THE 2nd ASIA TIER CENTER FORUM

30 NOV - 2 DEC 2016
SURANAREE UNIVERSITY OF TECHNOLOGY
NAKHON RATCHASIMA , THAILAND

ATCF Status Report

Sang-Un Ahn
for Asia Tier Center Forum

Contents

ASIA TIER CENTER FORUM

22–24 September 2015, KISTI, Daejeon, Republic of Korea
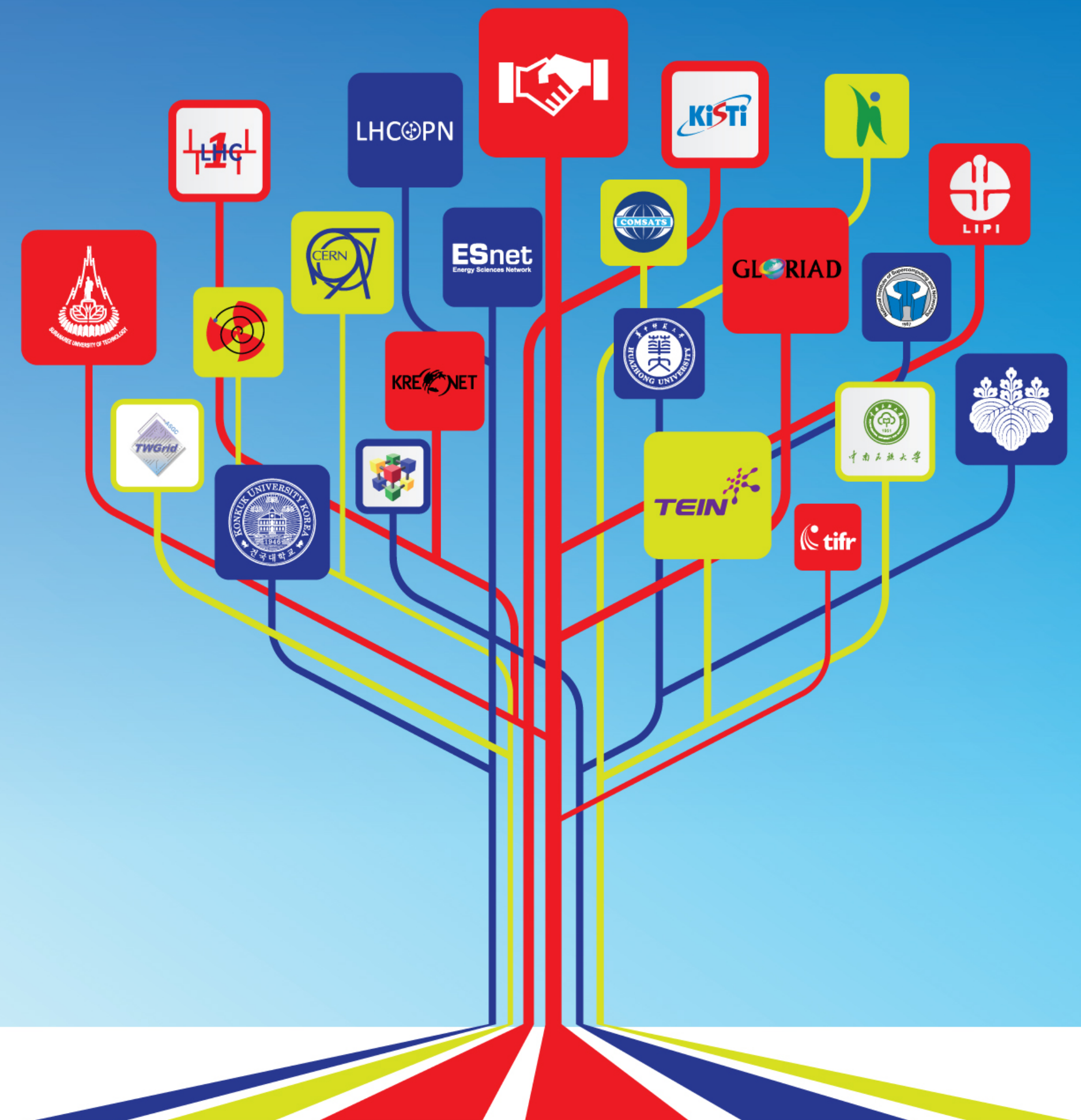
Introduction

Motivation

From Latchezar Betev's 1st ATCF wrap-up in Sep 2015
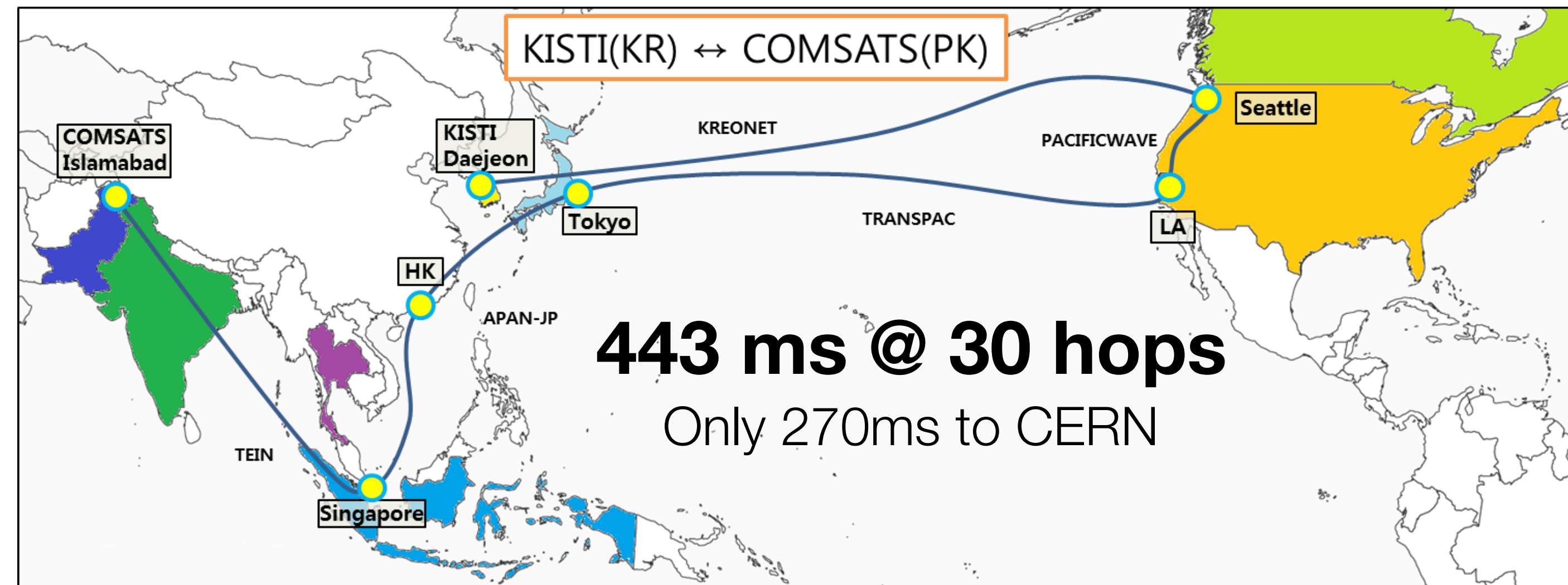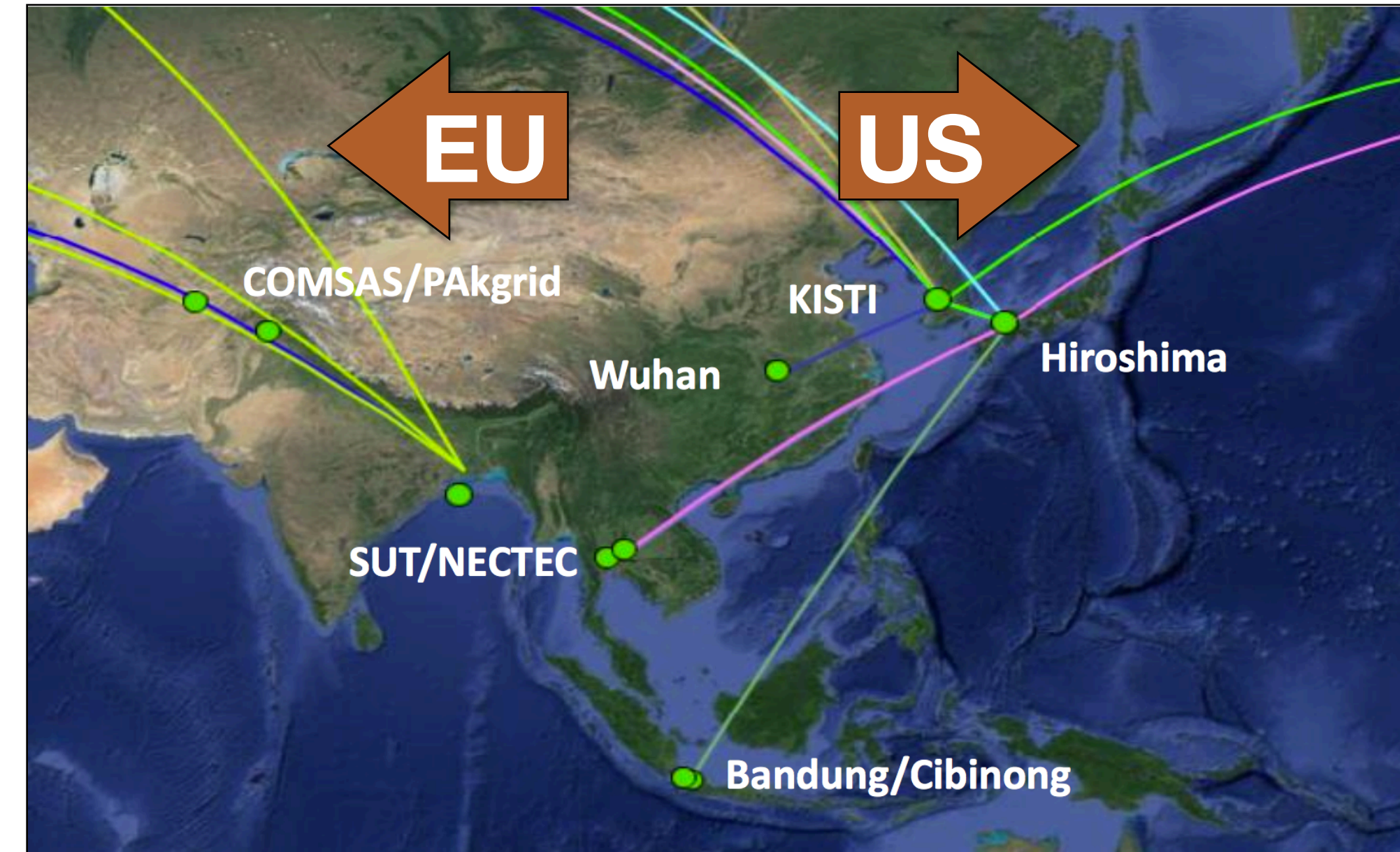
- In the construction of Tier-1 at KISTI, we realized that traffic of Asian sites for ALICE experiment is mostly directing to Europe or US

- Latency test to Asian sites confirmed that the connectivity within Asian sites is worse than Europe and US

  - Small T2 relies on TEIN, Japan sites connect to SINET, KISTI runs KREONet

  - However TEIN, SINET and KREONet were not peered

  - APAN-JP provides connectivity between JP sites and a few T2 in Asia
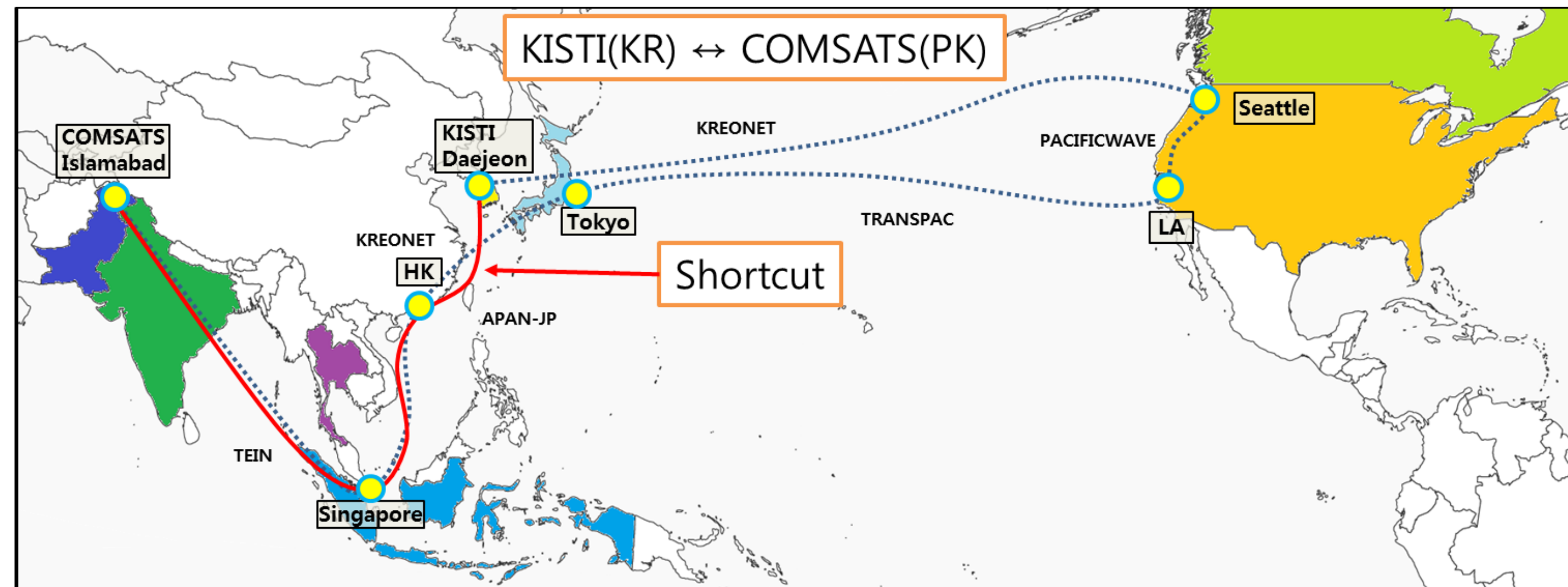
- "Normalization of abnormality"

KISTI(KR) ↔ COMSATS(PK)

443 ms @ 30 hops
Only 270ms to CERN

4

Motivation

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- In the construction of Tier-1 at KISTI, we realized that traffic of Asian sites for ALICE experiment is mostly directing to Europe or US

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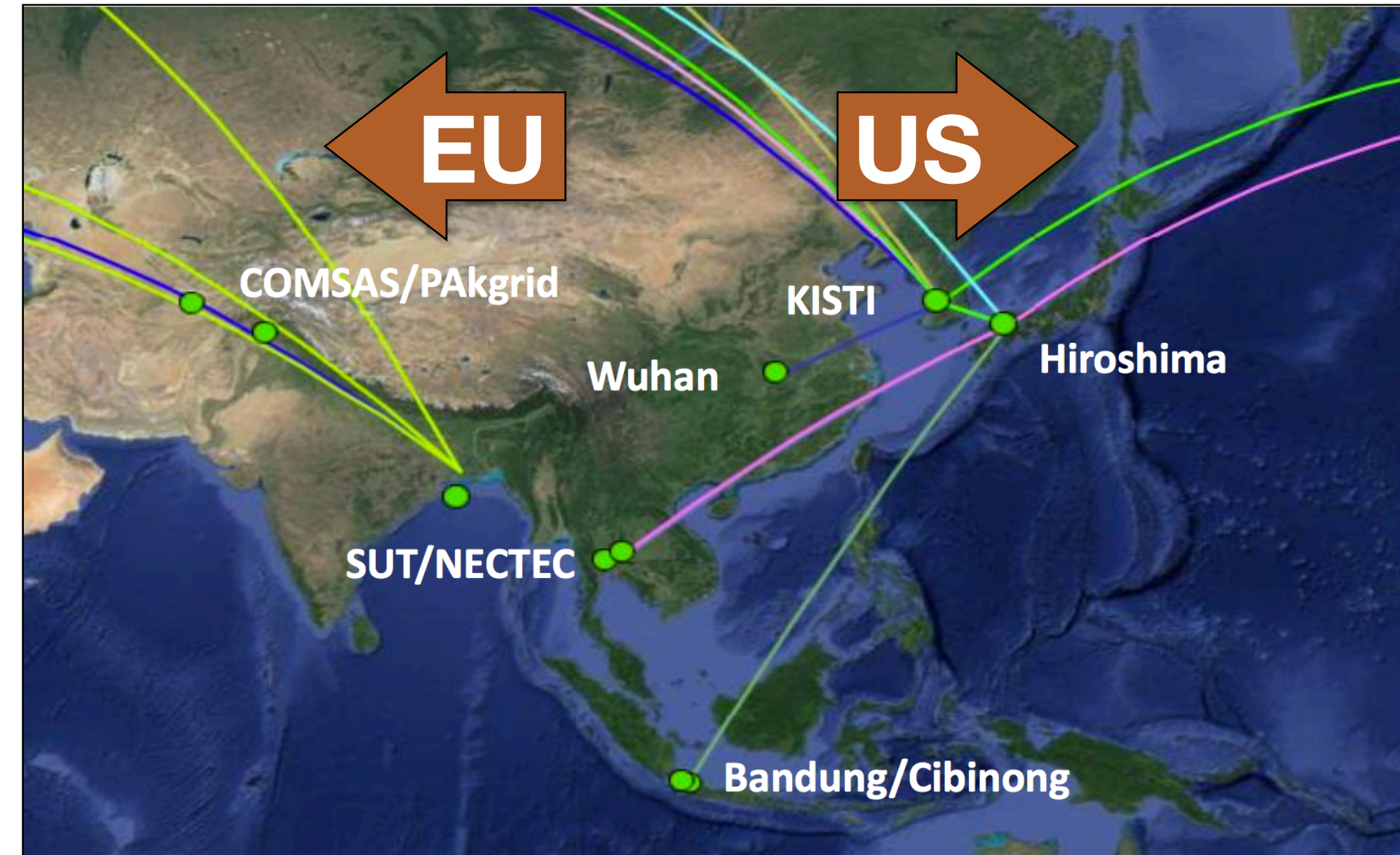
- "Normalization of abnormality"

Goal of the forum

Short-term
- To discuss on the possible solutions for the improvement of connectivity among Asian Tier sites and their domestic network environment, and to monitor periodically the status of the established network environment

Long-term
- To provide a place where Asian Tier sites can share and discuss not only the network issues but also any other potential issues, if any, so that we can collaborate to resolve them

Target
- Mostly Asian Tier sites however, open to every interested parties, in particular, distributed computing coordinations of LHC experiments and network experts

Asia Tier Center Forum

ASIA TIER CENTER FORUM
22–24 September 2015, KISTI, Daejeon, Republic of Korea

1st ATCF @ KISTI, Sep 2015

- 34 participants from 10 sites (ASGC, COMSATS, Hiroshima, Tsukuba, Wuhan, SUT, LIPI, Kolkata, TIFR, KISTI), TEIN*CC, KREONet, ESnet and CERN

2nd ATCF @ SUT, Nov 2016

- 20 participants from 7 sites (COMSATS(*), Hiroshima, Wuhan(*), NECTEC, SUT, LIPI, KISTI), TEIN*CC(*), KREONet, ThaiREN, UniNET, GÉANT and CERN
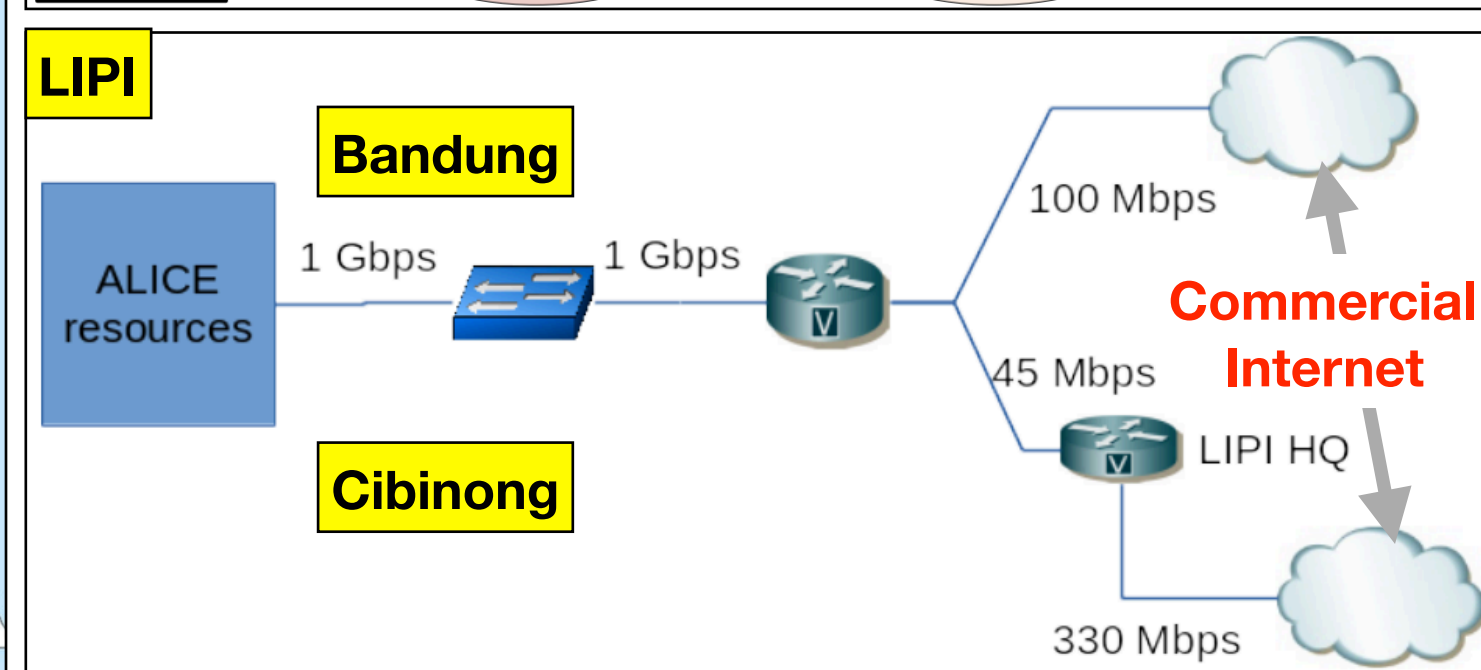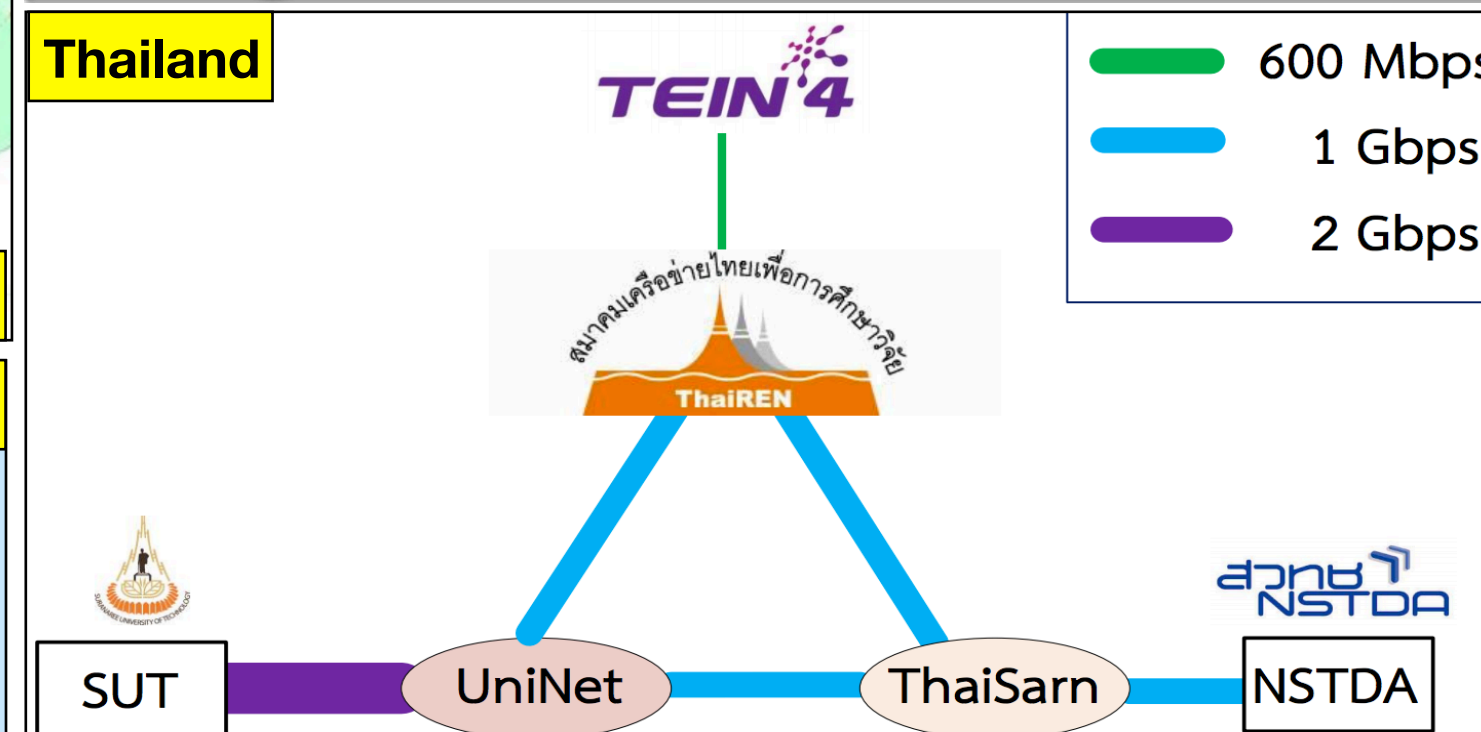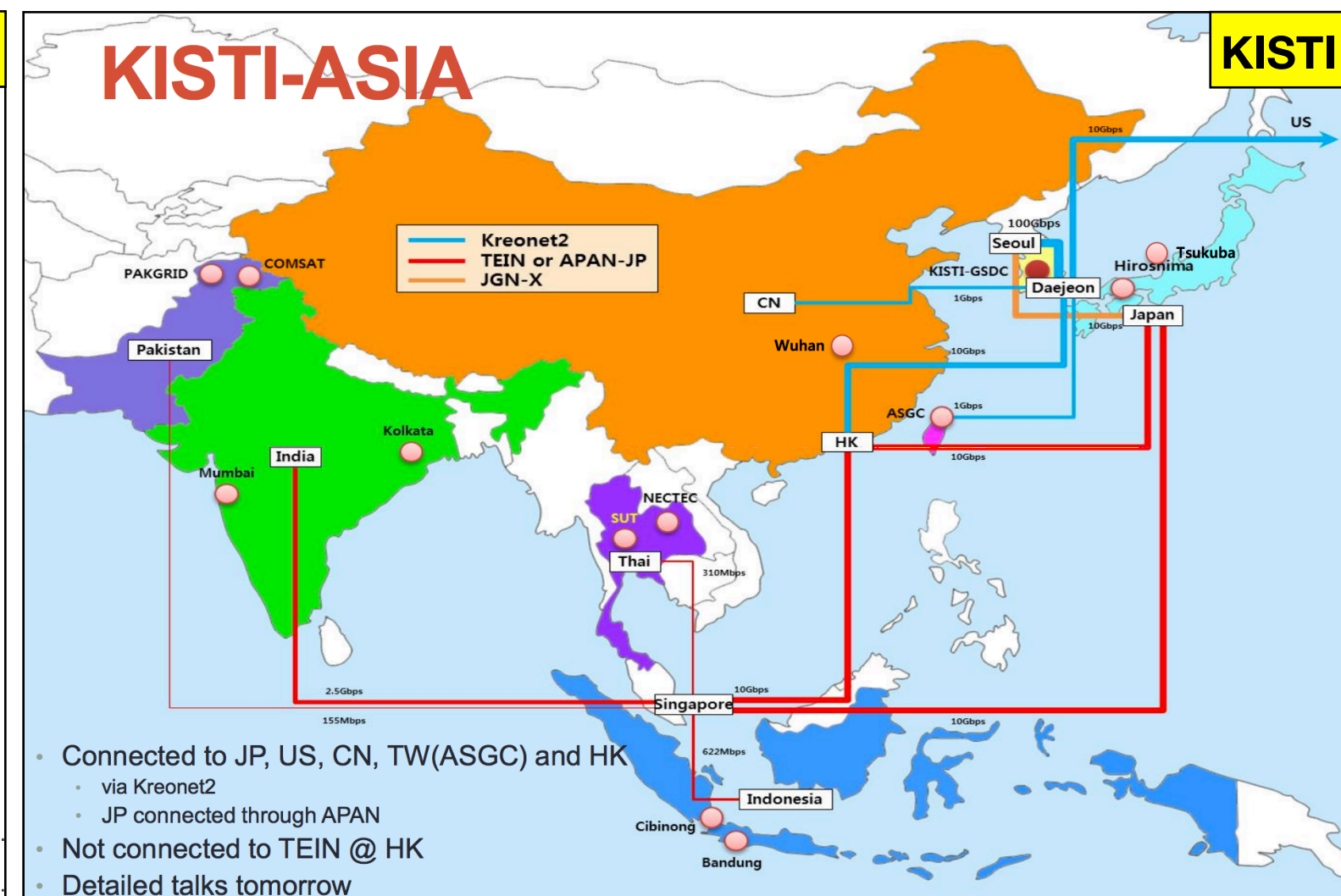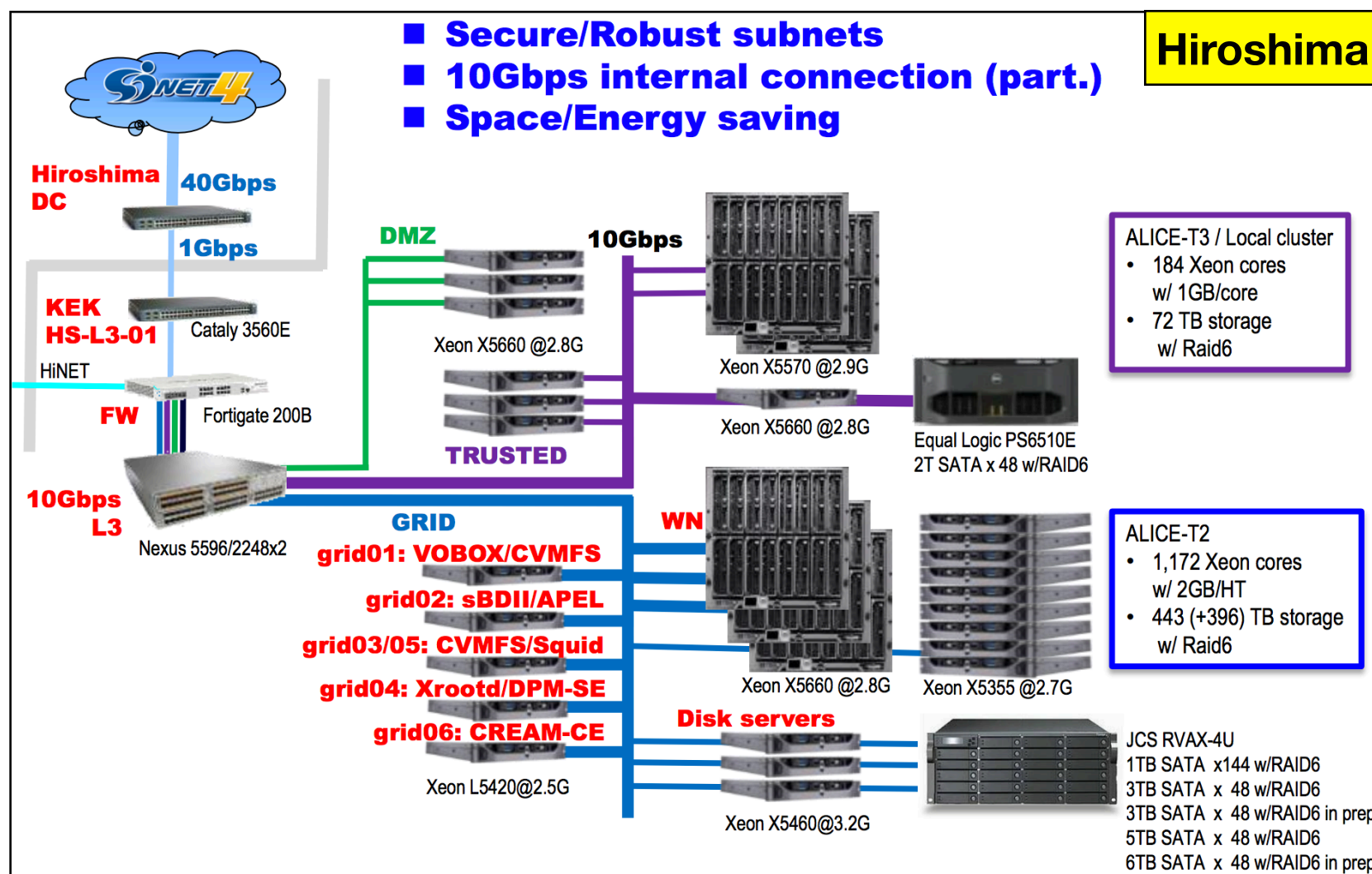
(*)Remote

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1st ATCF

Asian Site Reports

- JP, KR, IN sites well connected to EU and US
- Some T2s in bad situation
- And no detailed information about their networks

Tsukuba

by S. Suzuki (KEK)

ALICE-T2 Tsuku...

Managed by ALICE Tsukuba

Kolkata

CERN LHCONE

TEIN-3 Network

TIFR Mumbai

POP in Mumbai

Internet

Core Network

POP in Kolkata

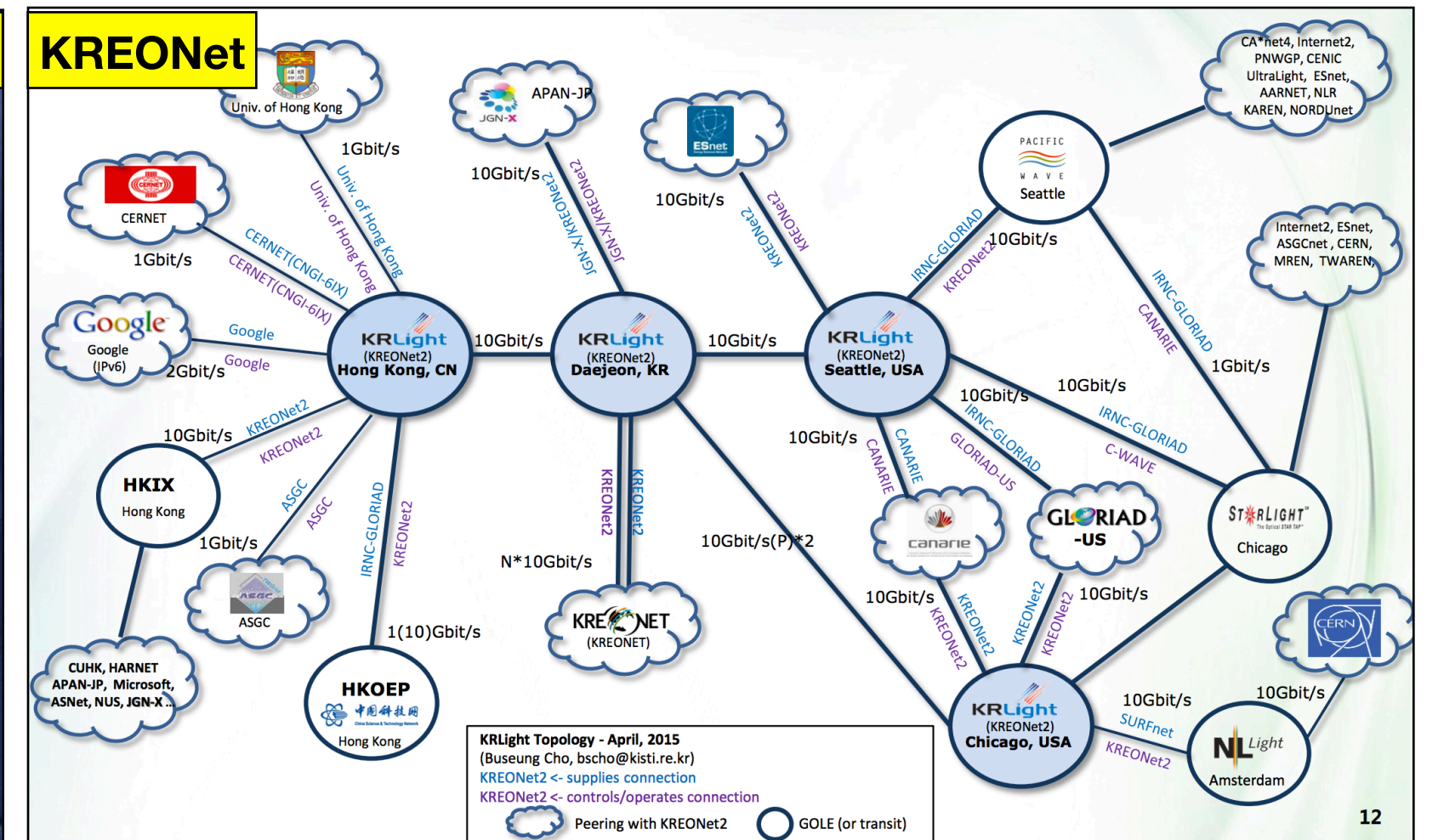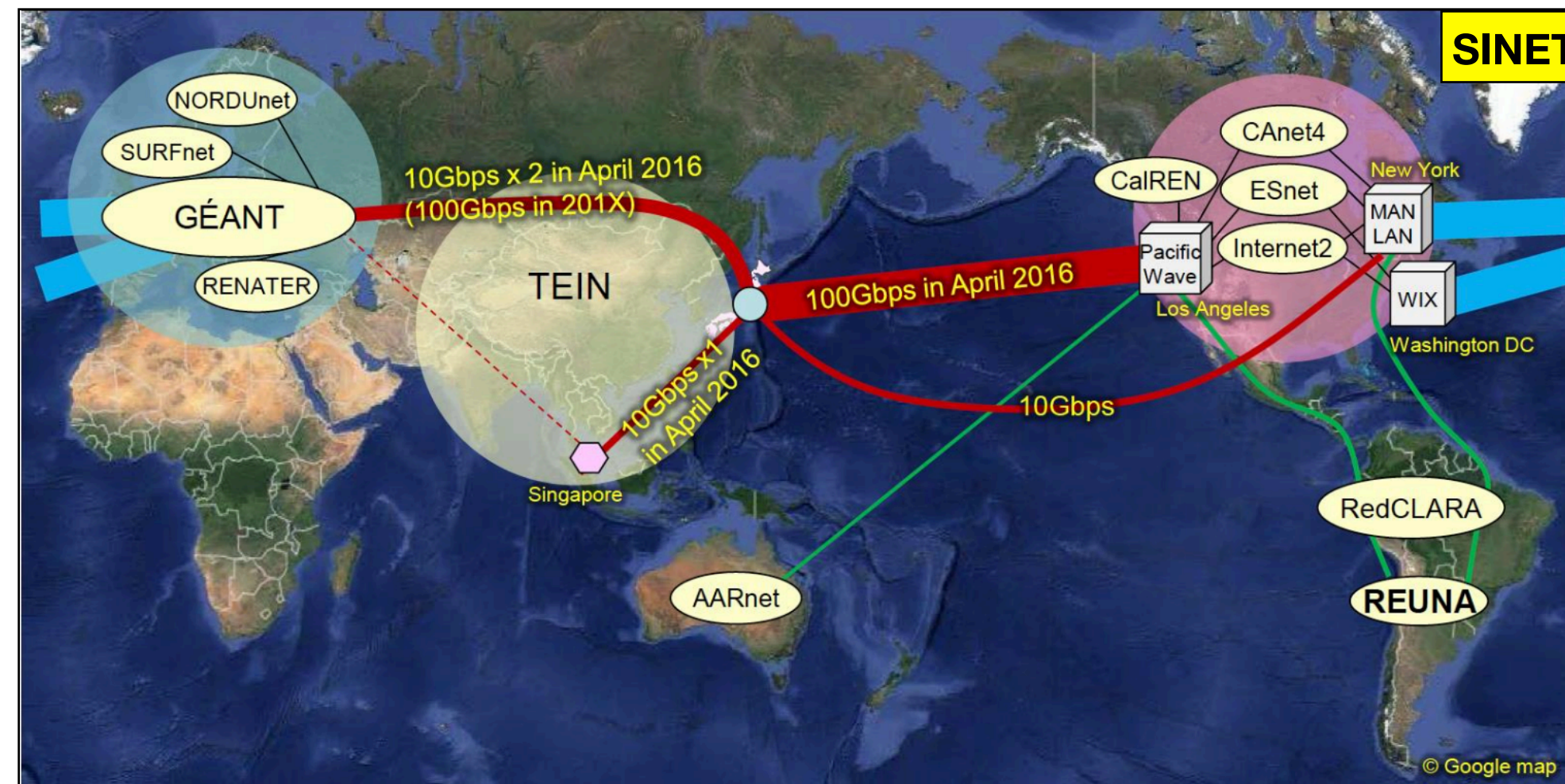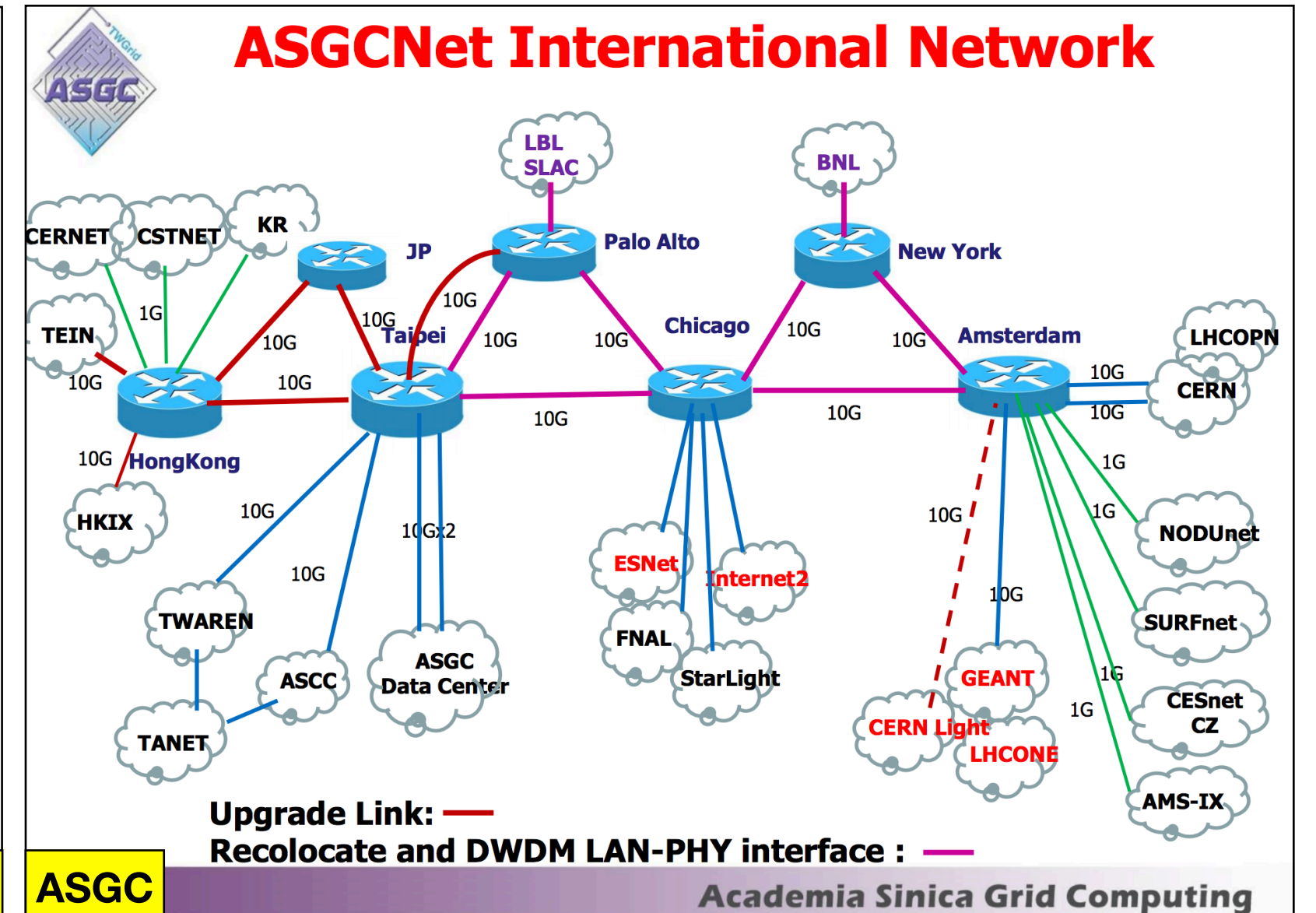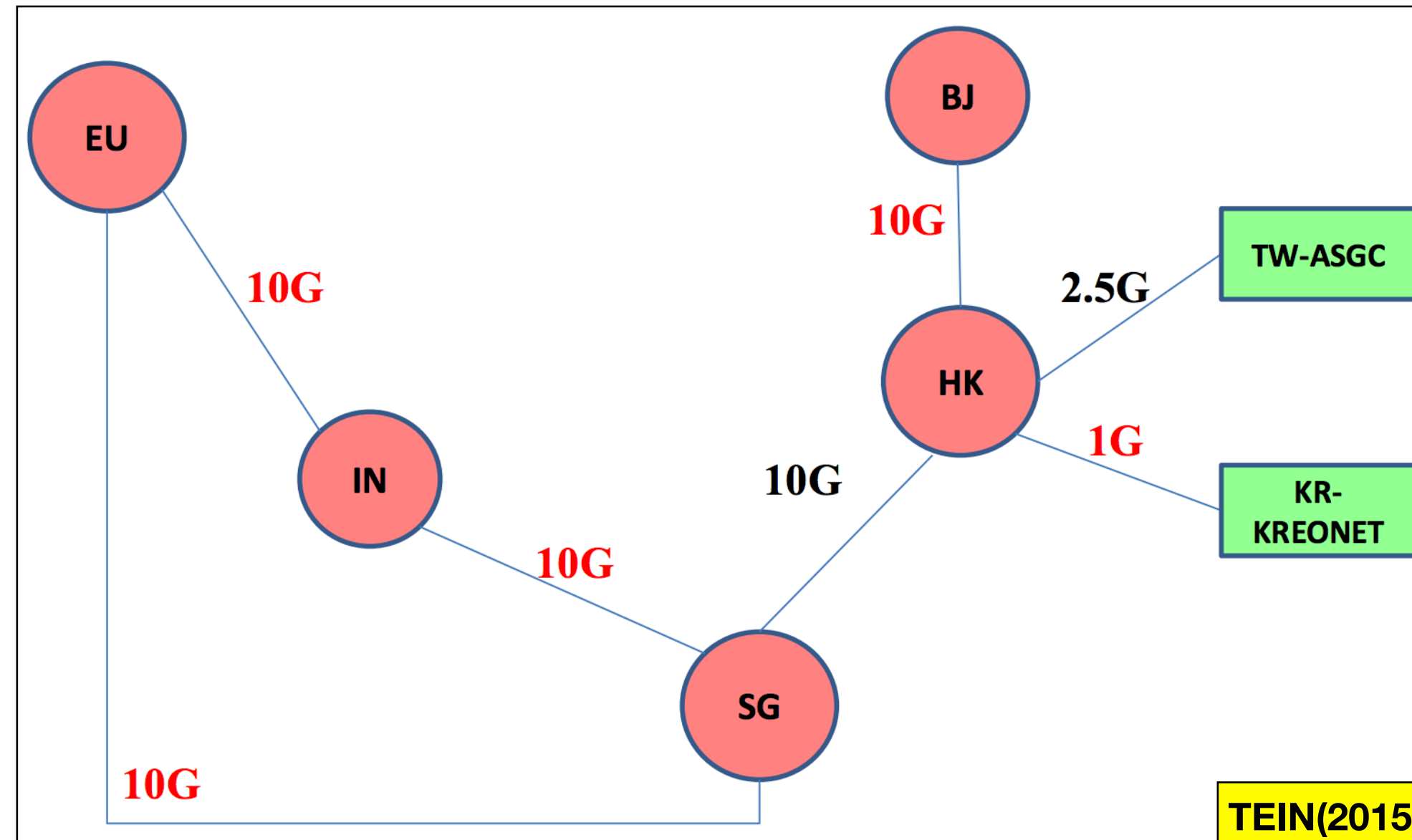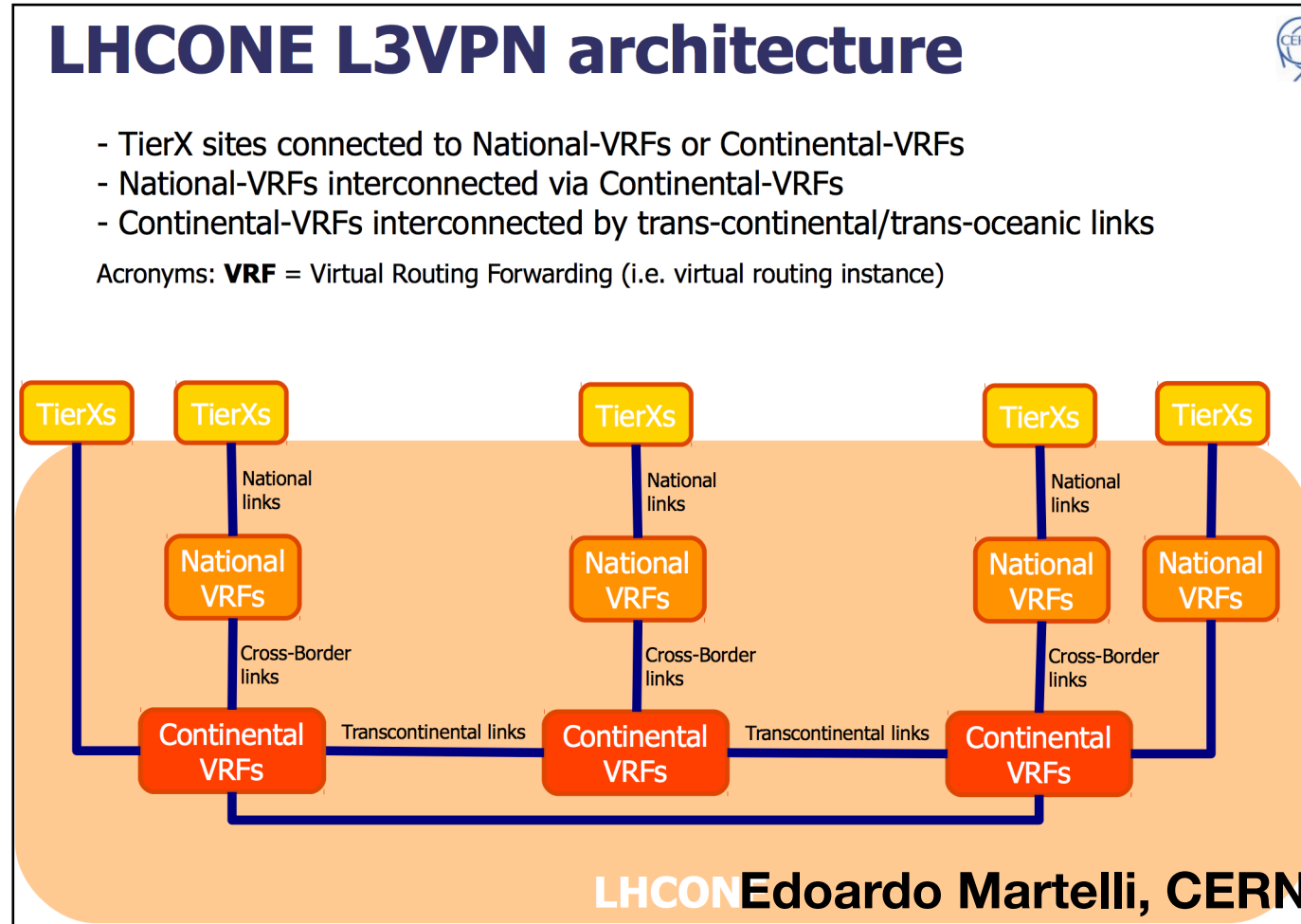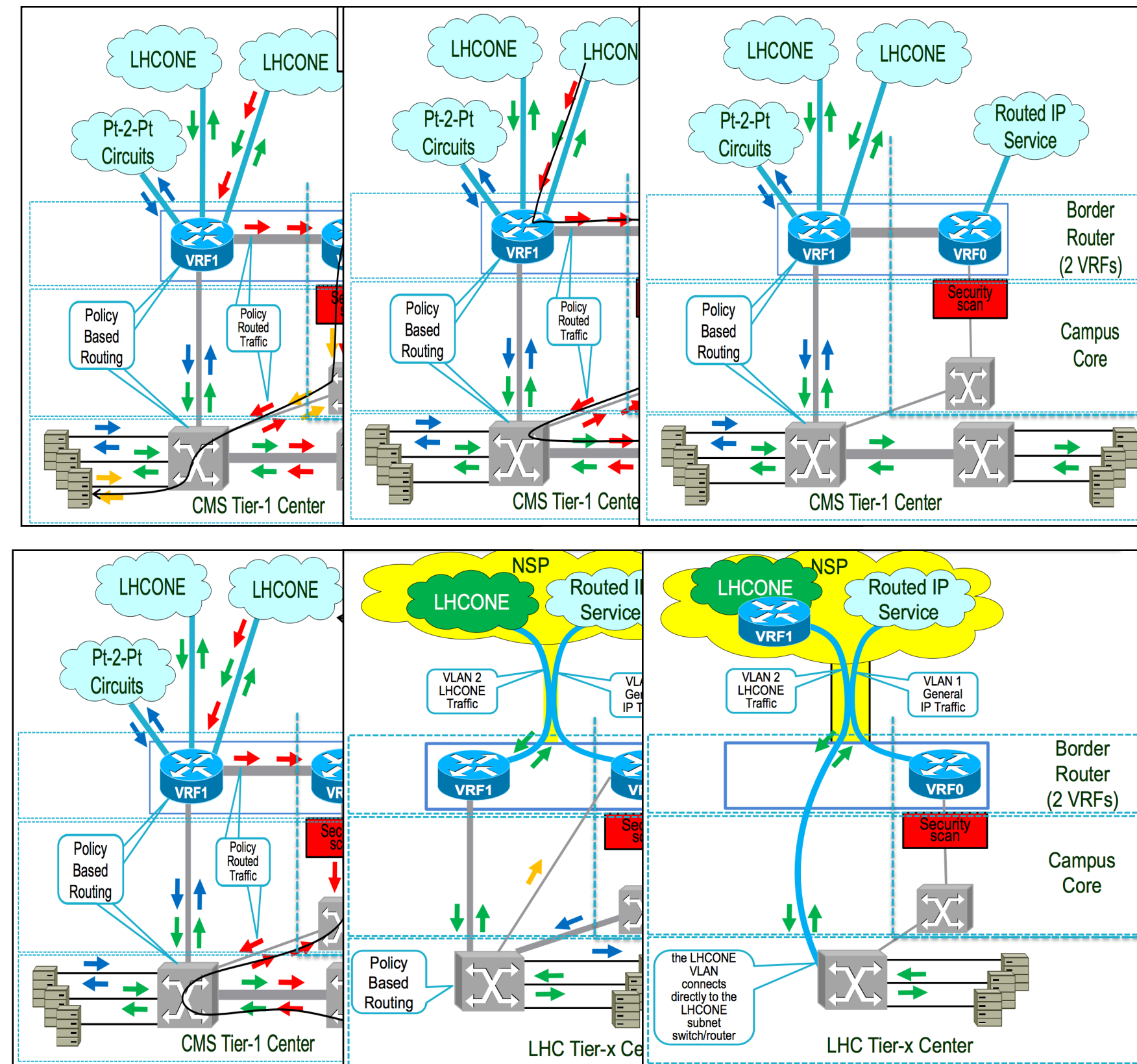SINP Kolkata

VECC Kolkata

Kolkata Tier-2

4 Gbps/10 Gpbs Shared

10 Gbps

10 Gbps (Under going)

1 Gbps

10 Gbps

10 Gbps

10 Gbps

1 Gbps

1 Gbps

1 Gbps

1 Gbps

10 Gbps — 10 Gbps
4-10 Gbps
1 Gbps
x Gbps

Wuhan

华中师范大学校园网网络拓扑图

TIFR

LHCONE, GEANT, FNAL, peering on CERN, Geneva P2P 4G link with best effort up to 10 G

4G dedicated Best effort 10G

ISP (FLAG/ Reliance) MUX Quadway 6x600-8

India-CMS Router

Firewall

India-CMS GRID Network

Switching throughput up to 3.5Tbps

NKN-TEIN4 2.5G to EU / Singapore

NKN Router @ Computer Centre With 1G link to NKN

VECC
RRCAT
IPR

10G

10G

10G

2G → 10G

Thailand

TEIN 4

ThaiREN

SUT

UniNet

ThaiSarn

NSTDA

600 Mbps
1 Gbps
2 Gbps

Hiroshima

- Secure/Robust subnets
- 10Gbps internal connection (part.)
- Space/Energy saving

Hiroshima DC

40Gbps

1Gbps

KEK HS-L3-01

Cataly 3560E

HiNET

FW

Fortigate 200B

10Gbps L3

Nexus 5596/2248x2

DMZ

10Gbps

Xeon X5660 @2.8G

Xeon X5570 @2.9G

Xeon X5660 @2.8G

Equal Logic PS6510E 2T SATA x 48 w/RAID6

TRUSTED

GRID

grid01: VOBOX/CVMFS
grid02: sBDII/APEL
grid03/05: CVMFS/Squid
grid04: Xrootd/DPM-SE
grid06: CREAM-CE

WN

Xeon X5660 @2.8G

Xeon X5355 @2.7G

Disk servers

Xeon L5420@2.5G

Xeon X5460@3.2G

ALICE-T3 / Local cluster
- 184 Xeon cores w/ 1GB/core
- 72 TB storage w/ Raid6

ALICE-T2
- 1,172 Xeon cores w/ 2GB/HT
- 443 (+396) TB storage w/ Raid6

JCS RVAX-4U
1TB SATA x144 w/RAID6
3TB SATA x 48 w/RAID6
3TB SATA x 48 w/RAID6 in prep.
5TB SATA x 48 w/RAID6
6TB SATA x 48 w/RAID6 in prep.

KISTI

KISTI-ASIA

Kreonet2
TEIN or APAN-JP
JGN-X

Connected to JP, US, CN, TW(ASGC) and HK
- via Kreonet2
- JP connected through APAN
- Not connected to TEIN @ HK
- Detailed talks tomorrow

LIPI

Bandung

ALICE resources

Cibinong

1 Gbps

1 Gbps

100 Mbps

45 Mbps

Commercial Internet

LIPI HQ

330 Mbps

Backbone Reports (Physical Connections)

10 T2 sites connected with TEIN

Useful Information

LHCONE L3VPN architecture

- TierX sites connected to National-VRFs or Continental-VRFs
- National-VRFs interconnected via Continental-VRFs
- Continental-VRFs interconnected by trans-continental/trans-oceanic links

Acronyms: **VRF** = Virtual Routing Forwarding (i.e. virtual routing instance)

Edoardo Martelli, CERN

Current LHCONE Status

William Johnston, ESnet

LHCONE Site Architecture Examples

William Johnston, ESnet

LHCONE Site Configuration

Outline

- Introduction
- ESnet LHCONE Traffic Volumes
- LHCONE BGP Reachability
- Customer Edge Routing Symmetry
- Site Connection Guidelines
- Lessons Learned From Early Adopters
- BNL VRF & Policy Routing Example
- Alternative Architectures for Destination Routing
- DTNs in the Science Enclave
- SDN Based Policy Routing Engine
- LHCONE BGP Prefix Filtering Conventions
- Cross Domain Troubleshooting
- PerfSONAR Measurement in LHCONE
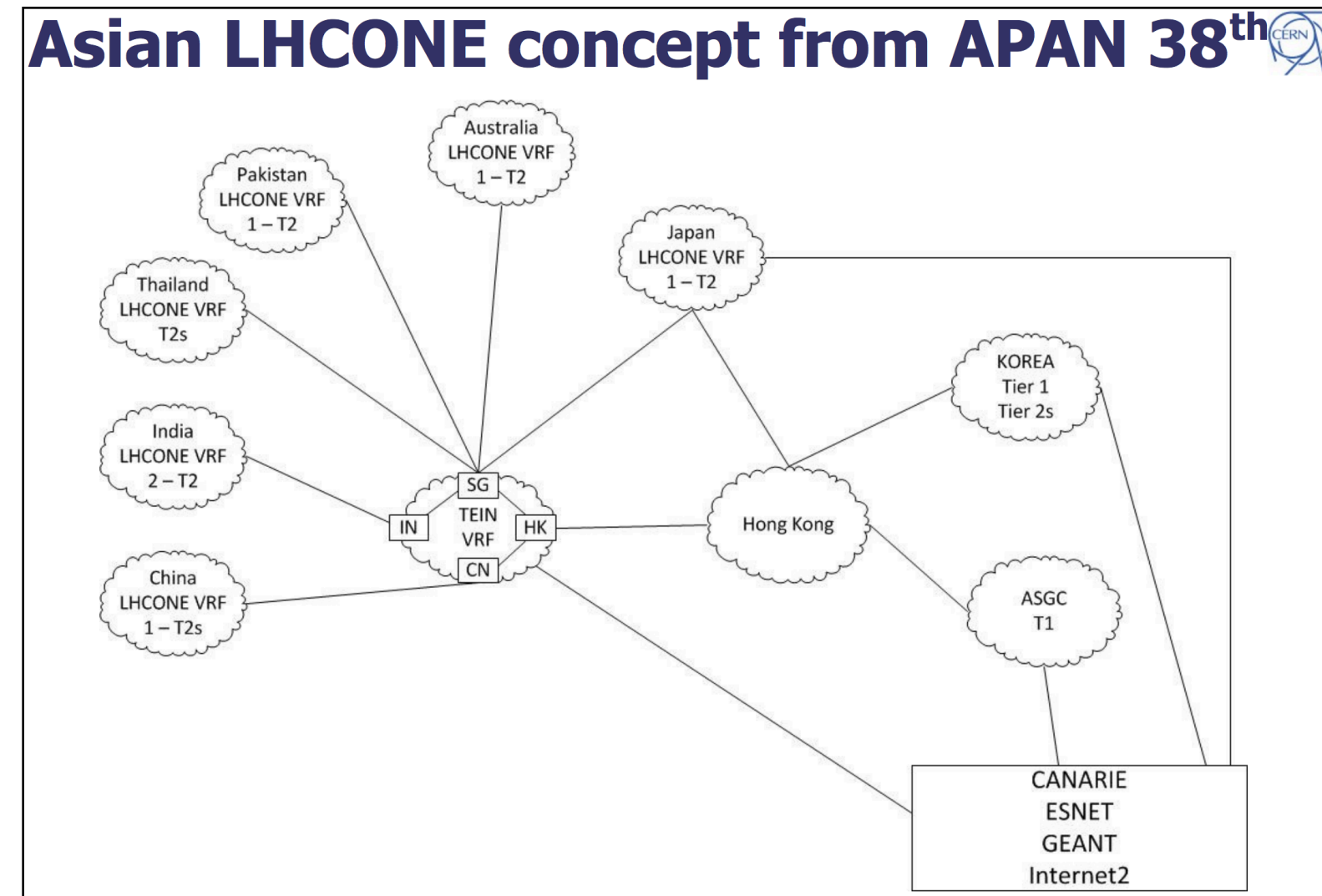- New Site Connection Data

Michael O'Connor, ESnet/BNL
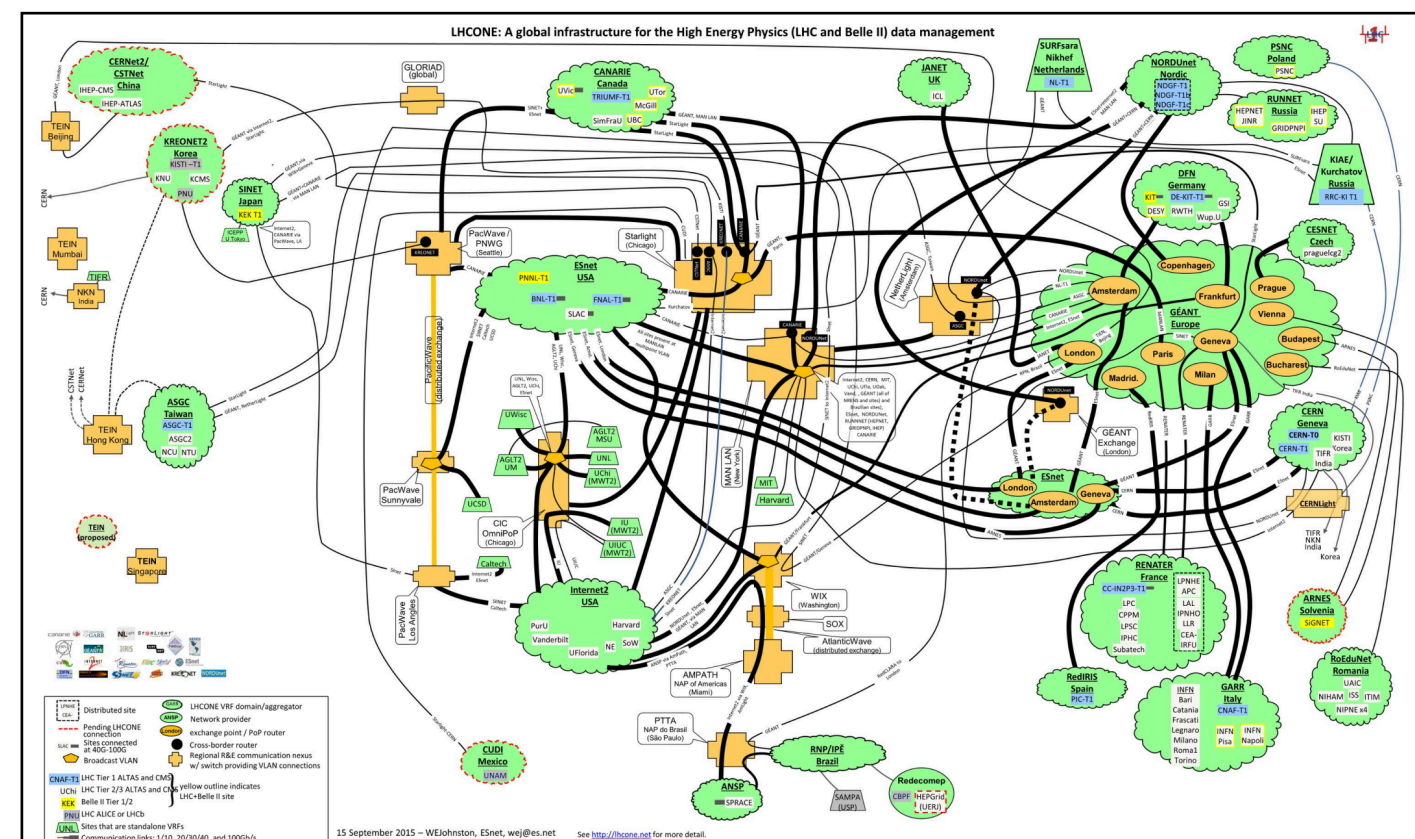
Thanks to contribution from CERN and ESnet

Possible Solutions & Actions for Asian LHCONE
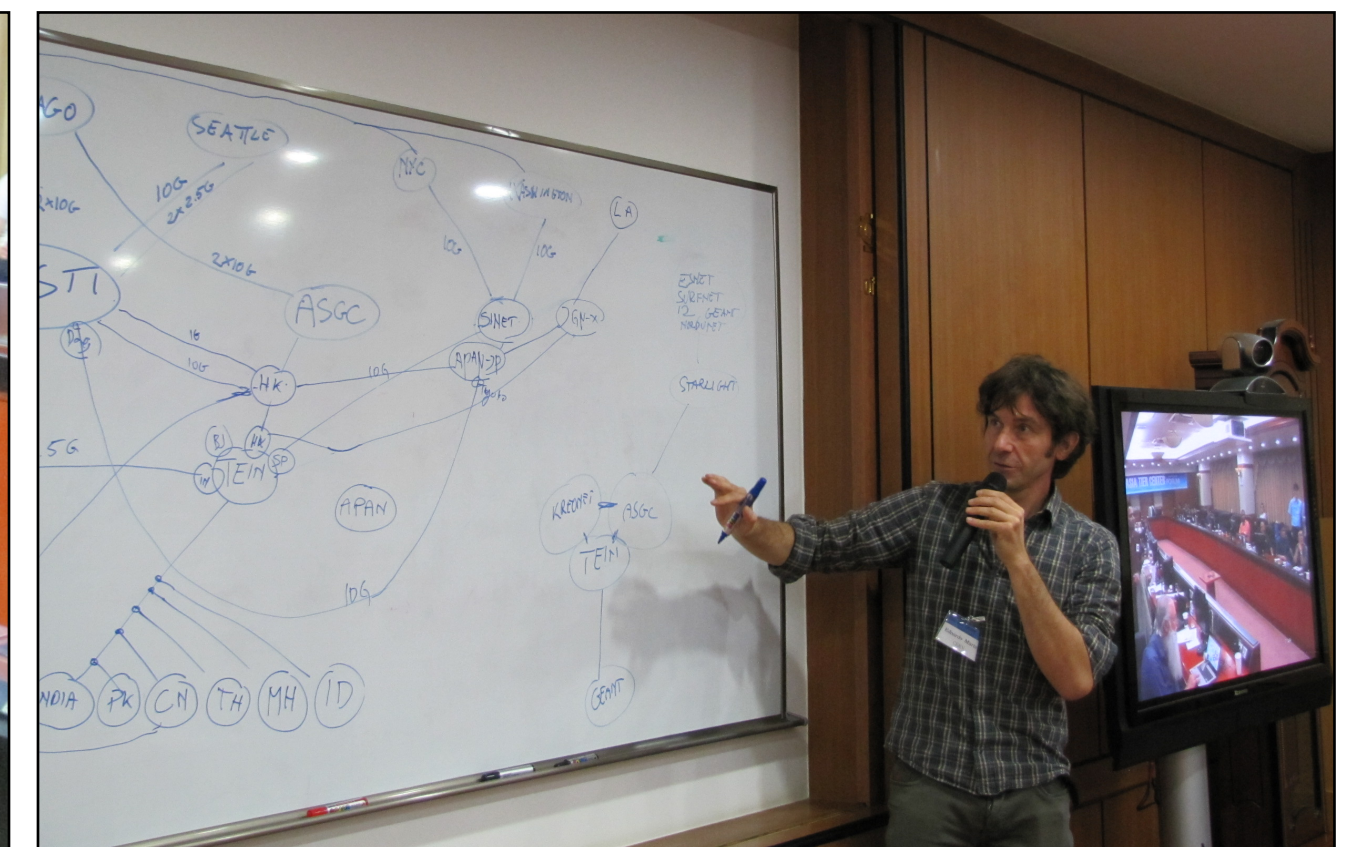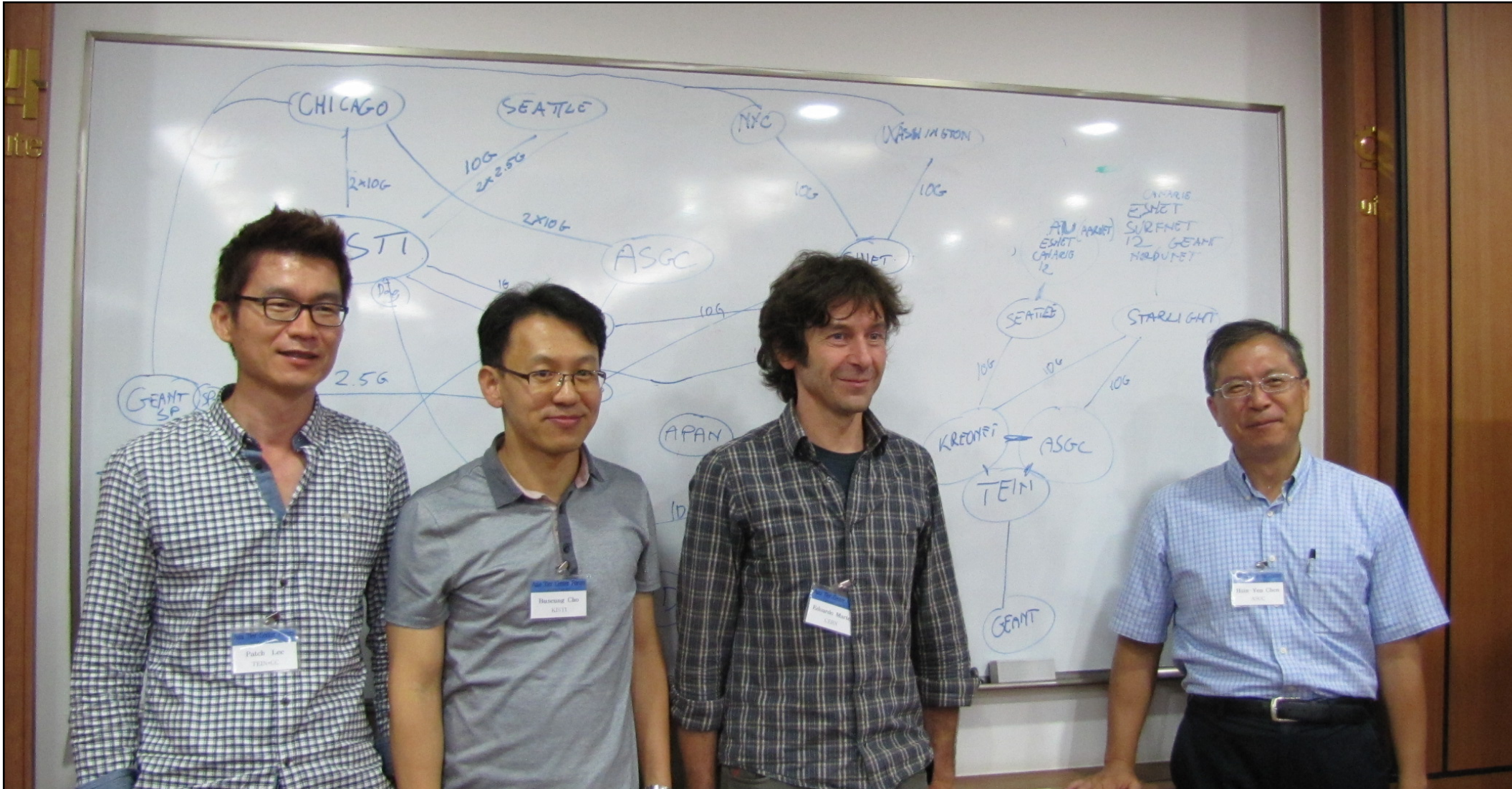
Edoardo Martelli, CERN
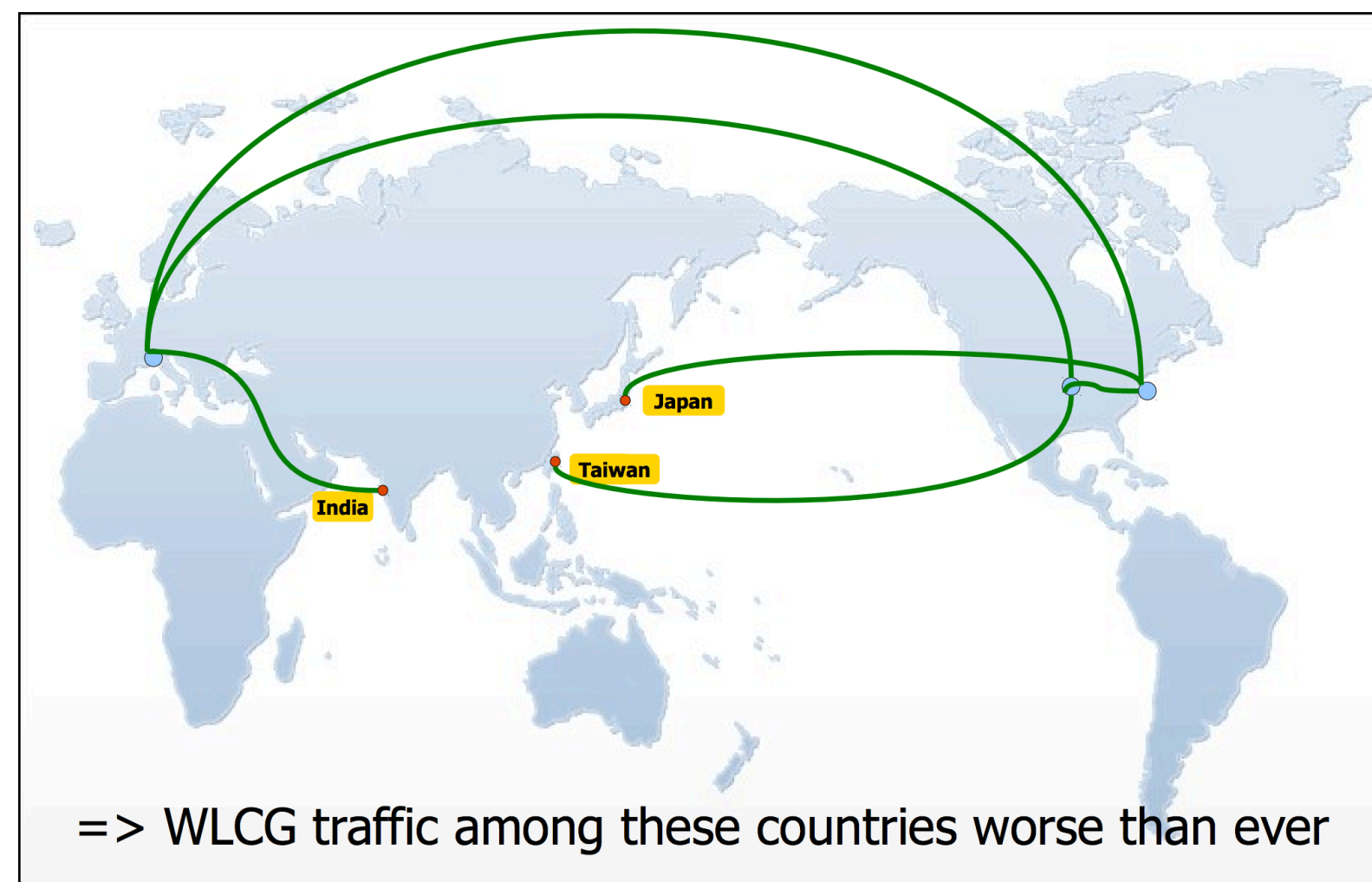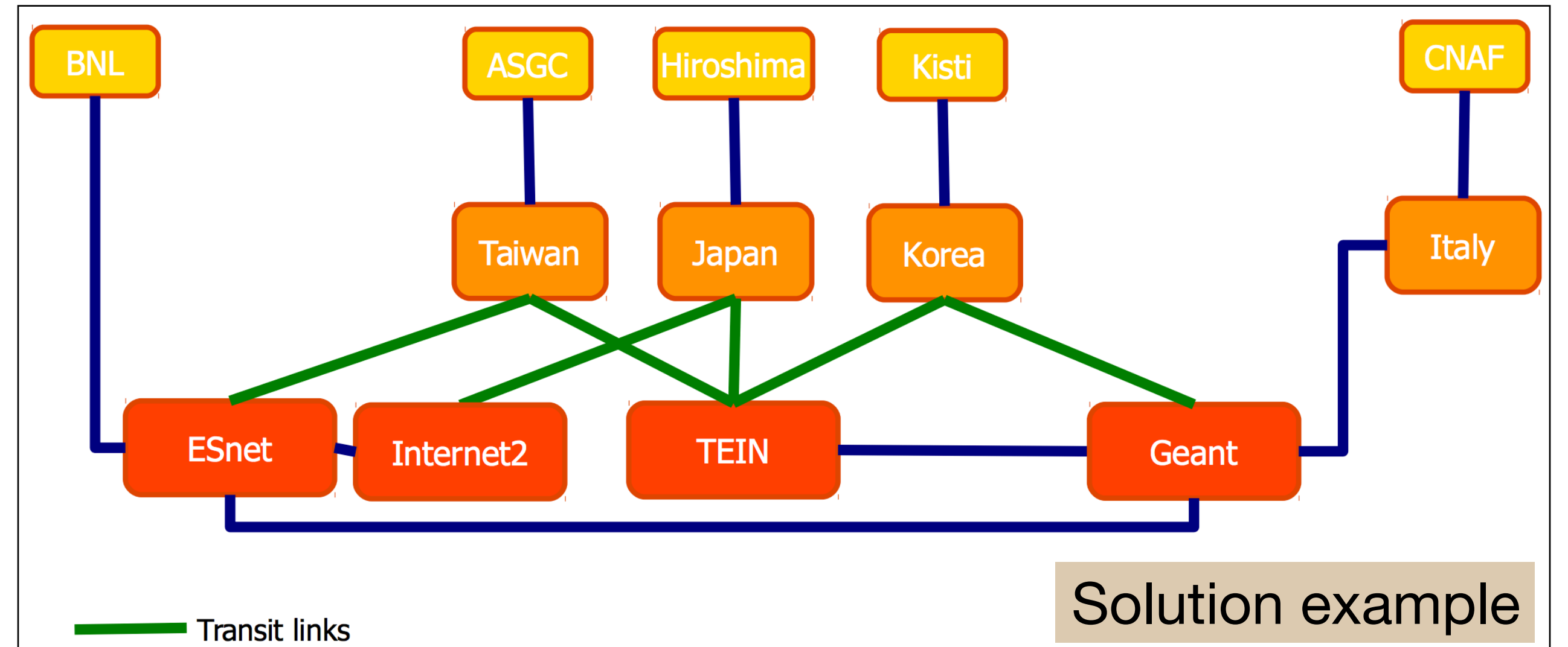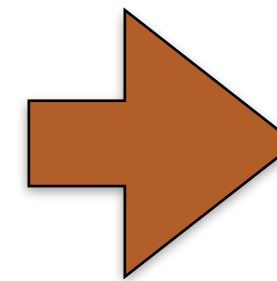
Proposed Actions

- **Agree on the architecture**
- **Agree on the policies (transit)**
- **Agree on shared resources**
- **Define national and continental VRFs**
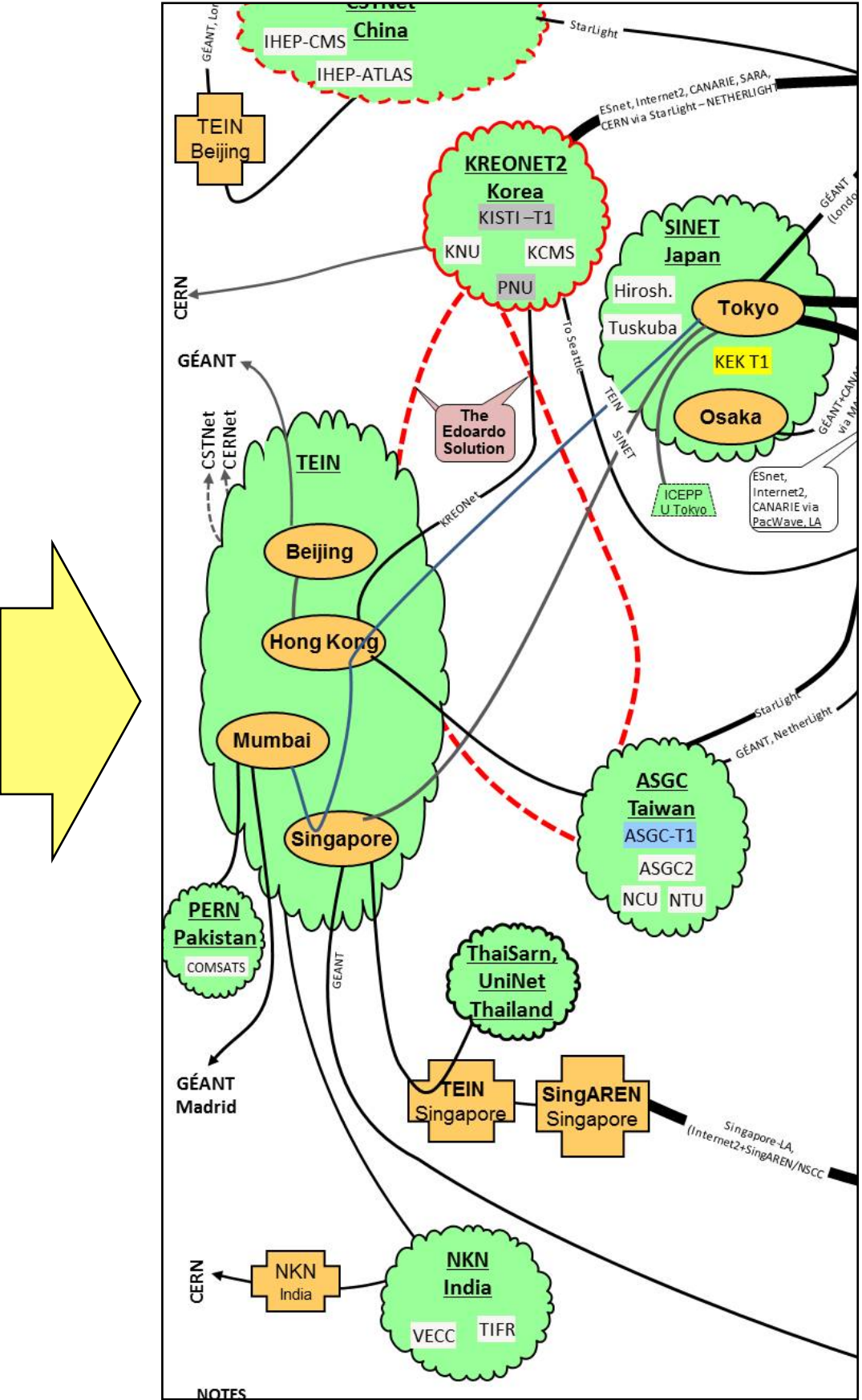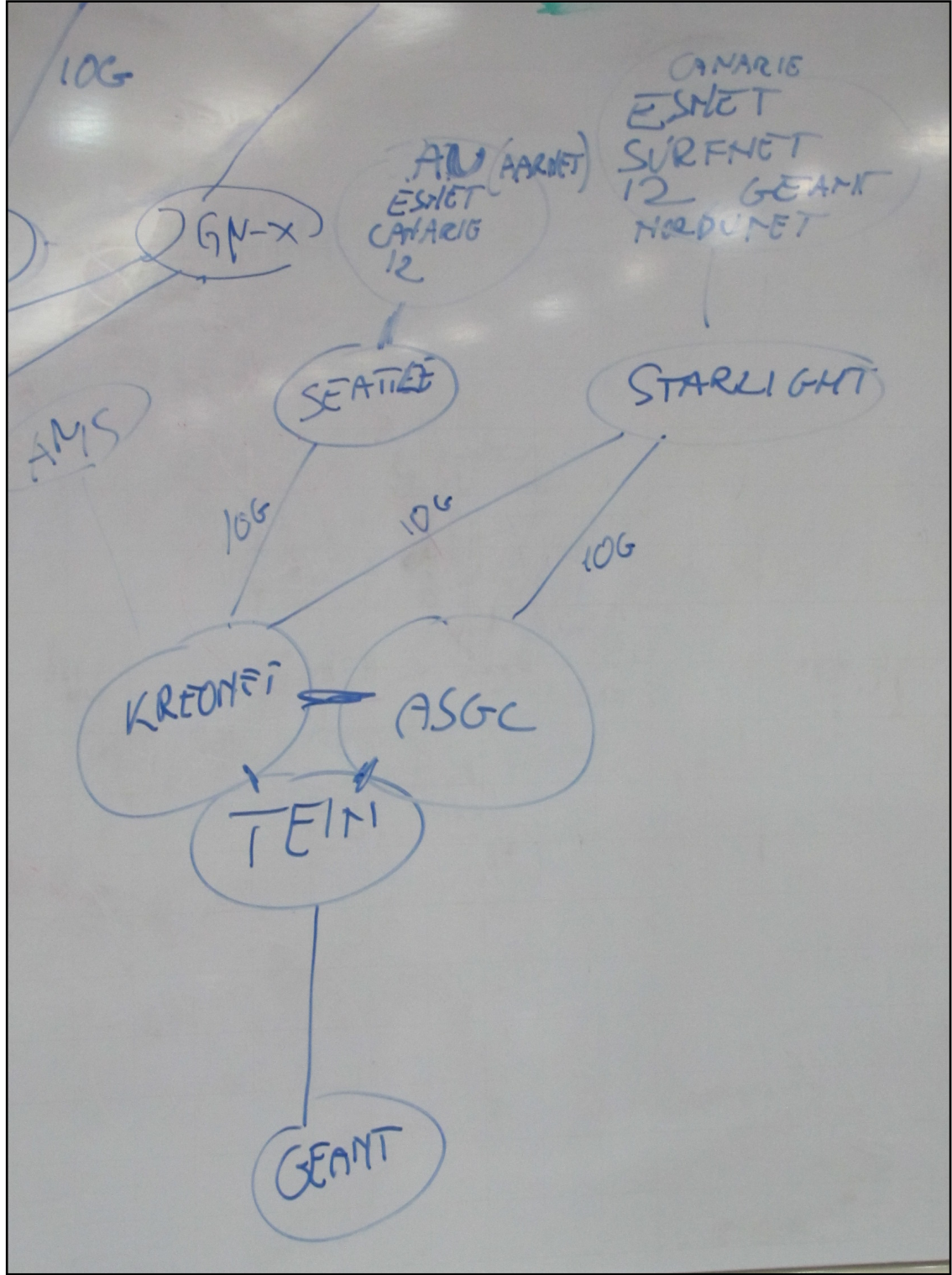- **Interconnect**
- **Enjoy**

And…

- **Intensive discussion focusing on how to improve the network connectivity in Asia with the given conditions:**

  - Local network environment as well as the connection to backbone for each site

  - Status of backbones for LHCONE

  - LHCONE implementation in US

  - Implementation model of LHCONE in Asia

  - LHCONE guidance for site configuration

The Outcome

From William Johnston's ATCF report at LHCONE/LHCOPN workshop in Oct 2015

- Edoardo Martelli(CERN) brokered the following:
- TEIN, ASGC and KREONet have agreed to implement LHCONE VRFs in their networks, to interconnect the VRFs in HK, and to give each other transit over their peering links to GÉANT, Starlight and Seattle

The Edoardo Solution

In the context of **LHCONE VRF** rules and inter-VRF connections

A part of LHCONE Map (v3.4)
William Johnston, ESNET

2nd ATCF

Site Status Update @ 2nd Forum

- T2s has managed to upgrade their networks
- Some sites the situation is still the same
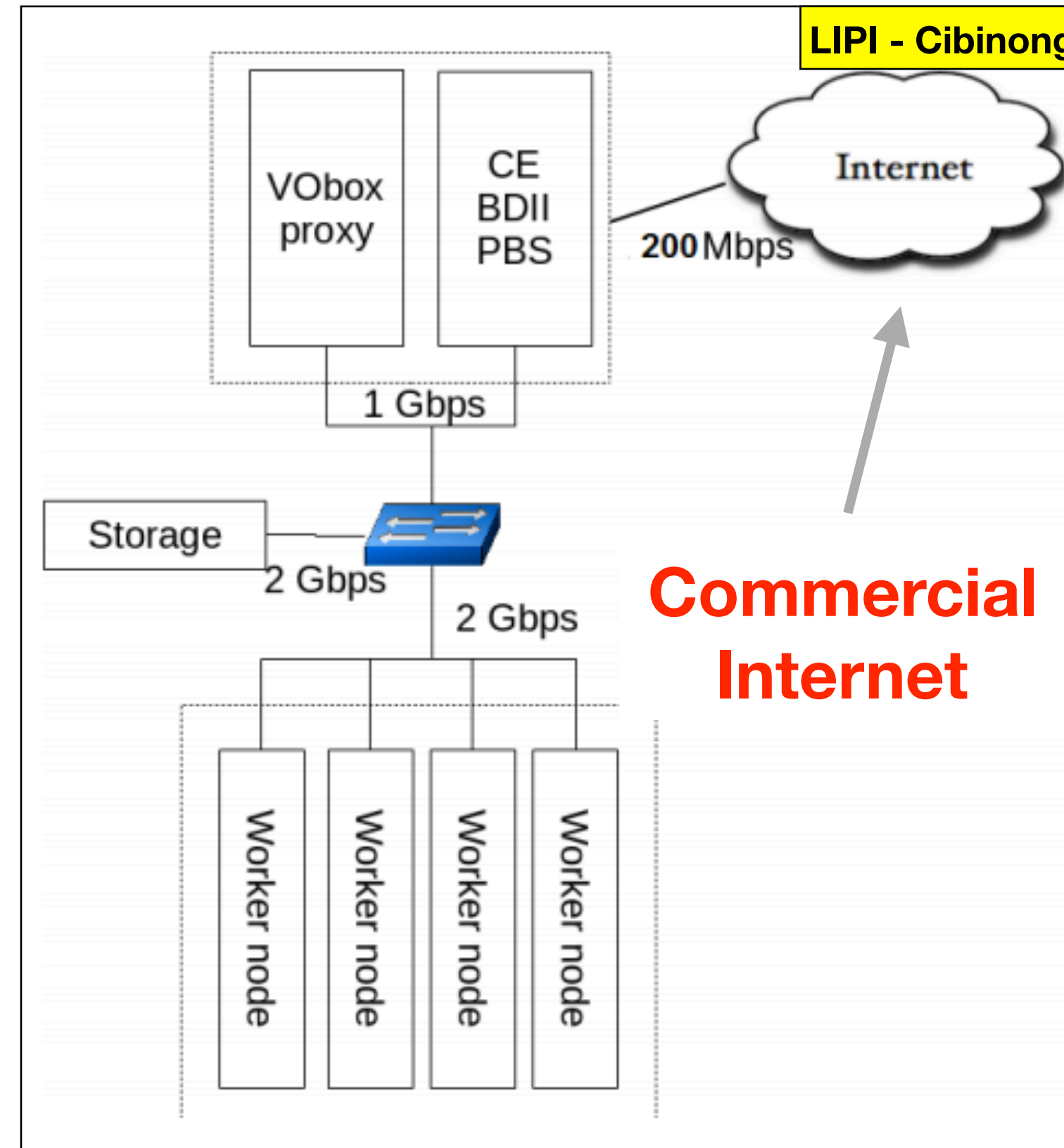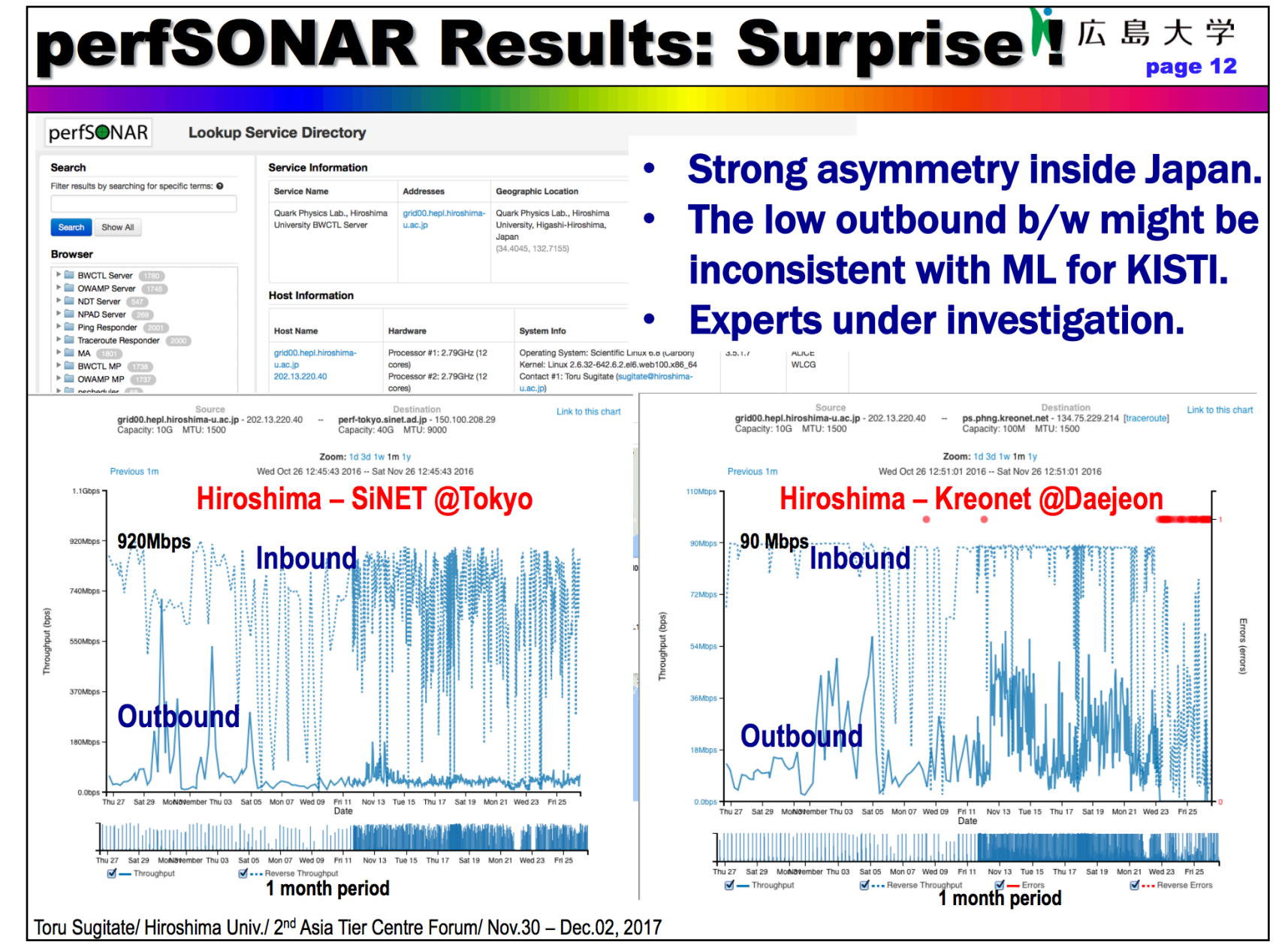- Some sites get worse than before

The Good
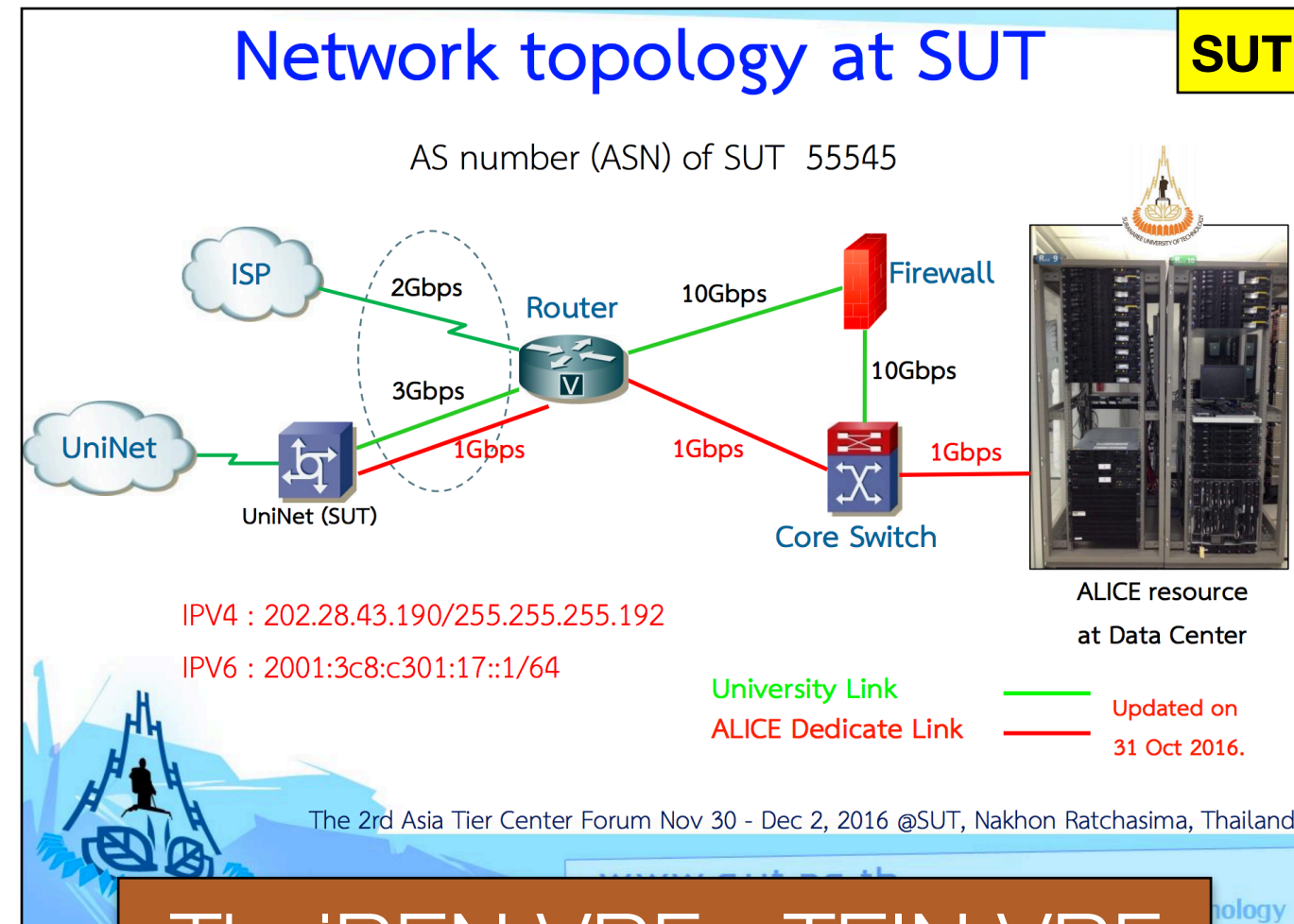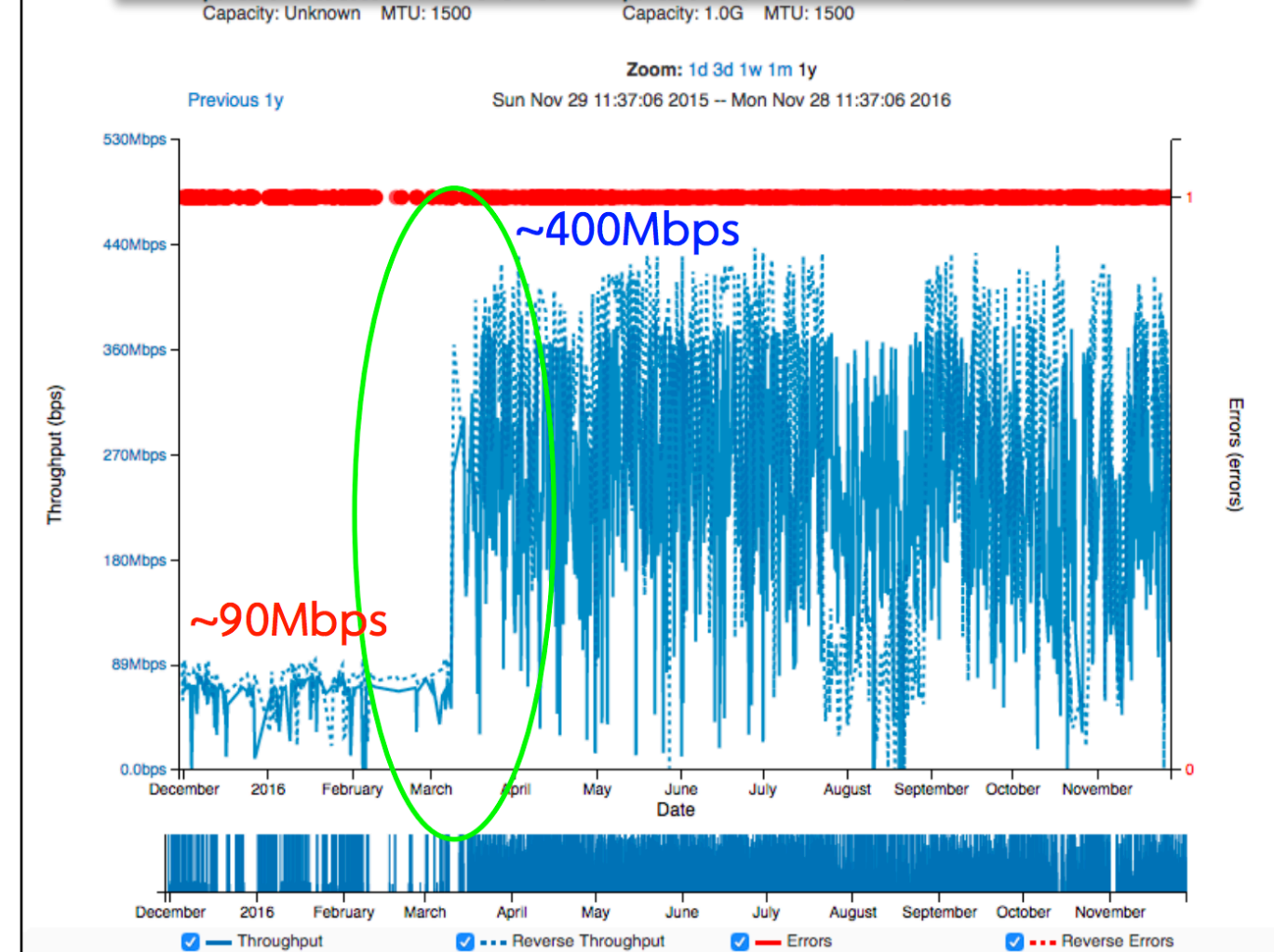
The Bad

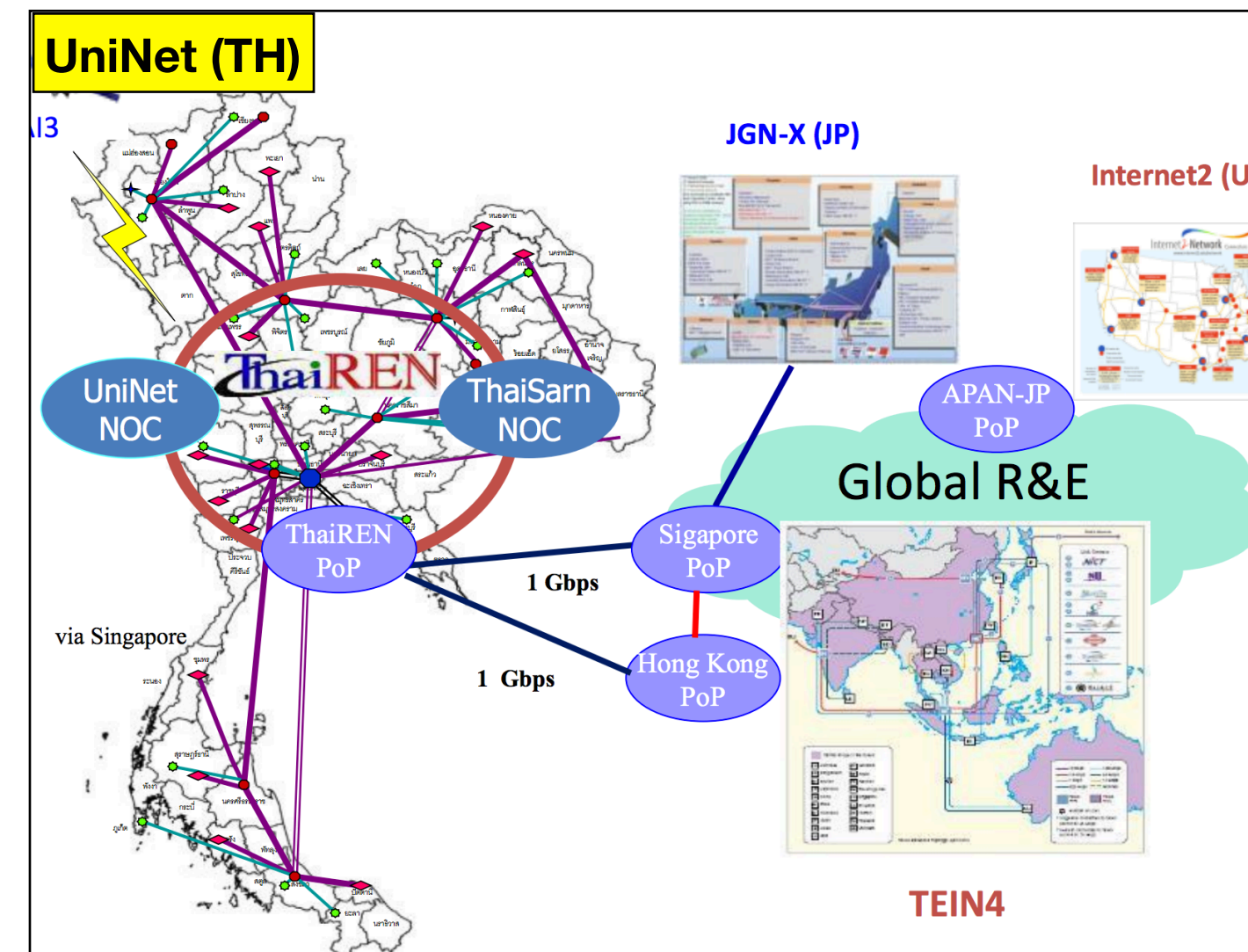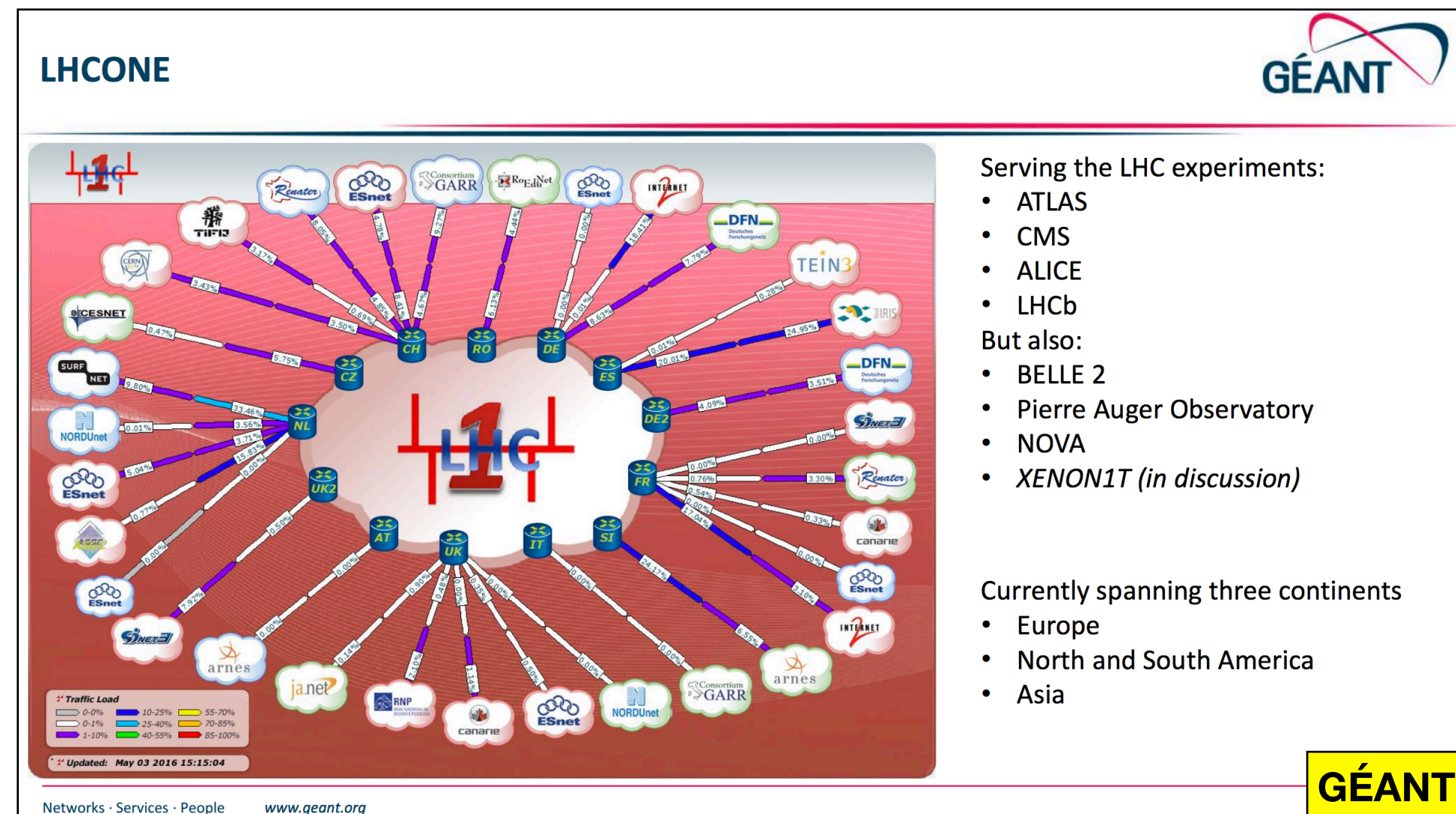- Wuhan site still inactivated because of network

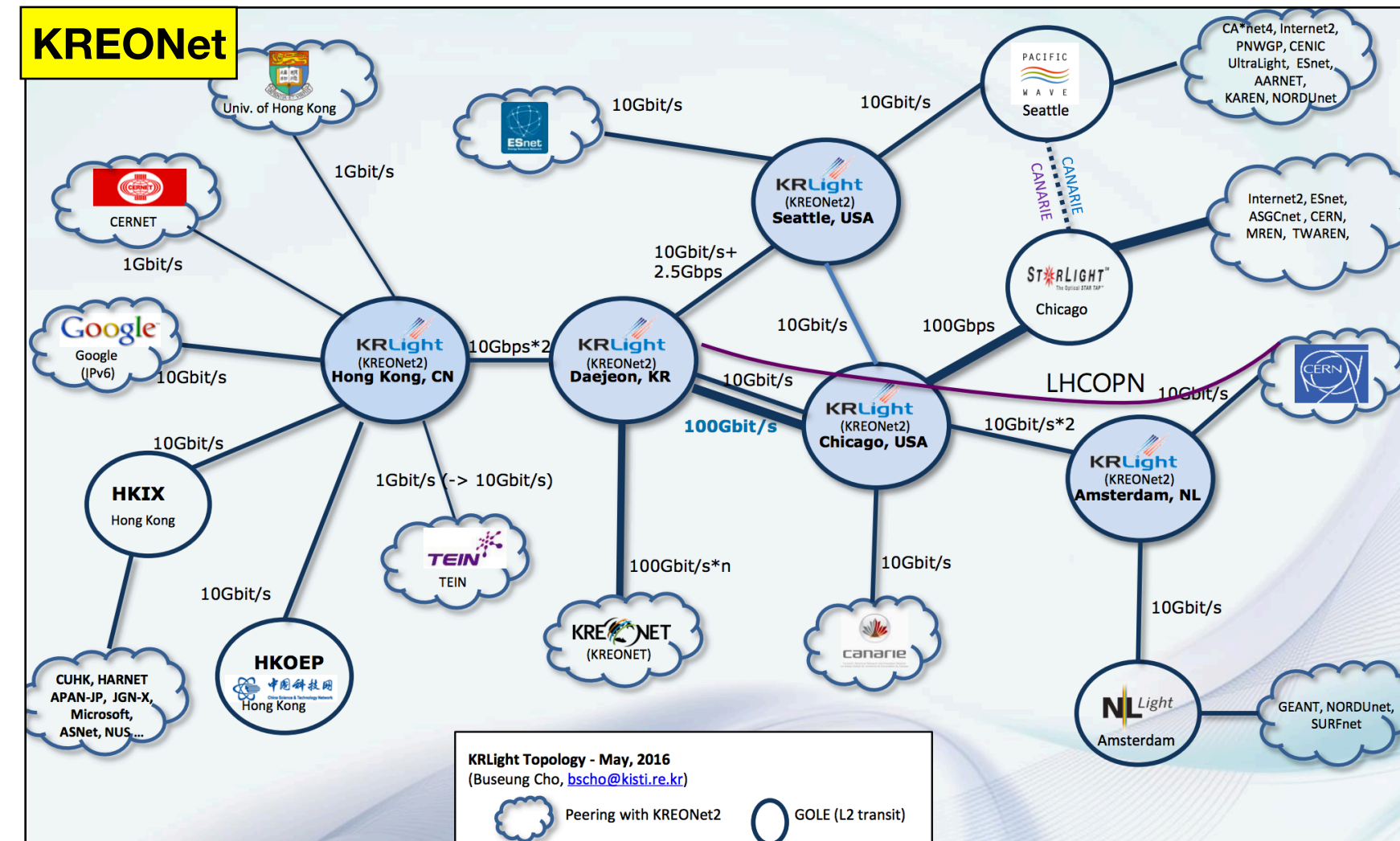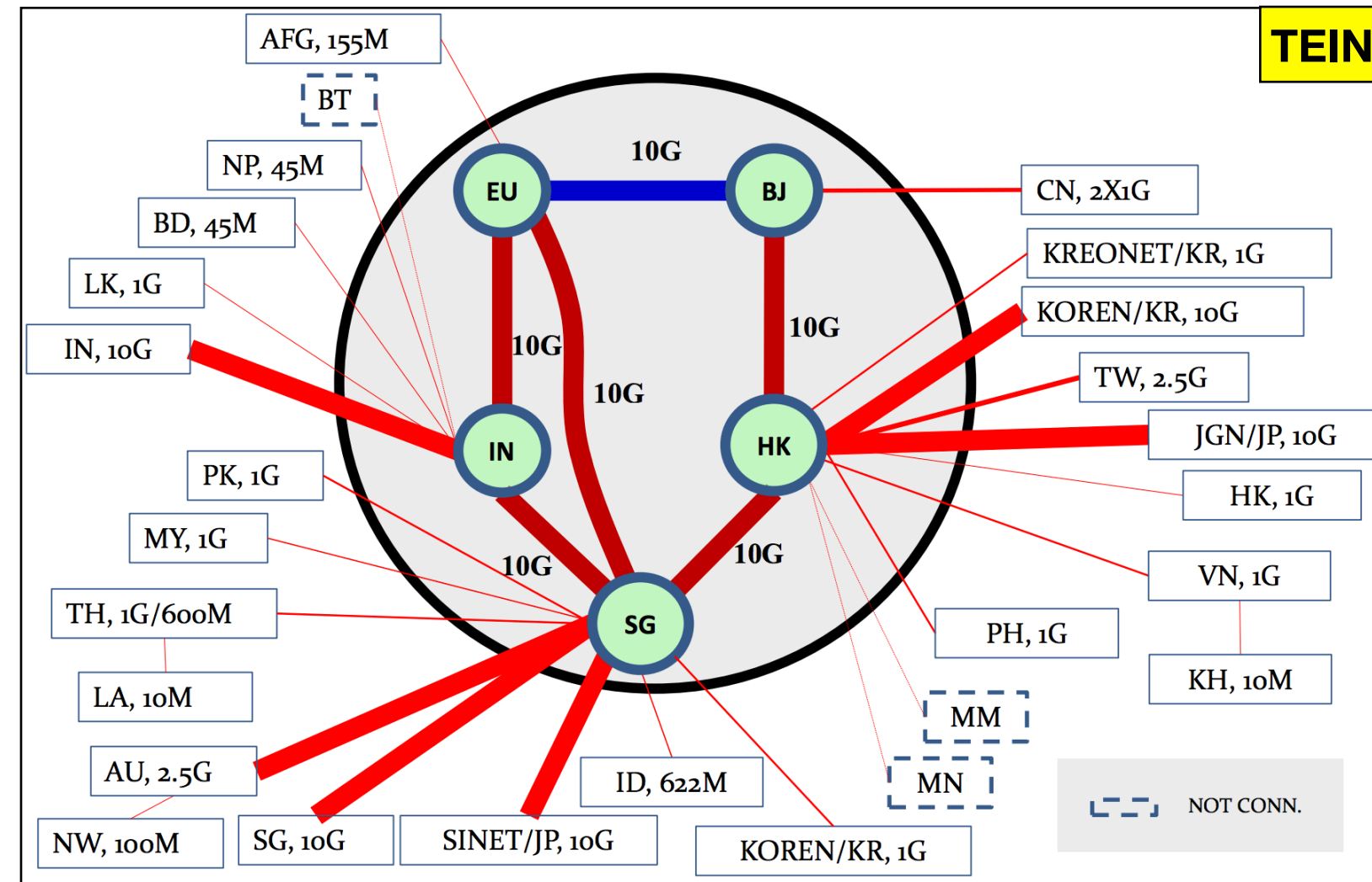## The Weird

- Asymmetry inside Japan
- Lost direct connection between JP and KR
  - JGN-x - KREONet

Backbone Status Update

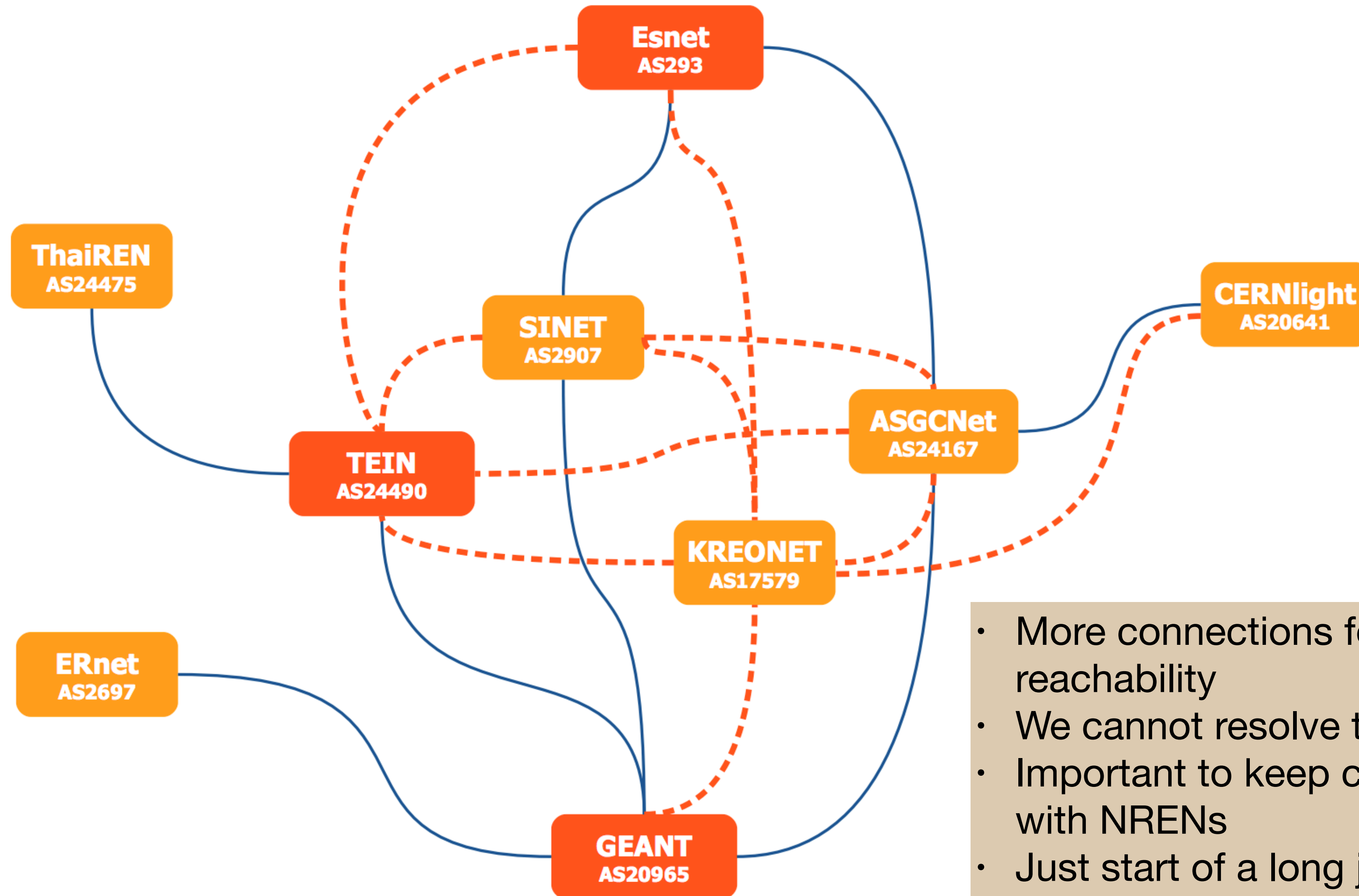- Significant upgrade conducted in TEIN & KREONet
  - Full 10G (TEIN)
  - 100G up to US (KREONet)
- GÉANT LHCONE Status
- Some details about UniNet (TH)

Status of LHCONE VRFs in Asia
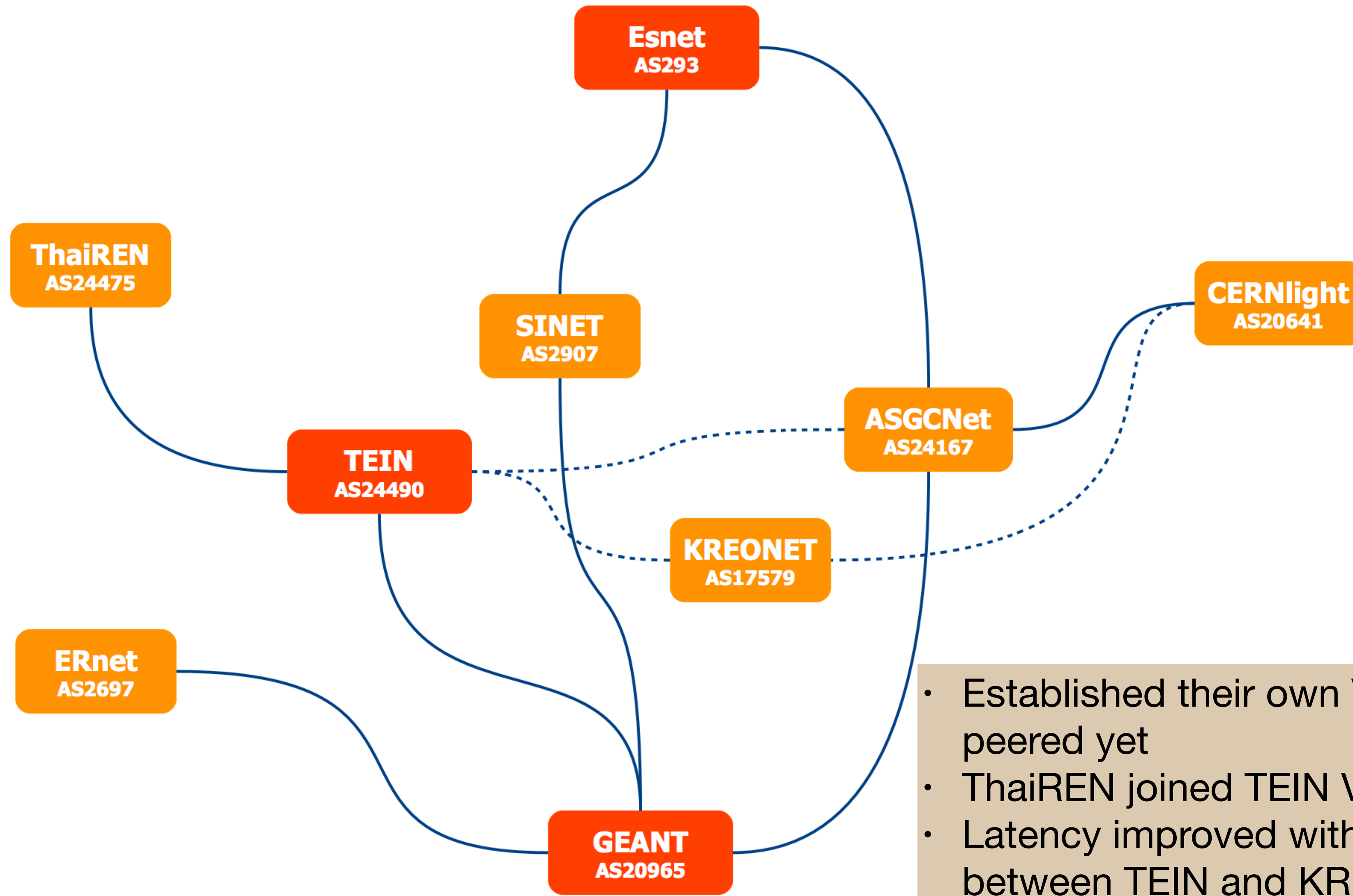
- Established their own VRF but some still not peered yet
- ThaiREN joined TEIN VRF (seen by GÉANT)
- Latency improved with physical connection between TEIN and KREONet

Missing connections

- More connections for full mesh & reachability
- We cannot resolve this at once
- Important to keep communicating with NRENs
- Just start of a long journey for network consolidation in Asia

Plan

Next

- Keep tracking the progress of LHCONE status in Asia through the forum

    - Communicating with TEIN and KREONet for their progress

- KISTI will hold ATCF again this year when the participation from NREN as well as Asian Tier sites can be maximized

    - This will be decided in April

More info

- Please feel free to visit: http://atcforum.org

  - All the materials presented at 1st & 2nd ATCF and minutes

  - Guidelines for LHCONE site configuration

    - Presented by Michael O'Connor, ESnet/BNL

    - https://indico.cern.ch/event/395656/contributions/1833956/attachments/1158490/1666790/LHCONE-site-connections-esnet.pdf

- Please refer to my previous talks presented at ISGC2017 for KISTI-GSDC status as well as KISTI CA

Thank you

Questions?