LHC network in Asia

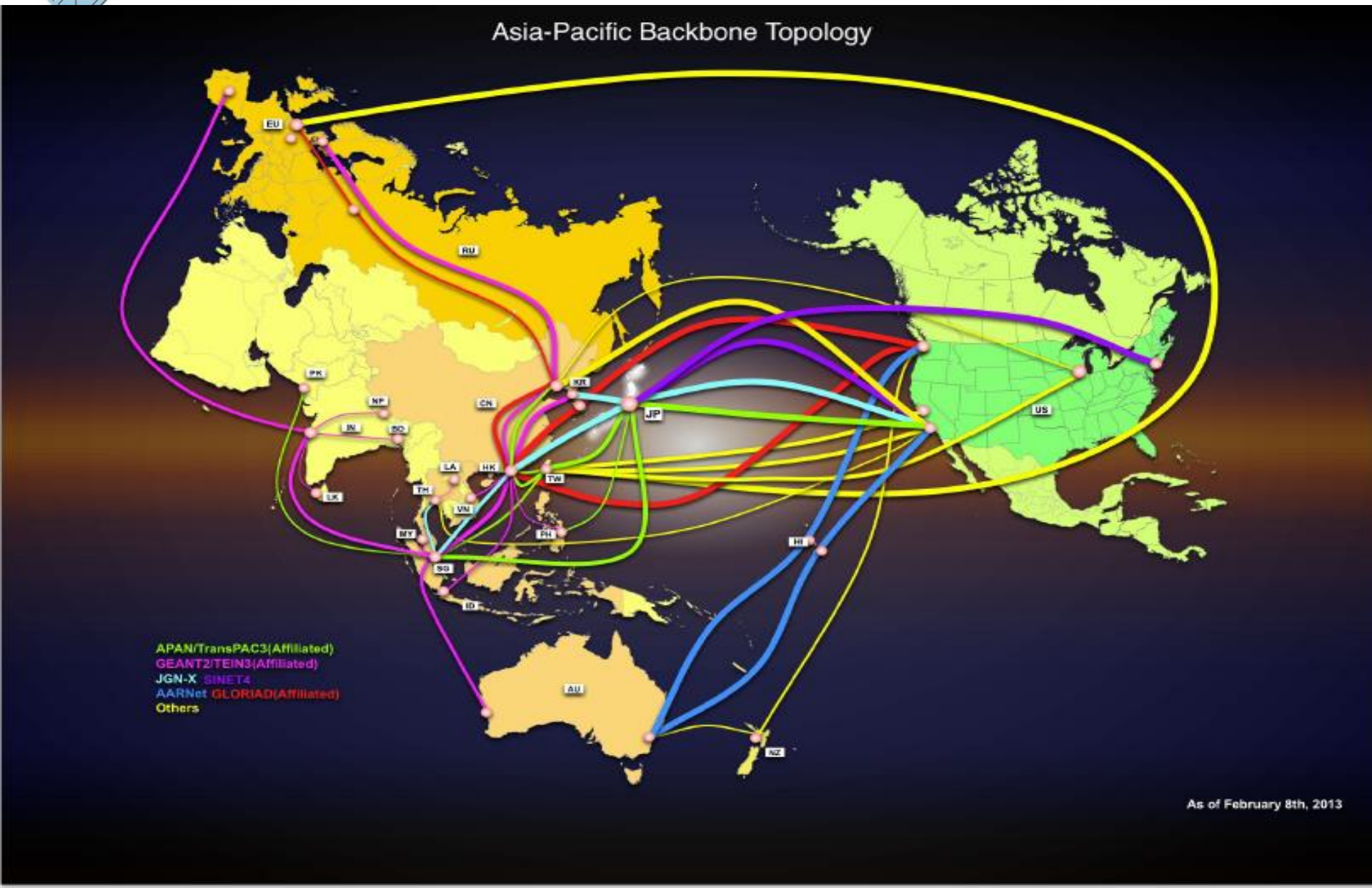
HSIN-YEN CHEN

APAN38

NanTou

13 Aug. 2014

Asia R&E Network backbone

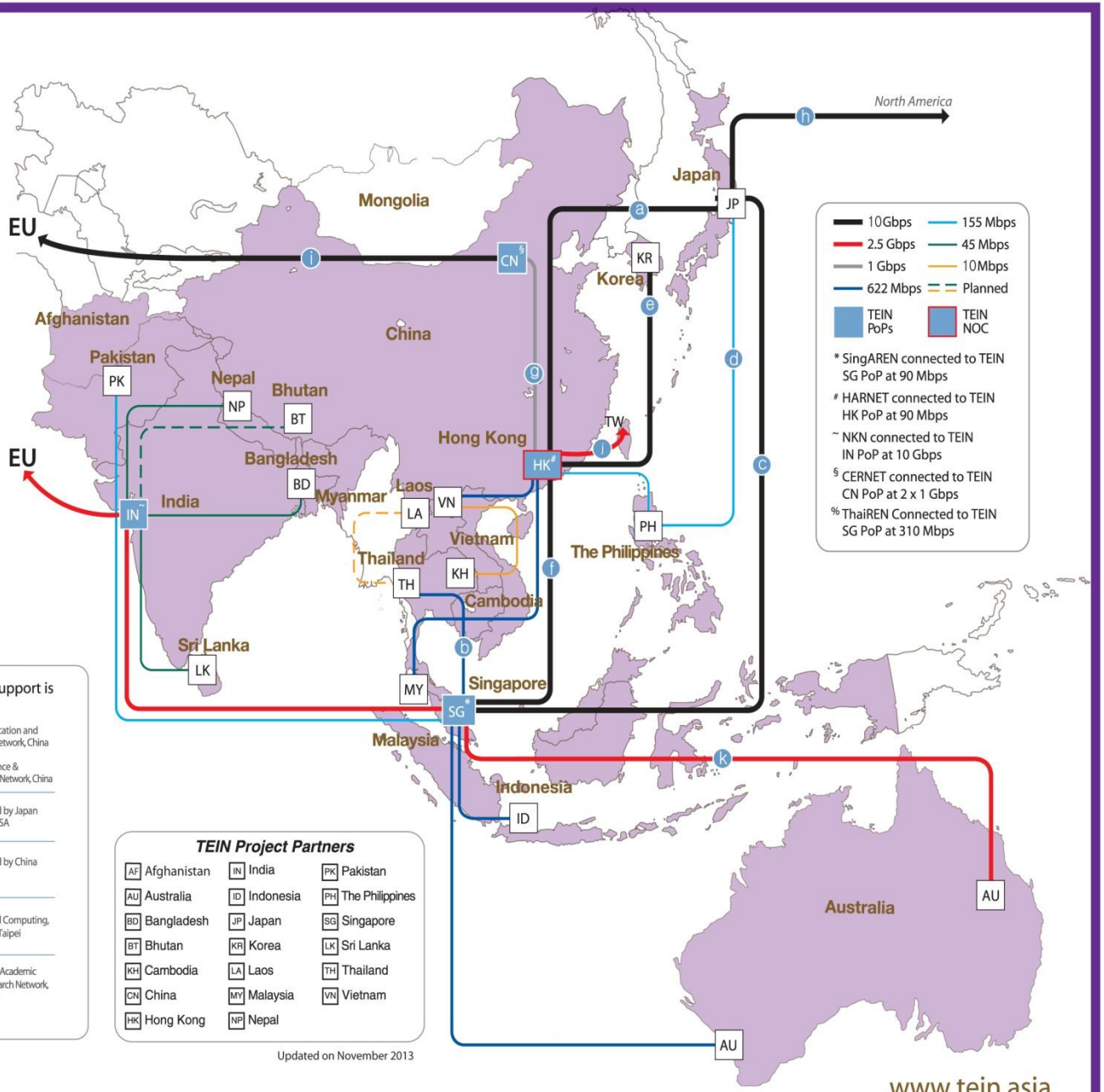


APAN Introduction

- APAN (Asia Pacific Advanced Network) was first established as a non-profit international consortium on 3 June 1997
- 16 primary members
- APAN connects the research and education networks of its member countries/economies to each other and to other research network around the world
- APAN coordinates activities related to network technologies, services, and applications among its members and with its peer international organisations
- In the past few years, research and education networks of United States and Europe leap its international network bandwidth and links with Asia-Pacific. Together, the three regions are realizing a truly global ring architecture as well as driving the connectivity to the less-off regions such as Africa, Central Asia and Pacific Island

TEIN

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 NICT — National Institute of Information and Communications, Japan
- b NICT — National Institute of Information and Communications, Japan; Thailand Research and Education Network, Thailand
- c NII — National Institute of Informatics, Japan
- d MAFFIN — Ministry of Agriculture, Forestry and Fisheries Research Network, Japan
- e f NIA — National Information Society Agency, South Korea
- g CERNET — China Education and Research Network, China; China Science & Technology Network, China
- h TransPAC — co-funded by Japan and the USA
- i ORIENTplus — co-funded by China and EU
- j ASGC — Academia Sinica Grid Computing, Republic of Chinese Taipei
- k aarnet — Australia, Academic and Research Network, Australia

TEIN Project Partners

AF Afghanistan	IN India	PK Pakistan
AU Australia	ID Indonesia	PH The Philippines
BD Bangladesh	JP Japan	SG Singapore
BT Bhutan	KR Korea	LK Sri Lanka
KH Cambodia	LA Laos	TH Thailand
CN China	MY Malaysia	VN Vietnam
HK Hong Kong	NP Nepal	

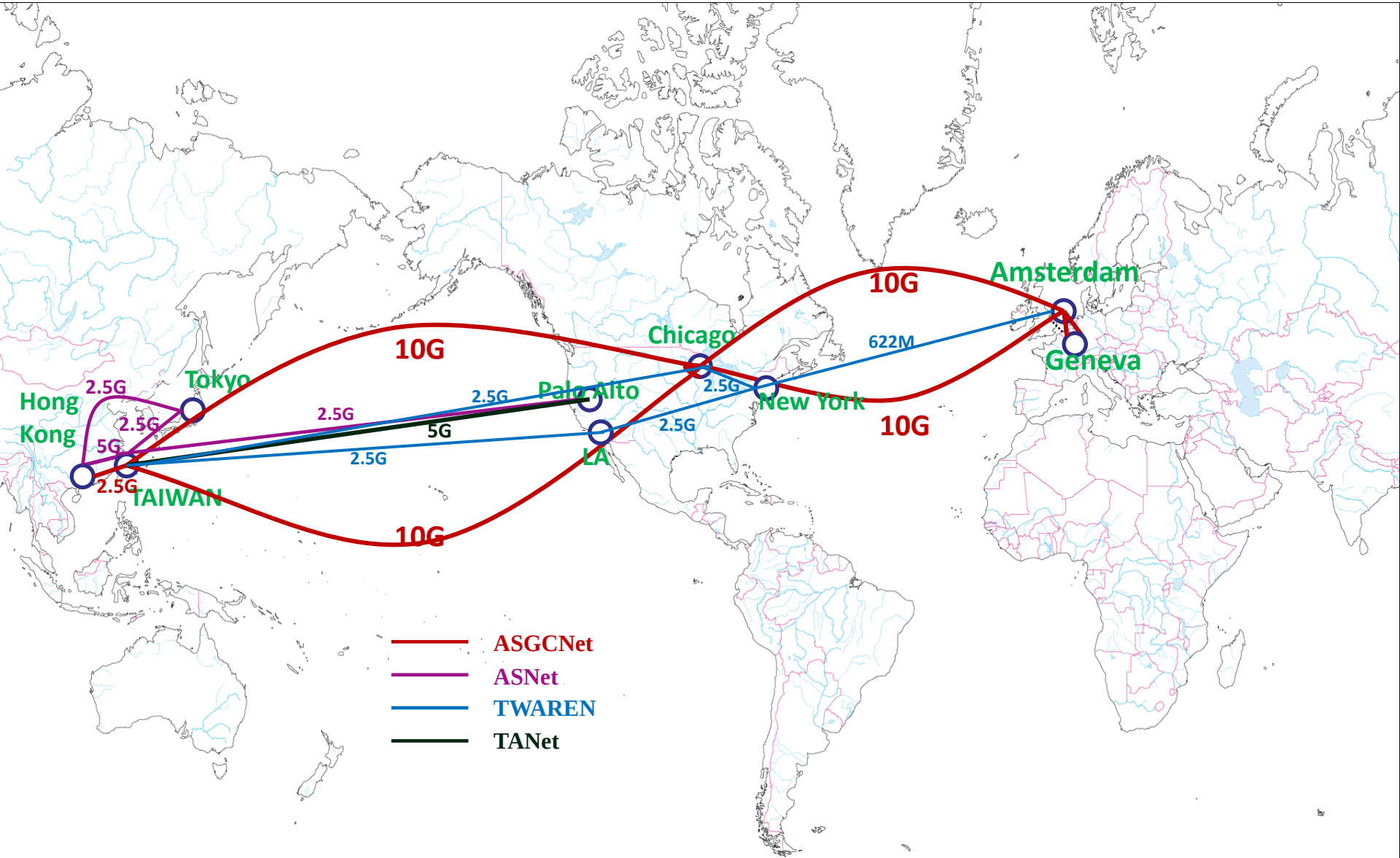
Updated on November 2013

www.tein.asia

TEIN*CC COOPERATION CENTER
www.teincc.org

TEIN is co-funded by the European Commission through the Directorate-General for Development and Cooperation-EuropeAid

TAIWAN Global R&E Network



ASGC HEP & e-Science resources

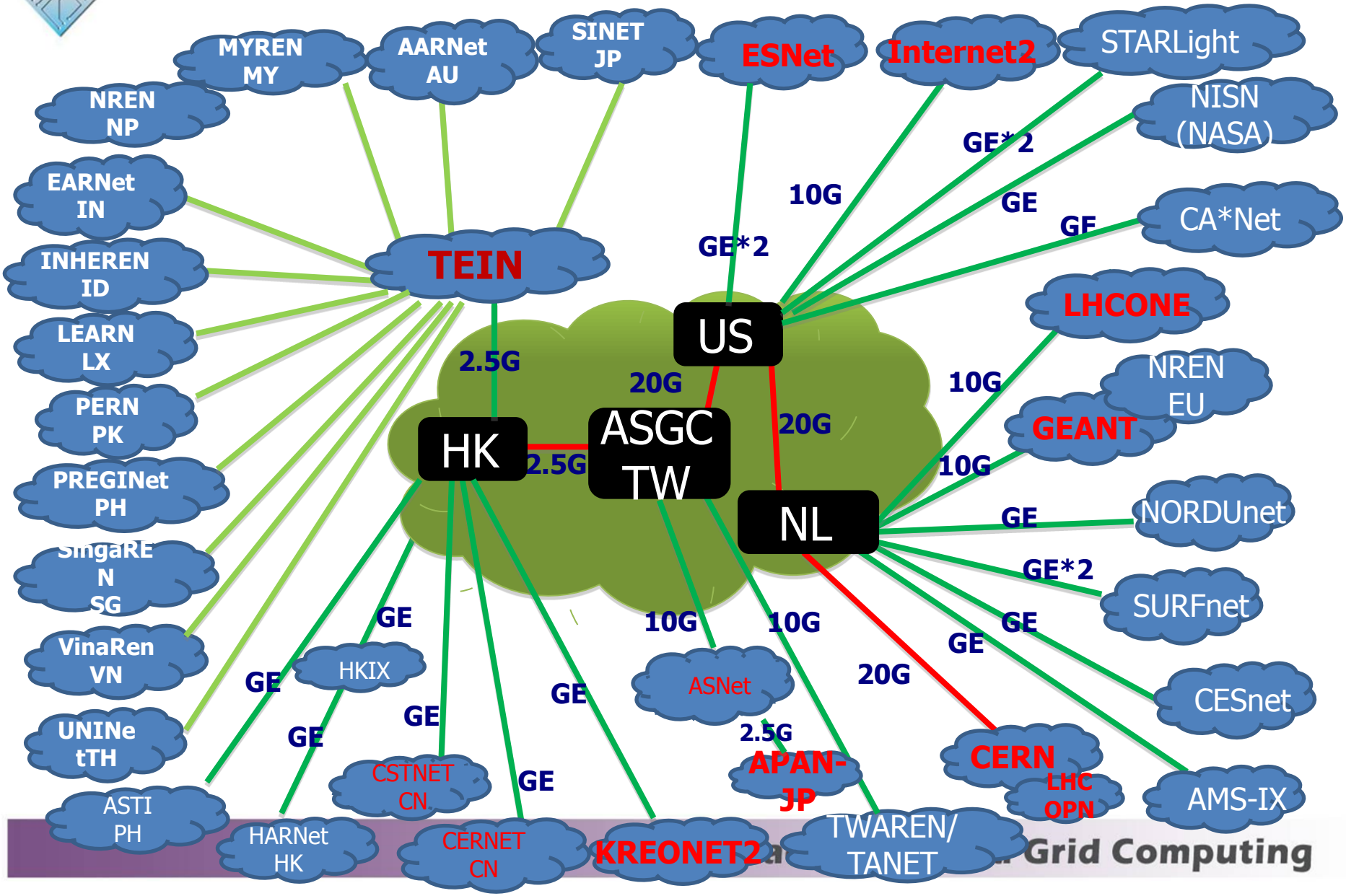
- Scientific Collaborations: HEP (WLCG & AMS), Life Sciences, Earth Sciences (Earthquake, Tsunami & Storm Surge), Climate Change, Humanity, etc.

- Network
  - Aggregated 2x10G links between TW-US-AMS-CERN since Sept. 2013
    - RTT is ~ 280 ms
  - 1x2.5G link to HK, for CN, JP and other Asia countries

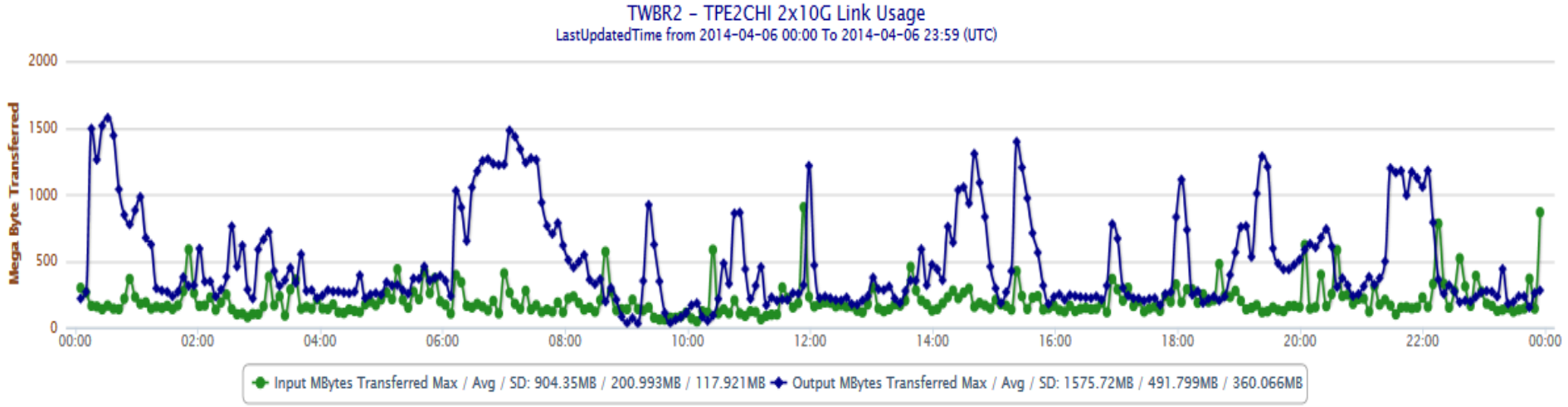
- Computing
  - Total 20,000 CPU Cores
  - Panda+Rucio; DiCOS
  - Cloud

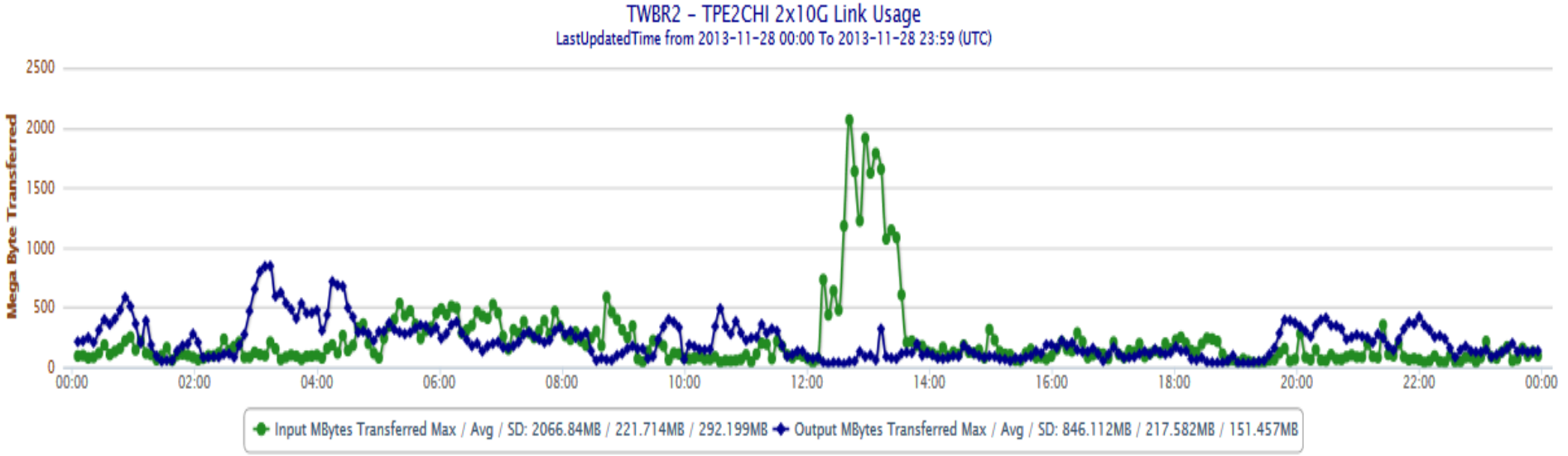
- Storage
  - 12PB Disk + 5 PB Tape
  - DPM, EOS
  - FTS3

ASGC e-Science Global Network

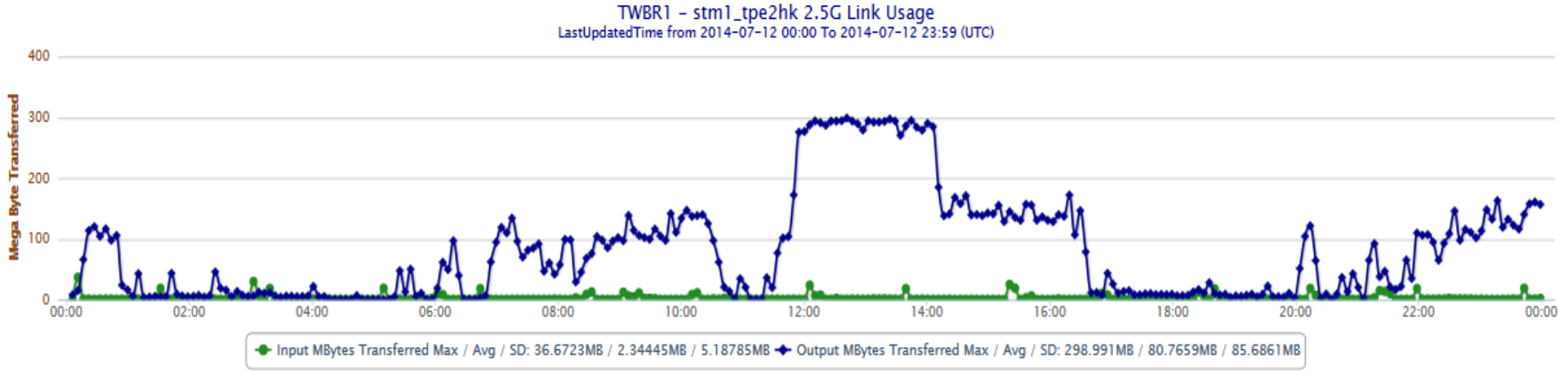


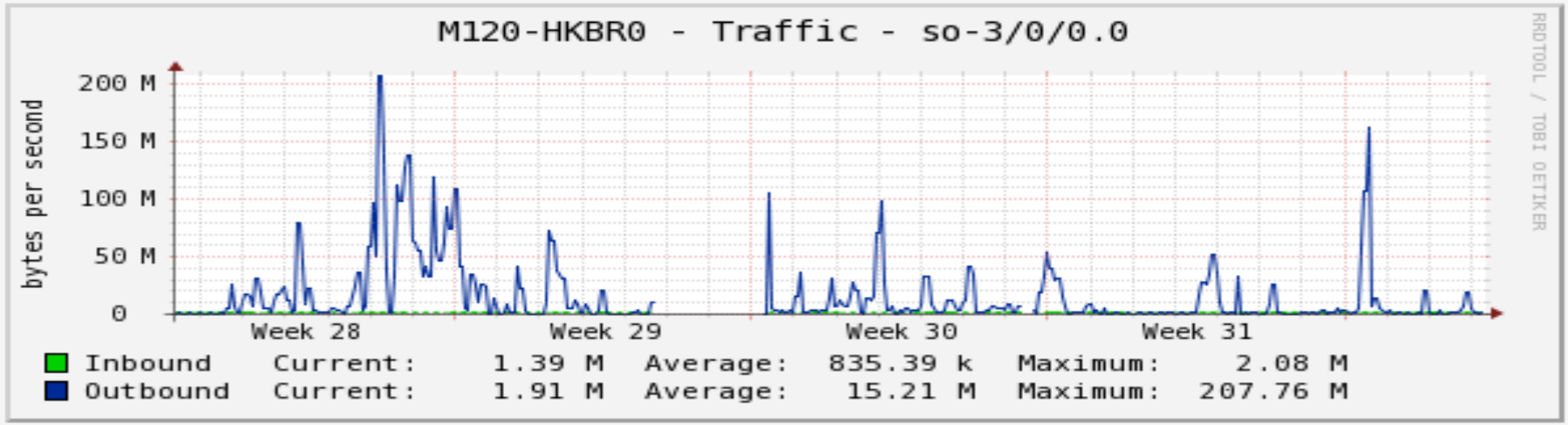
The 2x10G Links Running in Good Network Performance





ASGC-TEIN Network Usage
ASGC-Tokyo U.





Monthly (2 Hour Average)

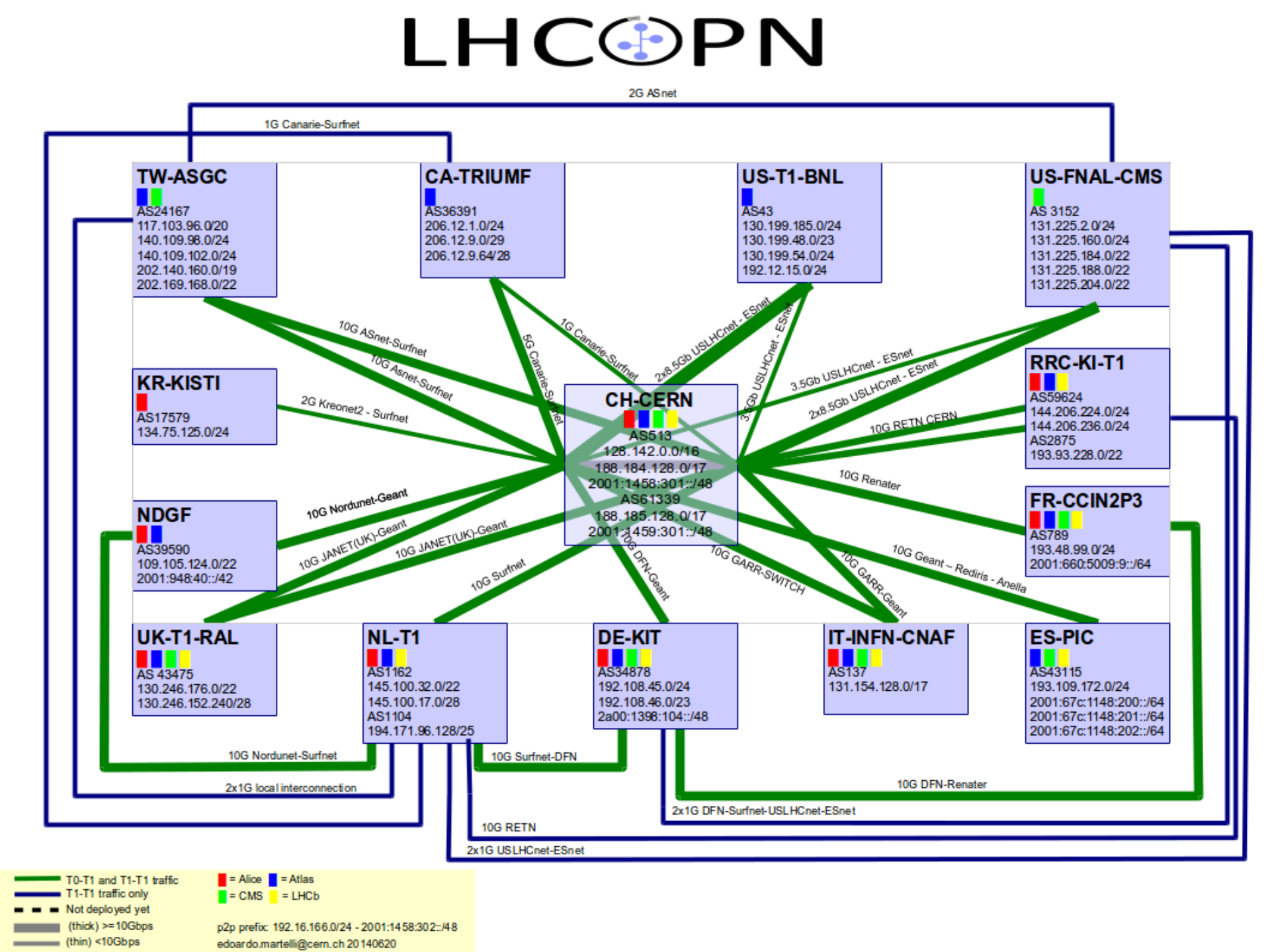
WLCG & e-Science in Asia

- Big Science: HEP
  - WLCG
    - Current: AU, CN, IN, JP, KR, MY, NZ, PK, TH, TW
    - Future: HK, SG, VN
  - APROC

- e-Science Communities
  - Life sciences, Medical, Earthquake, Tsunami, Climate changes, Cultural heritages, Agriculture, etc.

Network Challenges in Asia

- Routing Complexity
  - BGP peering can be realized among NRENs, if agreed bilaterally
- Network Performance
  - TCP Throughput <= TCPWinSize/RTT
  - Asian TierXs must tune server and client TCP kernel parameters to get better throughput
- LHCONE L3VPN could help resolving the application traffic


LHCOPN
2G ASnet
1G Canarie-Surfnet
TW-ASGC
AS24167
117.103.96.0/20
140.109.98.0/24
140.109.102.0/24
202.140.160.0/19
202.169.168.0/22
CA-TRIUMF
AS36391
206.12.1.0/24
206.12.9.0/29
206.12.9.64/28
US-T1-BNL
AS43
130.199.185.0/24
130.199.48.0/23
130.199.54.0/24
192.12.15.0/24
US-FNAL-CMS
AS 3152
131.225.2.0/24
131.225.160.0/24
131.225.184.0/22
131.225.188.0/22
131.225.204.0/22
KR-KISTI
AS17579
134.75.125.0/24
CH-CERN
AS513
128.142.0.0/16
188.184.128.0/17
2001:1458:301::/48
AS61339
188.185.128.0/17
2001:1459:301::/48
RRC-KI-T1
AS59624
144.206.224.0/24
144.206.236.0/24
AS2875
193.93.228.0/22
NDGF
AS39590
109.105.124.0/22
2001:948:40::/42
FR-CCIN2P3
AS789
193.48.99.0/24
2001:660:5009:9::/64
UK-T1-RAL
AS 43475
130.246.176.0/22
130.246.152.240/28
NL-T1
AS1162
145.100.32.0/22
145.100.17.0/28
AS1104
194.171.96.128/25
DE-KIT
AS34878
192.108.45.0/24
192.108.46.0/23
2a00:1398:104::/48
IT-INFN-CNAF
AS137
131.154.128.0/17
ES-PIC
AS43115
193.109.172.0/24
2001:67c:1148:200::/64
2001:67c:1148:201::/64
2001:67c:1148:202::/64
10G ASnet-Surfnet
10G Asnet-Surfnet
5G Canarie-Surfnet
1G Canarie-Surfnet
2x8.5Gb USLHCnet - ESnet
3.5Gb USLHCnet - ESnet
3.5Gb USLHCnet - ESnet
2x8.5Gb USLHCnet - ESnet
2G Kreonet2 - Surfnet
10G RETN CERN
10G Renater
10G Nordunet-Geant
10G JANET(UK)-Geant
10G JANET(UK)-Geant
10G Surfnet
10G DFN-Geant
10G GARR-SWITCH
10G GARR-Geant
10G Geant – Rediris - Anella
10G Nordunet-Surfnet
10G Surfnet-DFN
2x1G local interconnection
10G DFN-Renater
2x1G DFN-Surfnet-USLHCnet-ESnet
10G RETN
2x1G USLHCnet-ESnet
T0-T1 and T1-T1 traffic
T1-T1 traffic only
Not deployed yet
(thick) >=10Gbps
(thin) <10Gbps
= Alice
= Atlas
= CMS
= LHCb
p2p prefix: 192.16.166.0/24 - 2001:1458:302::/48
edoardo.martelli@cern.ch 20140620

LHCONE: A global infrastructure for the LHC Tier1 Data Center – Tier 2 Analysis Center Connectivity

Bill Johnston, ESNet

SimFraU
UVic
UAlb
UTor
TRIUMF-T1
McGill
CANARIE
Canada

NIKHEF-T1
SARA
Netherlands

NDGF-T1a
NDGF-T1a
NDGF-T1c
NORDUnet
Nordic

Korea

CERN-T1
CERN
KISTI
Korea
Genev
a
TIFR
India

Geneva

Chicago

Amsterdam

US LHCNet

KNU
KREONET2
Korea

SLAC
ESnet
USA
FNAL-T1
BNL-T1

Seattle

New York

DESY
DE-KIT-T1
GSI
DFN
Germany

India

GÉANT
Europe

ASGC-T1
ASGC
Taiwan

UCSD
Caltech
NE
UFlorida
SoW
UWisc
MidW
UNeb
PurU
GLakes
MIT
Internet2
USA
Harvard

Washington

CC-IN2P3-T1
GRIF-IN2P3
Sub-IN2P3
CEA
RENATER
France

NCU
NTU
TWAREN
Taiwan

PIC-T1
RedIRIS
Spain

INFN-Nap
CNAF-T1
GARR
Italy

UNAM
CUDI
Mexico

NTU
Chicago

LHCONE VPN domain
End sites – LHC Tier 2 or 3 unless indicated as Tier 1
Regional R&E communication nexus
Data communication links, 10, 20, and 30 Gb/s
See http://lhcone.net for details.

LHCONE networking in Asia

- ASGC could provide the 20Gb global backbone (TW-US-EU) for Asian HEP communities
  - ASGC has an open policy to support the networking for all LHC experiments (ATLAS, CMS, Alice, LHCb) in Asia
  - ASGC has good connectivity with APAN (inc. KR, JP, CN, etc.) and TEIN
  - L3VPN Asia hub on HK

LHCONE VRF on ASGC

- LHCONE VRF between GEANT and ASGC at AMS
- Plan to connect the CERN LHCONE VRF at AMS
- Plan to implement the LHCONE VRF connecting the Internet2 and Esnet at CHI
- Plan to implement the LHCONE VRF connecting Asia Tier-Xs at HK

LHCONE Asia Workshops

- Kick-off Workshop: Co-locating with the APAN 38th Meeting (11~15 August 2014, Nantou, Taiwan)
  - Advantage: All Asia Pacific NRENs will be here

- Regular LHCONE Asia Workshop: Co-locating with the annual ISGC (International Symposium on Grids & Clouds) in March
  - Advantage:

    (1) Easier for Asian NRENs to get together

    (2) User community & Network provider

Question/Comment?