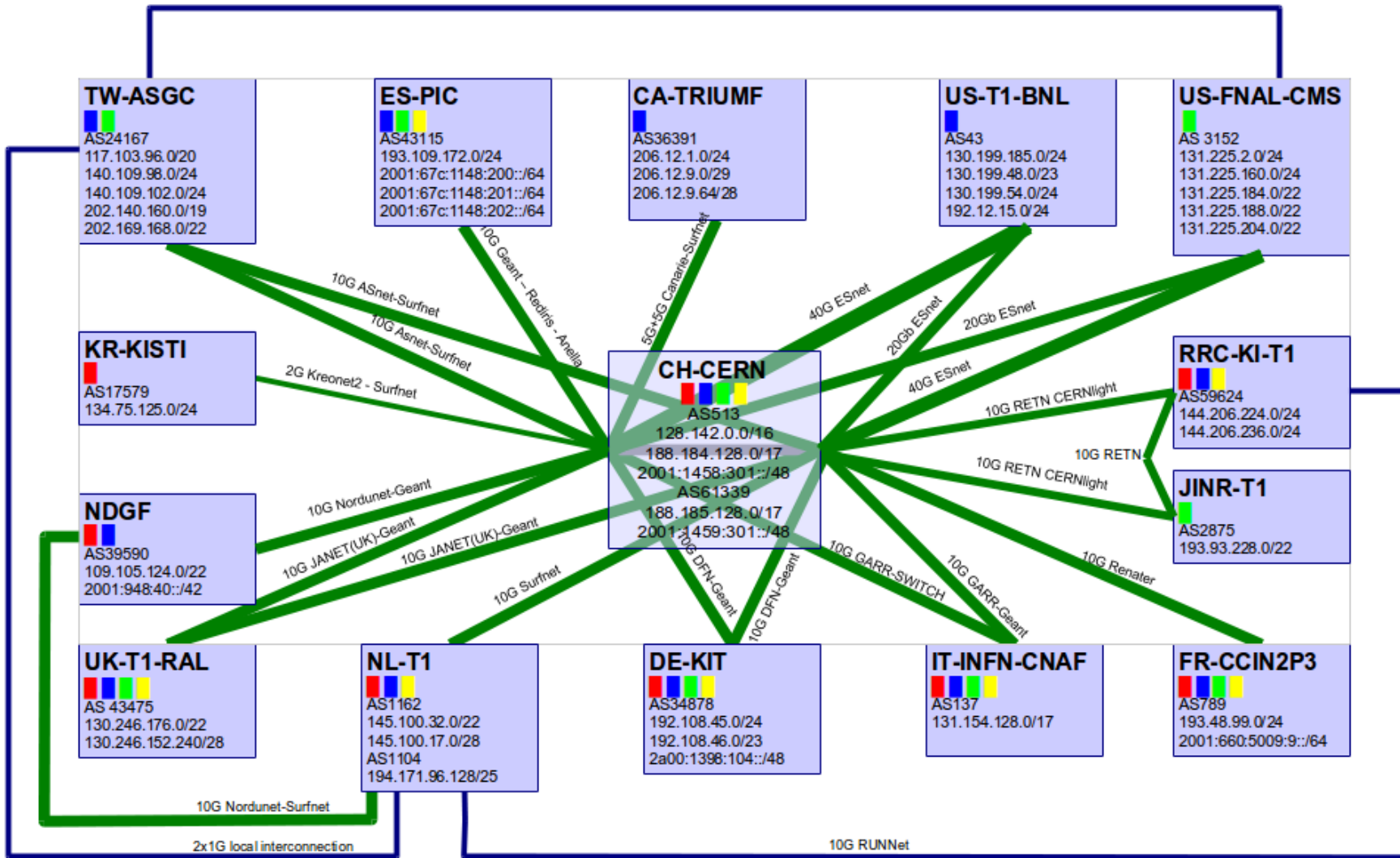




# **ASGC LHCOPN/LHCONE**

# LHCOPN

2G ASnet



— T0-T1 and T1-T1 traffic

— T1-T1 traffic only

— Not deployed yet

— (thick) >= 10Gbps

— (thin) <10Gbps

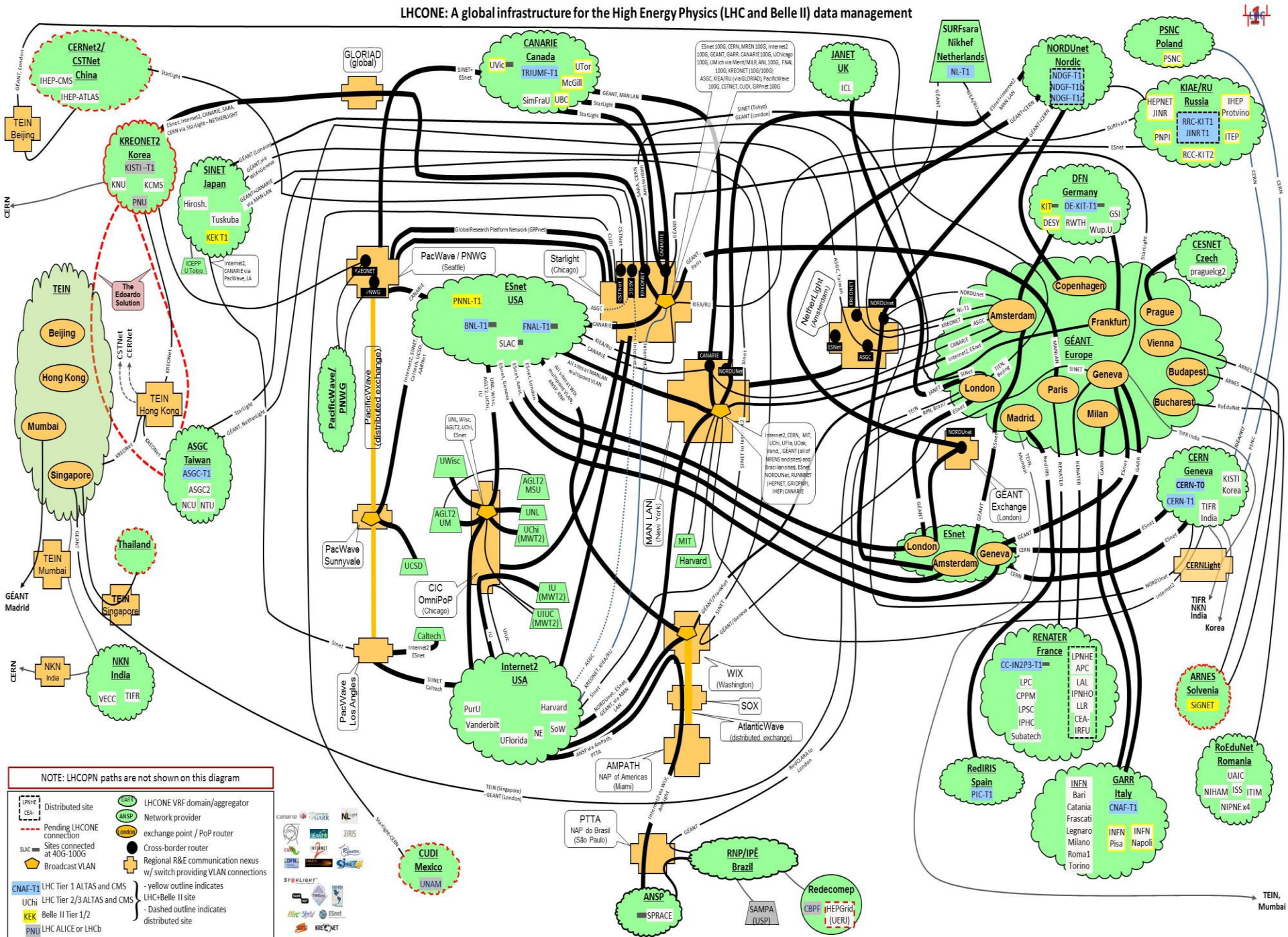
■ = Alice ■ = Atlas

■ = CMS ■ = LHCb

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# LHCONE: A global infrastructure for the High Energy Physics (LHC and Belle II) data management



NOTE: LHCOPN paths are not shown on this diagram

- Distributed site
- Pending LHCONE connection
- Sites connected at 40G-100G
- Broadcast VLAN
- LHCONE VRF domain/aggregator
- Network provider exchange point / PoP router
- Cross-border router
- Regional R&E communication nexus w/ switch providing VLAN connections
- yellow outline indicates LHC/Belle II site
- dashed outline indicates distributed site
- CNAF-T1 LHC Tier 1 ALTAS and CMS
- Uchi LHC Tier 2/3 ALTAS and CMS
- KEK Belle II Tier 1/2
- PNU LHC ALICE or LHCb
- Sites that are standalone VRFs
- Communication links: 1/10, 20/30/40, and 100Gb/s



# ASGC LHCOPN/LHCONE

## Update

- SARA proposes to decommission the ASGC 2xGE LHCOPN backup path at Vancis
- Connect to CERNLight with 10G link at Vancis
  - LHCONE VRF
- Plan to connect ESNet with 10G link at StarLight
  - LHCONE VRF
  - LHCOPN backup path
- Plan to upgrade the GE link with StarLight to 10G link that we peer with CARANIE, NIST, CERN, ESNet, GLORIAD and KREONET.
- Plan to connect JGN-X with 10G link at HK

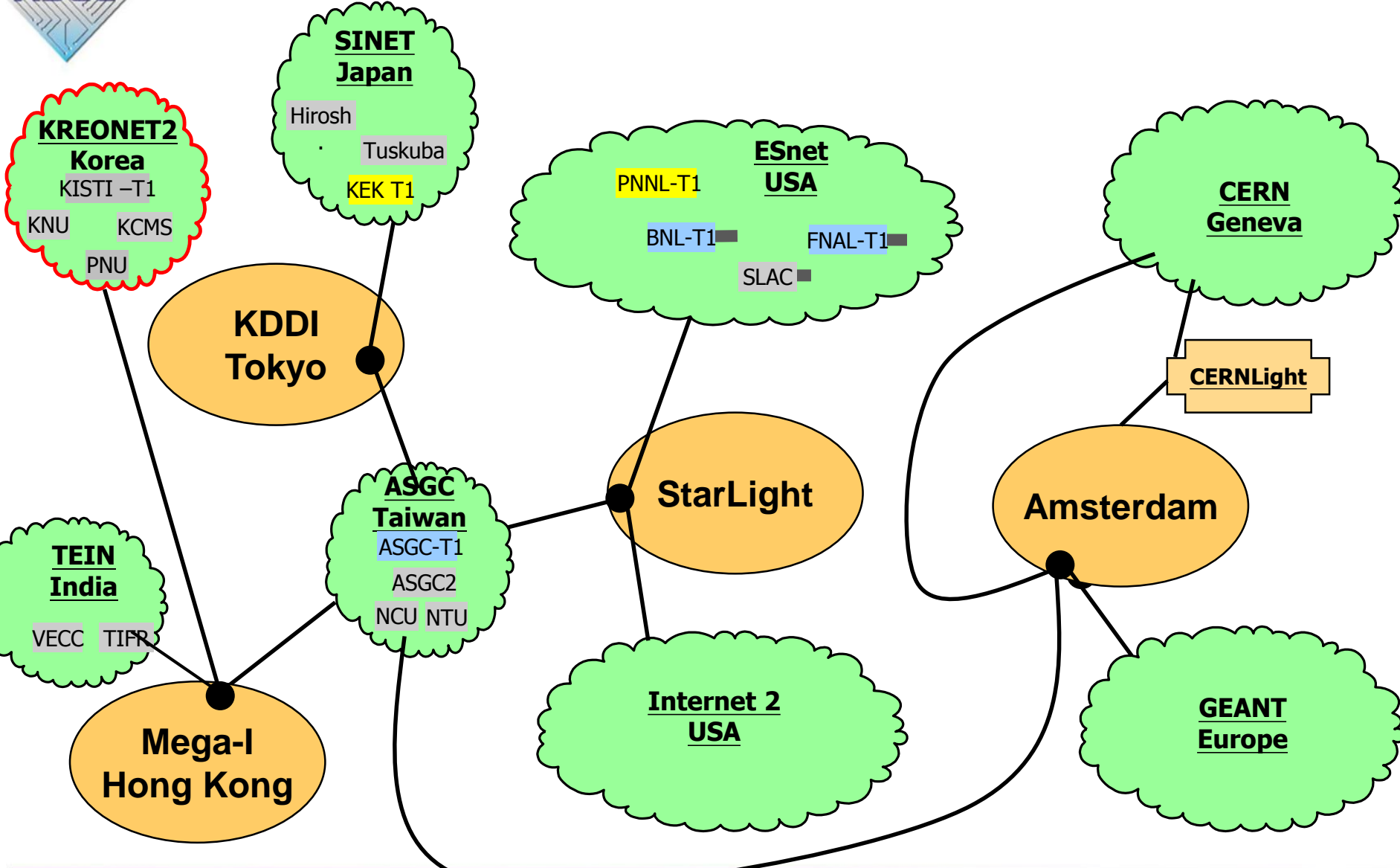


# LHC Network Challenges in Asia

- Routing Complexity
  - BGP peering can be realized among NRENs, if agreed bilaterally
  - Symmetry/Asymmetry routing
  - APAN backbone committee could address to the routing policy
- Network Performance
  - $\text{TCP Throughput} \leq \text{TCPWinSize}/\text{RTT}$
  - Asian TierXs must tune server and client TCP kernel parameters to get better throughput
- LHCONE L3VPN could help resolving the application traffic



# ASGC LHCONE VRF Plan





# SDN technology study

- Deploy the Brocade routers on our WAN
- Survey the OESS, OSCAR and Brocade OpenDayLight controller on our lab
- OF 1.0/1.3 ?
- Focus on the Network Virtualization, Security & Cloud topics



# Comment/Suggestion