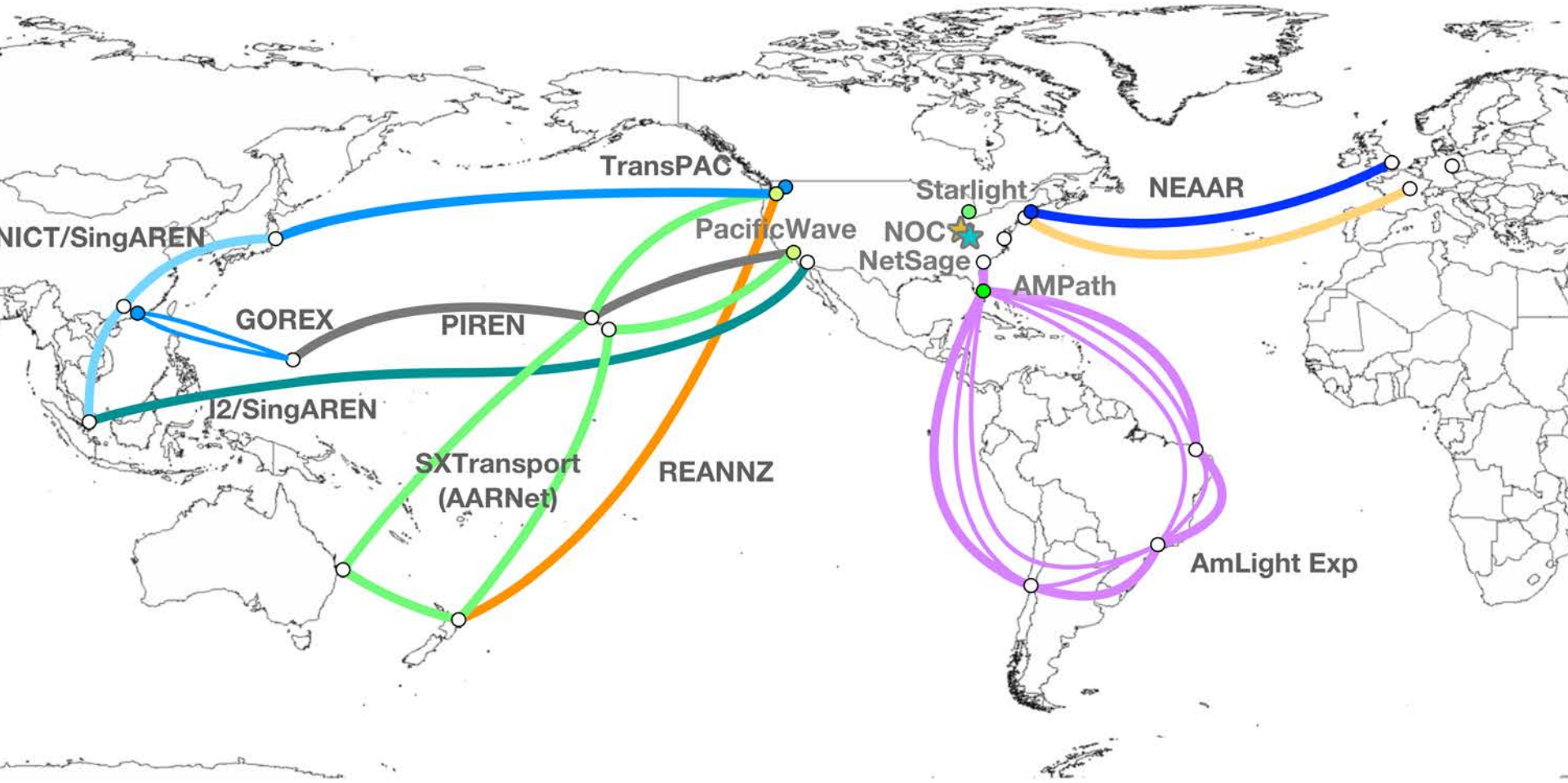
NEAAR/TransPAC Update

Andrew Lee

GLIF Americas meeting

Sept 19, 2018

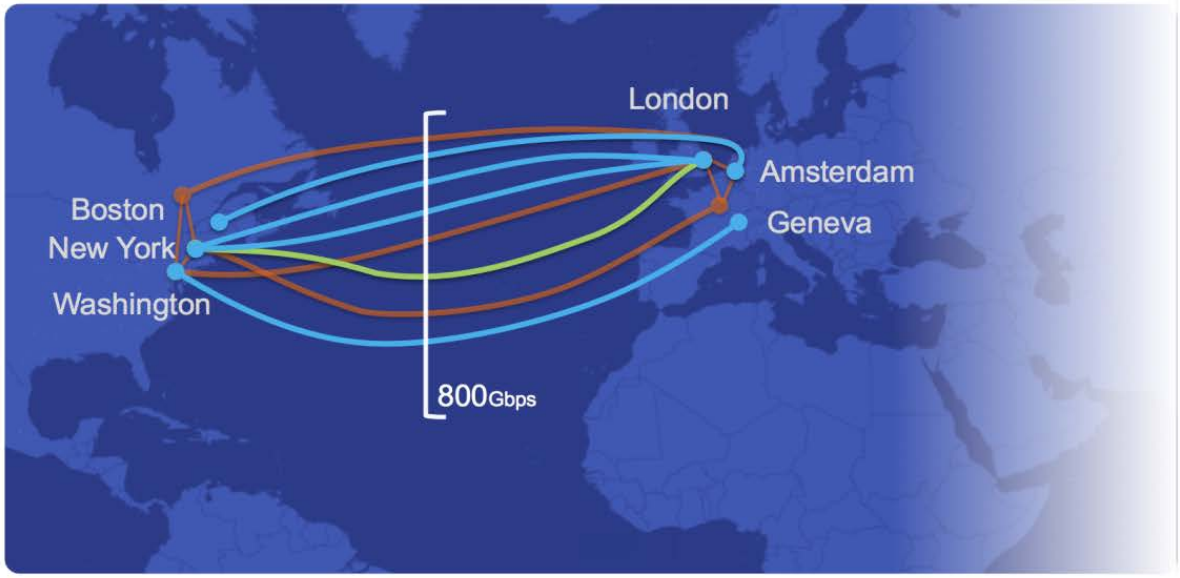
Helsignør, DK


TransPAC
Starlight
NEAAR
NICT/SingAREN
PacificWave
NOC
NetSage
AMPath
GOREX
PIREN
I2/SingAREN
SXTransport
(AARNet)
REANNZ
AmLight Exp

The NEAAR Collaboration

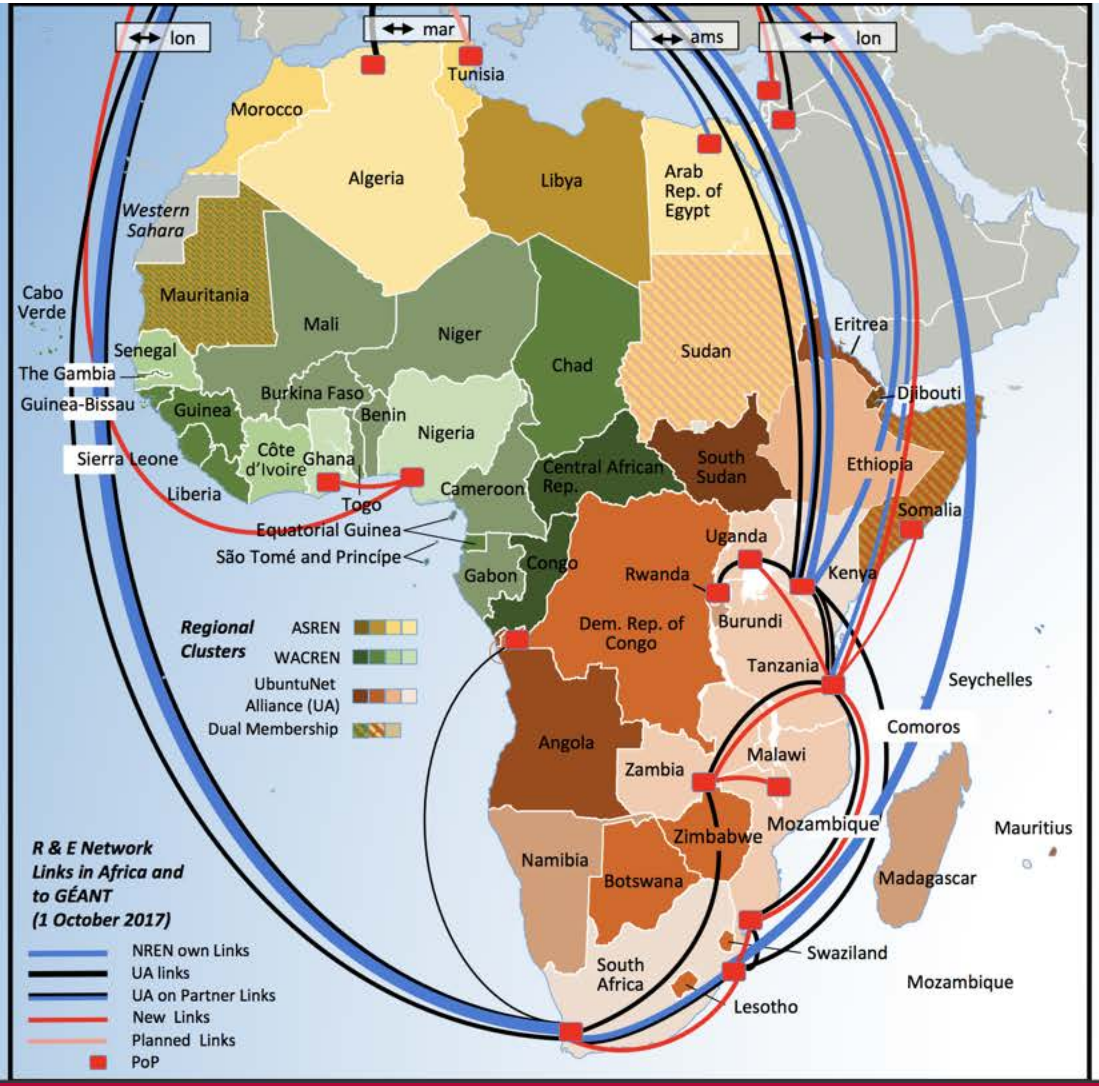
- Funding from US National Science Foundation
  - $3.25M over 4 years
- Partners:
  - Indiana University
  - GEANT
  - UbuntuNet Alliance
  - WACREN
  - ASREN
  - SANREN/TENET

Collaboration with ESnet & NEAAR



NORDUnet
Internet2
ESnet
canarie
GÉANT
SURFnet

Oct. 2017



INDIANA UNIVERSITY

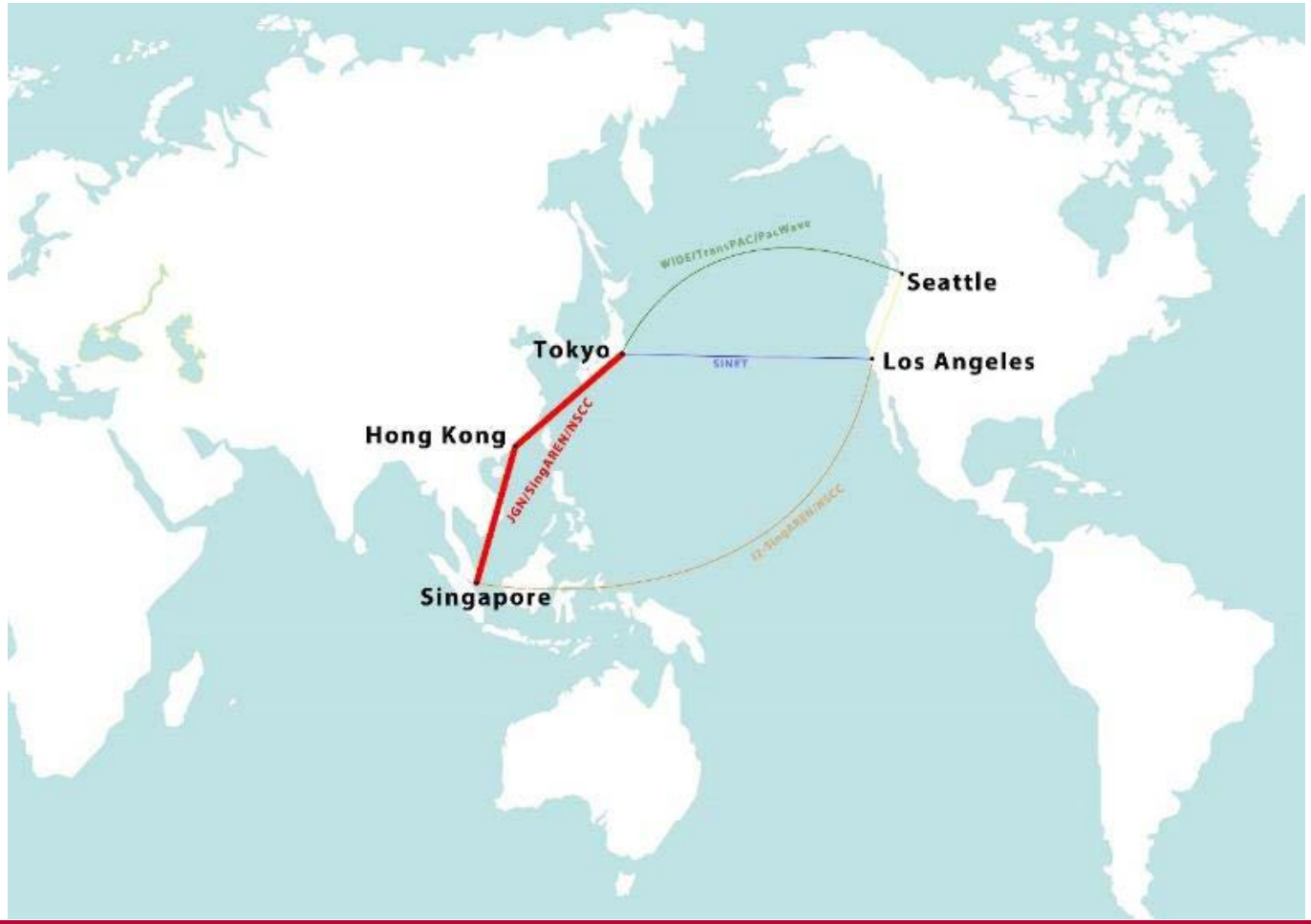
INTERNATIONAL NETWORKS
At Indiana University

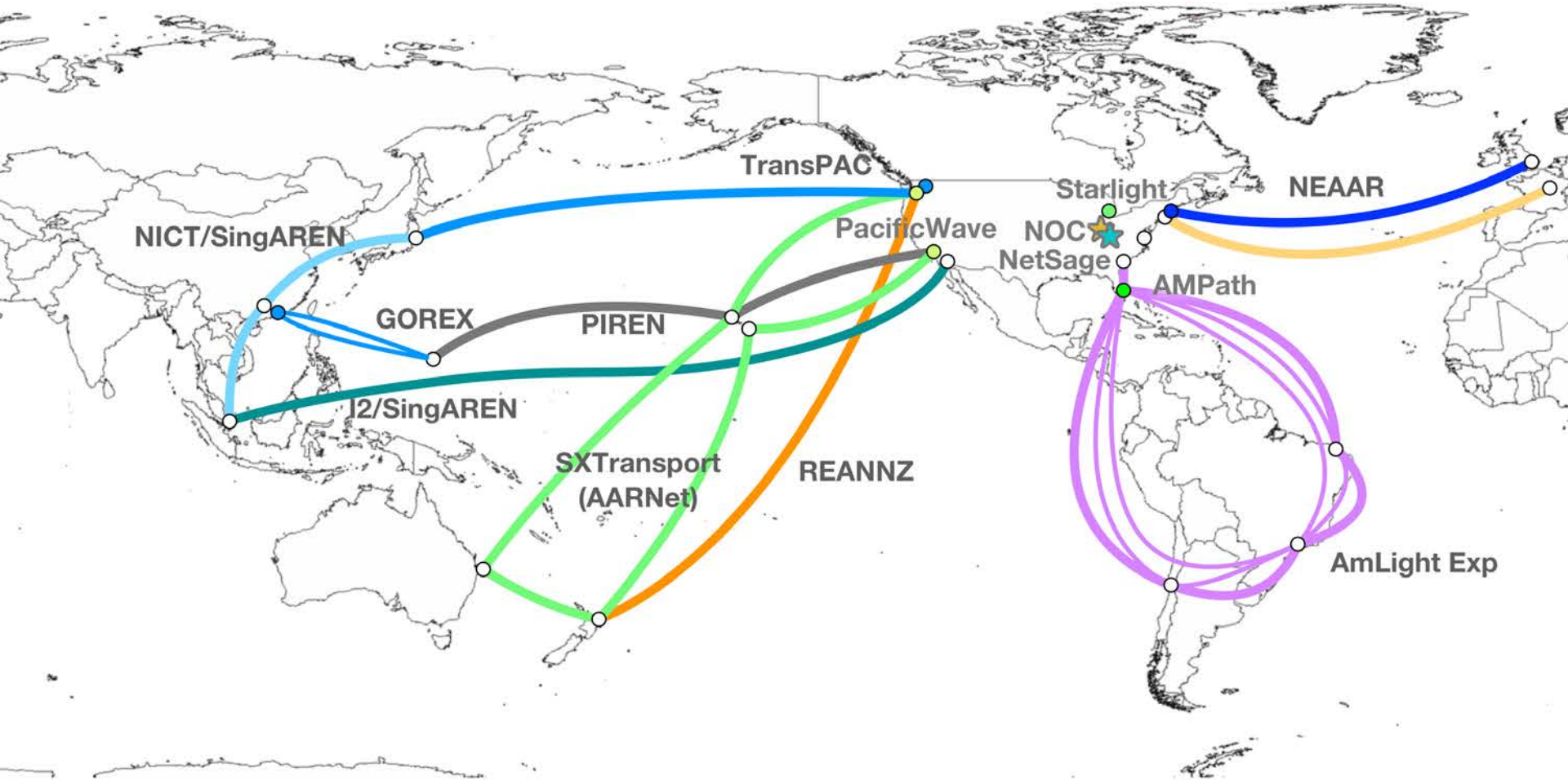
TransPAC

AMERICA CONNECTS TO ASIA

- **TransPAC project was started in 1998**
- **Provide connectivity between the US and the Asia Pacific region for educational and scientific research usage**
- **Cooperative partnership among Indiana University, APAN, TEIN/Asi@Connect, JGN/NICT-Japan, NII-Japan, CERNET, and others**

Asia Pacific Ring (APR)

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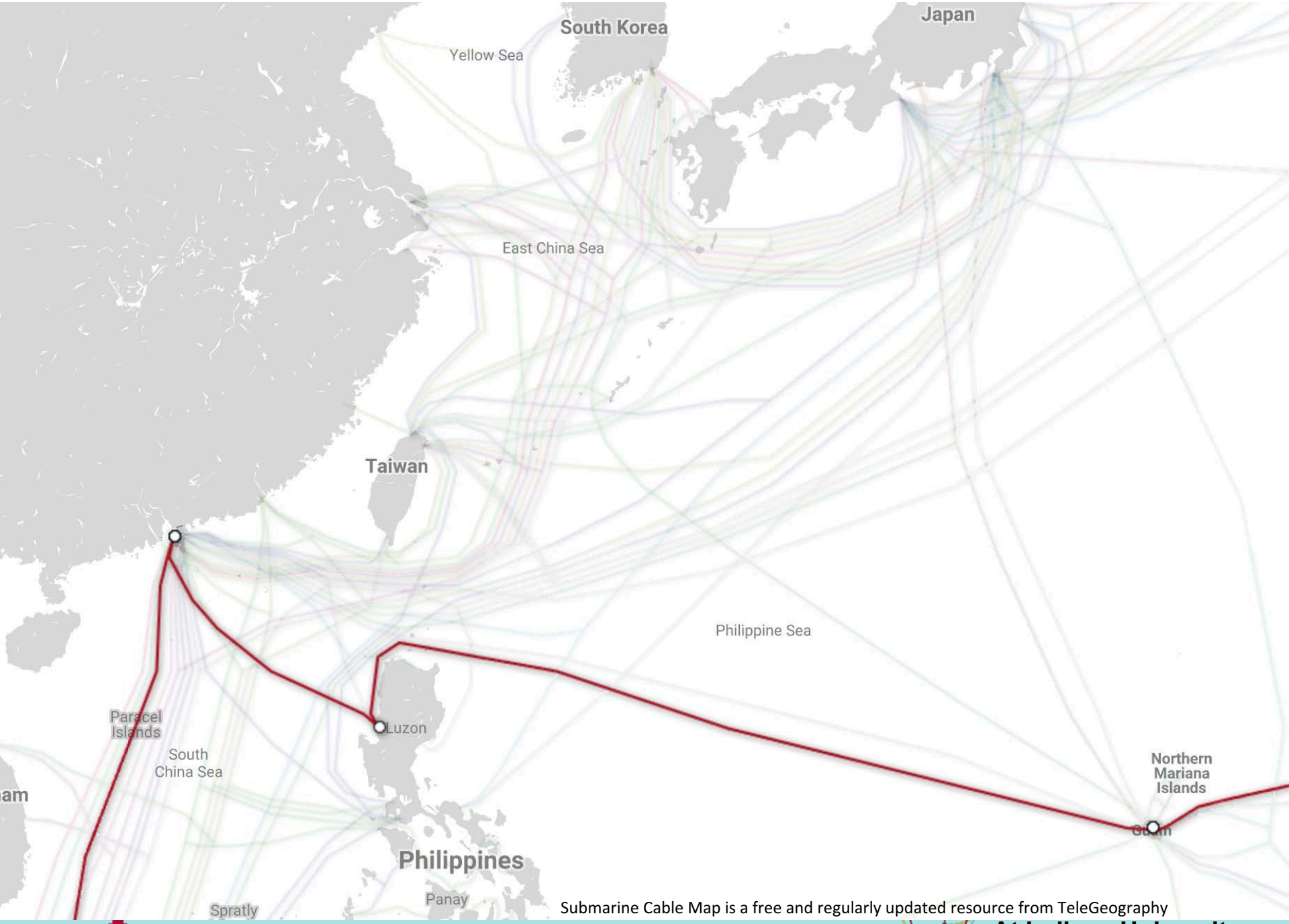
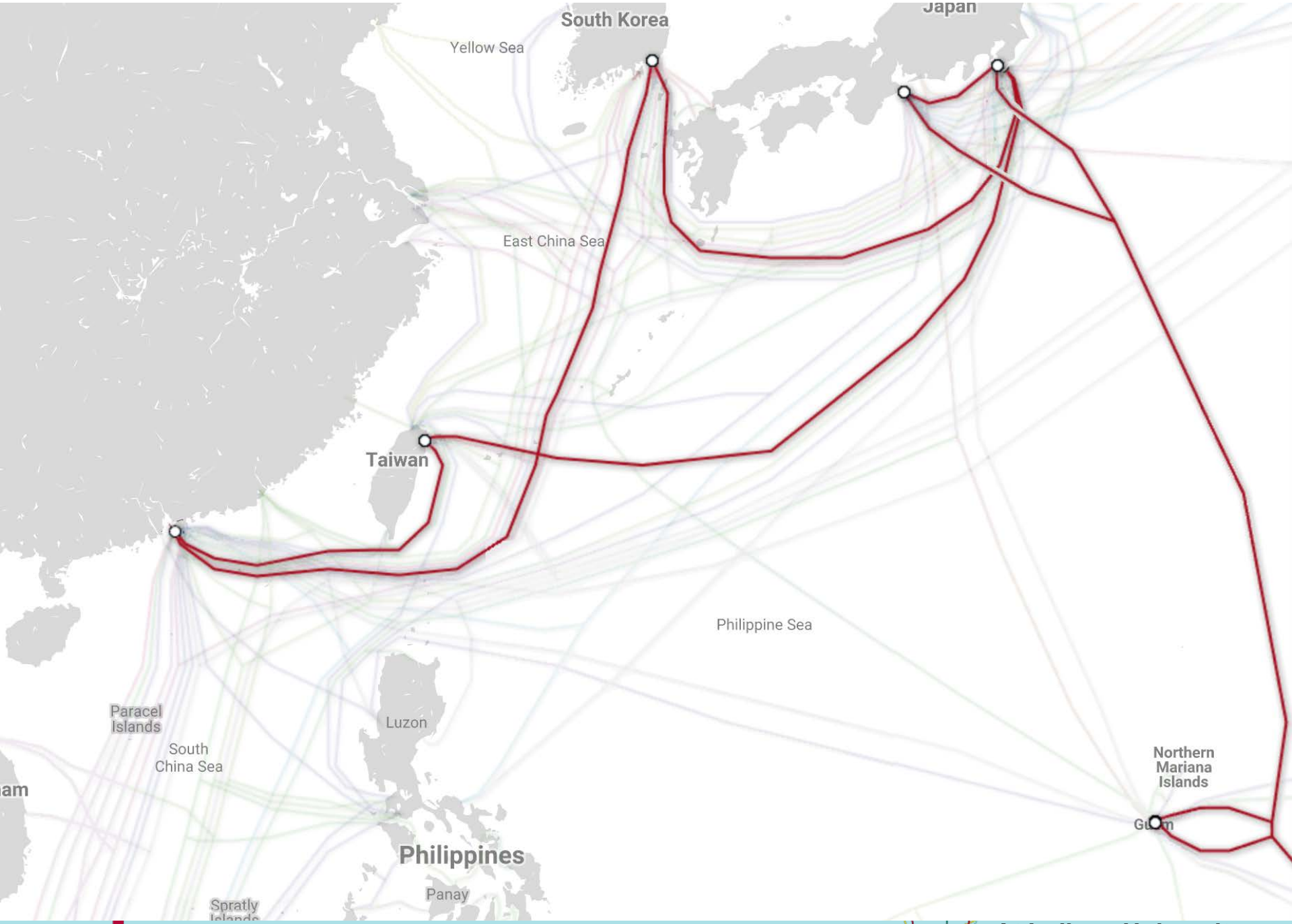
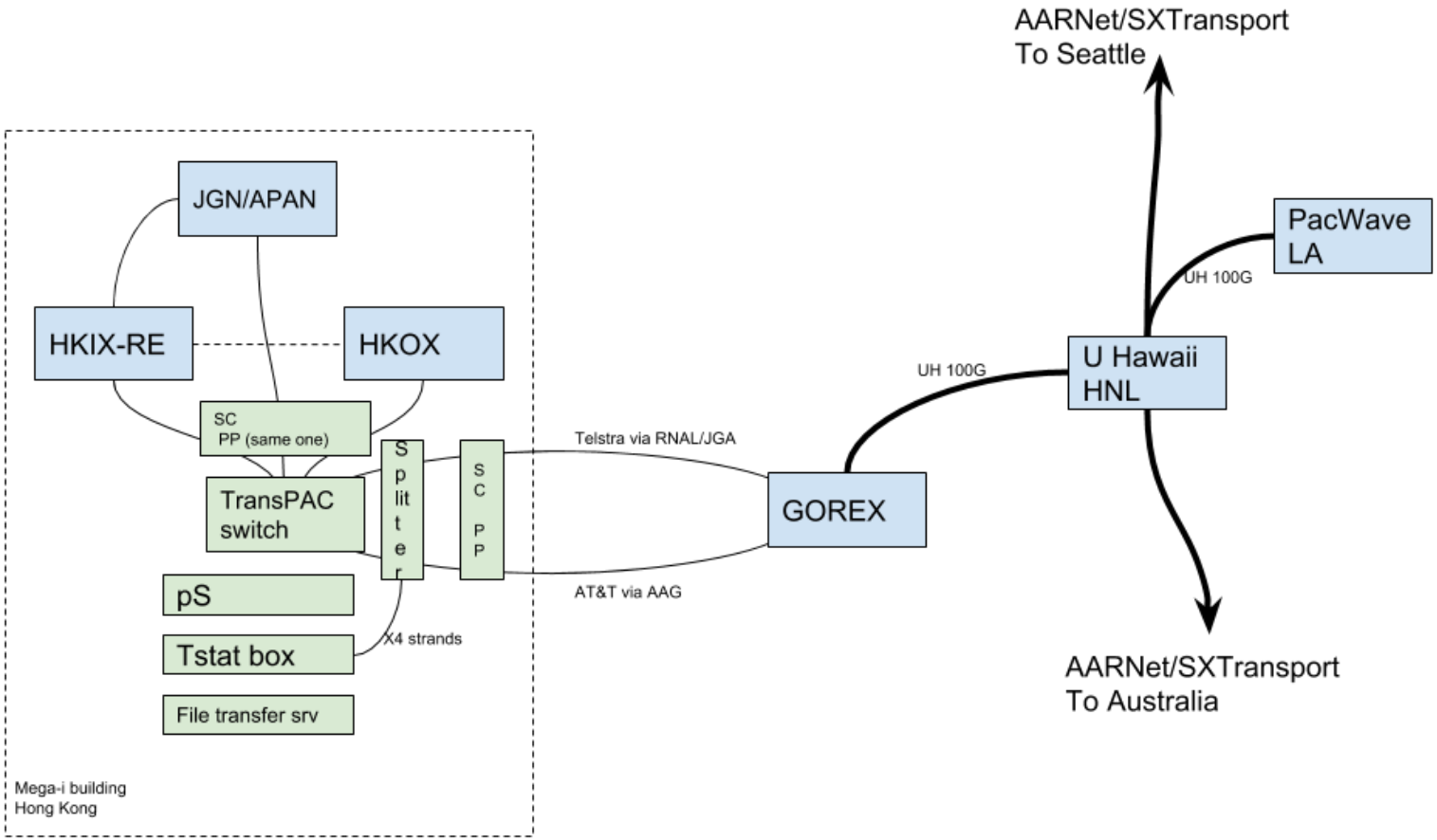
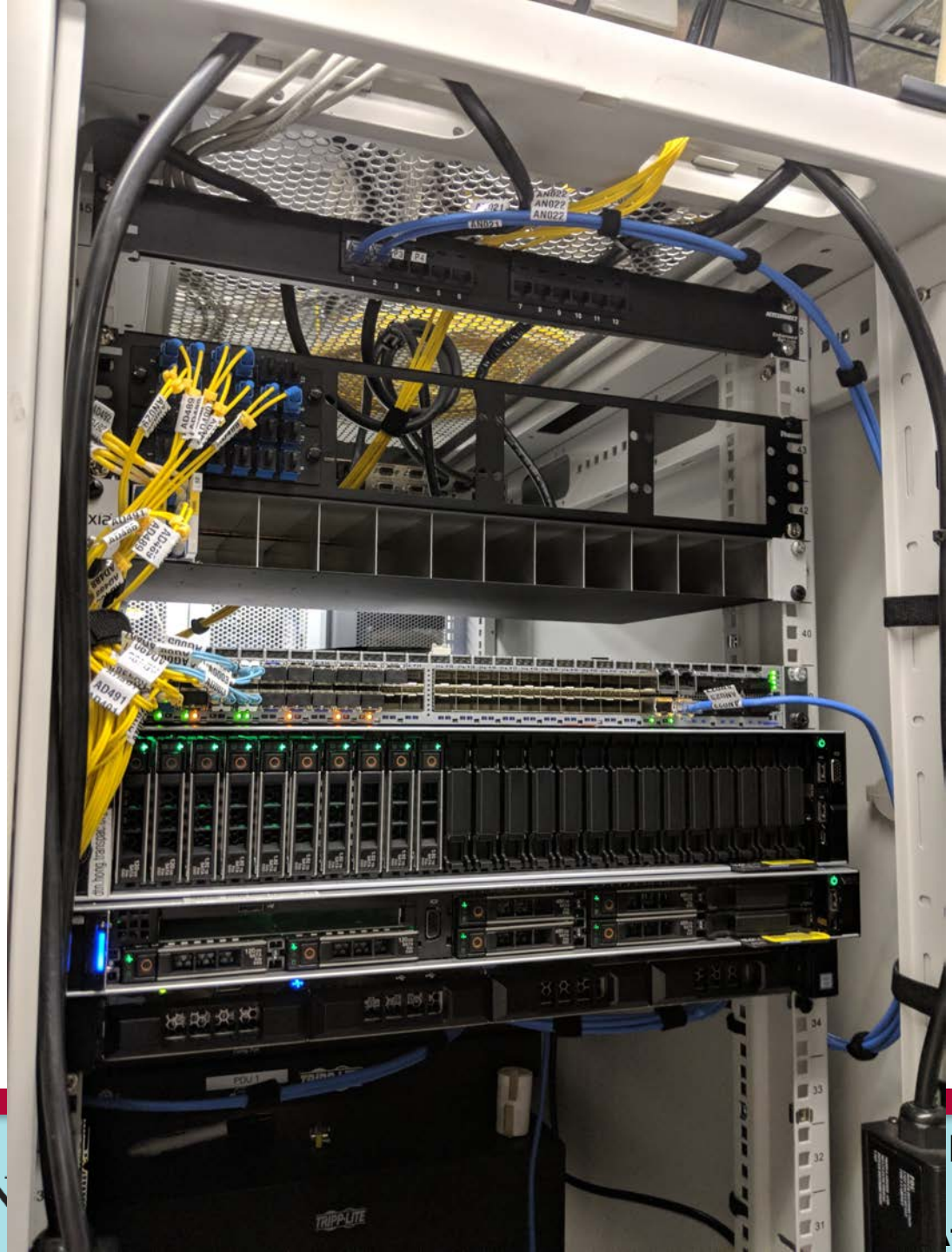


Submarine Cable Map is a free and regularly updated resource from TeleGeography


South Korea
Yellow Sea
East China Sea
Taiwan
Philippine Sea
Paracel Islands
South China Sea
Luzon
Philippines
Panay
Northern Mariana Islands


AARNet/SXTransport
To Seattle
PacWave
LA
UH 100G
JGN/APAN
HKIX-RE
HKOX
SC
PP (same one)
TransPAC
switch
Splitter
SC
PP
Telstra via RNAL/JGA
AT&T via AAG
GOREX
UH 100G
U Hawaii
HNL
pS
Tstat box
X4 strands
File transfer srv
Mega-i building
Hong Kong
AARNet/SXTransport
To Australia



Research & Engagement

- Research work on DDOS detection/mitigation
- Policy work to examine routing behavior across the networks
- Role of file transfer infrastructure on the international backbone
- Reach out to users/researchers/communities that are using or wanting to use the network
- Automated network configuration and user self service
- Training

Training

- **Domestic Workshops utilizing IN@IU-funded equipment and/or personnel**
- ***In Planning*** - SoX FIONA and perfSONAR Workshop - Sep. 2018 (1-day pS) - Atlanta, GA
- OIN sponsored by LSU and LONI - Dec. 2017 (2-day) - New Orleans, LA
- OIN sponsored by NYSERNet - Sep. 2017 (2-day) - New York, NY
- OIN sponsored by University of Hawaii - Aug. 2017 (2-day) - Honolulu, HI
- Virtual OIN - Jun. 2017 (2-day) - Online
- OIN sponsored by University of Utah - Jun. 2017 (2-day) - Salt Lake City, UT
- OIN sponsored by NYSERNet - Mar. 2017 (2-day) - Syracuse, NY
- OIN sponsored by University of Miami - Jan. 2017 - Miami, FL
- OIN sponsored by Vanderbilt University and SOX - Dec. 2016 (2-day) - Nashville, TN
- OIN sponsored by iLight - Jul. 2016 (2-day) - Bloomington, IN
- OIN sponsored by Washington University - Oct. 2015 - St. Louis, MO
- UCSC perfSONAR Deep Dive - Jun. 2015 (3-day) - Santa Cruz, CA
- **NEAAR Workshops utilizing IN@IU-funded equipment and/or personnel**
- ZAMREN perfSONAR Workshop - Sep. 2018 (4-day) - Lusaka, Zambia
- AfriNIC / AIS 18 Conference - Internet Measurements and Research in Africa Workshop - May 2018 (1-day) - Dakar, Senegal
- WACREN Conference - Oct. 2017 (4-day) - Accra, Ghana
- SANREN OIN Workshop - May 2017 (two 1-day) - Cape Town / Pretoria, South Africa
- KENET Training with NSRC - Sep. 2015 (4-day) - Nairobi, Kenya
- **TransPAC Workshops utilizing IN@IU-funded equipment and/or personnel**
- ***In Planning*** - Asi@Connect Workshop - July 2019 (2-day) - New Dehli, India
- ***In Planning*** - Asi@Connect Workshop - Mar. 2019 (2-day) - Loas
- APAN 46 perfSONAR Workshop - Aug. 2018 (1 day) - Aukland, New Zealand
- APAN 44 perfSONAR Workshop - Aug. 2017 (1 day) - Dalian, China
- International OIN sponsored by PREGINET - Mar. 2017 (2-day) - Manilla, Philippines
- APAN 43 perfSONAR Workshop - Feb. 2017 (1 day) - New Dehli, India
- APAN 42 OIN Workshop - Aug. 2016 (2-day) - Hong Kong
- APAN 41 perfSONAR Workshop - Jan. 2016 (half-day) - Manilla, Philippines
- APAN 40 perfSONAR Workshop - Jan. 2015 (1-day) - Kuala Lampur, Malaysia
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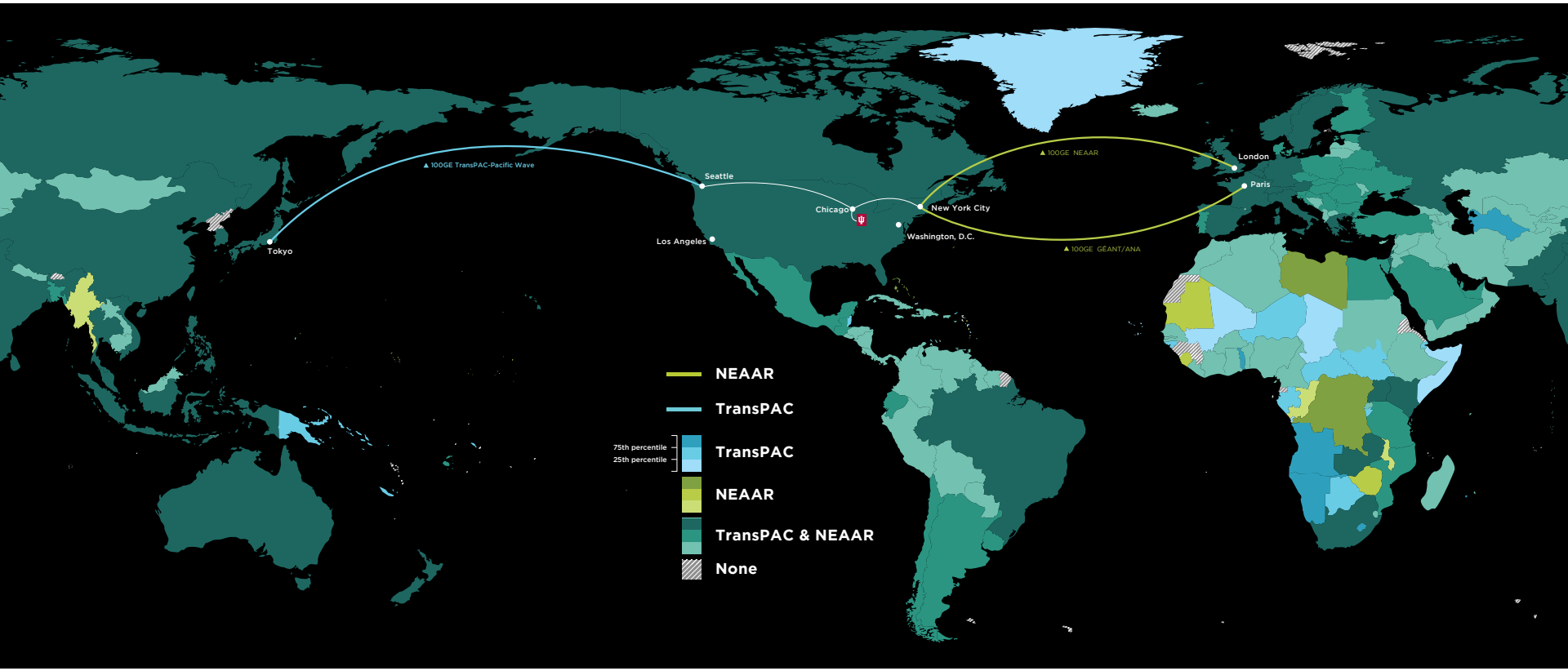
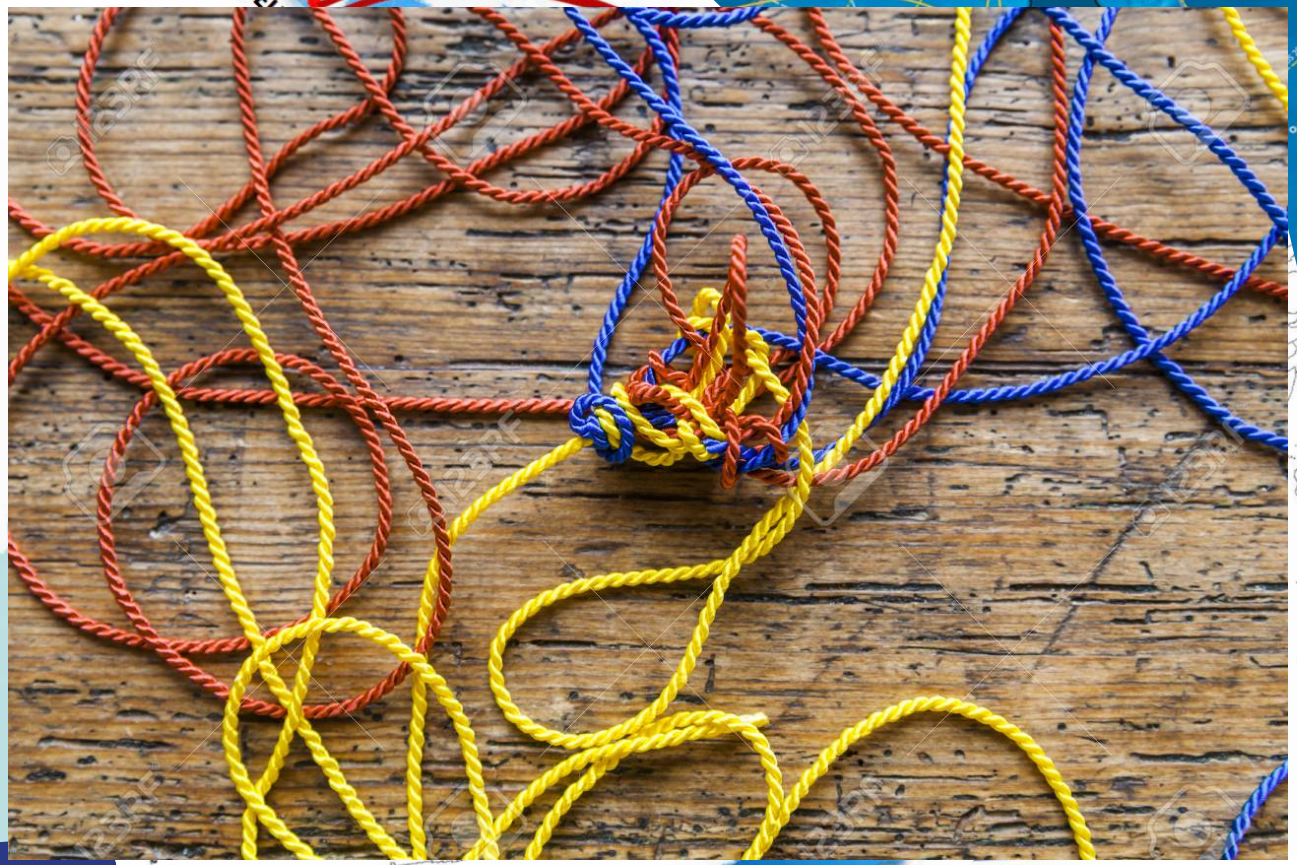
Training

- https://internationalnetworks.iu.edu/projects/engagement/workshops.html
- **In planning/upcoming**
- SoX FIONA and perfSONAR Workshop - Sep. 2018 (1-day pS) - Atlanta, GA
- ASREN perfSONAR Workshop - April. 2019 (4-day) - Morocco
- TERNET perfSONAR Workshop - Feb. 2019 (4-day) – Tanzania
- Southeast Asia Regional perfSONAR Workshop – March 2019
- South Asia Regional perfSONAR Workshop – June 2019


100GE TransPAC-Pacific Wave
Seattle
Chicago
New York City
Washington, D.C.
Los Angeles
Tokyo
100GE NEAAR
London
Paris
100GE GÉANT/ANA
NEAAR
TransPAC
75th percentile
25th percentile
TransPAC
NEAAR
TransPAC & NEAAR
None

Maps



Detecting and dealing with Routing Anomolies

- Proper analysis of flow and tstat data allows us to mine for conditions that might not be obvious
- Even cursory examinations of the data allow us to find odd conditions
- In NEAAR Y3Q1 sFlow data, I can see there was:
  - 1.2TB of data transmitted towards Europe with a IP source in Africa
  - 15TB of data incoming into the US has an IPdestination in Europe

Why?

- Flaw in the analysis
  - Error in data collection
  - Error in correlation of flow -> AS/Country
- Transient routing issue
  - Link goes down to force traffic on to a (by definition) suboptimal path
- Sometimes what appears to be suboptimal is intended
- Routing policy issue
- Perhaps something else I haven't thought of

So?

- As we build out and more greatly interconnect these networks we need to pay more attention to routing issues
- Backup agreements
- Historical routing policies that no longer make sense
- Find opportunities (often times without costs) to improve routing fabric by peering
- Be cognizant of unintended consequences when setting up intercontinental peerings

Some more data and examples

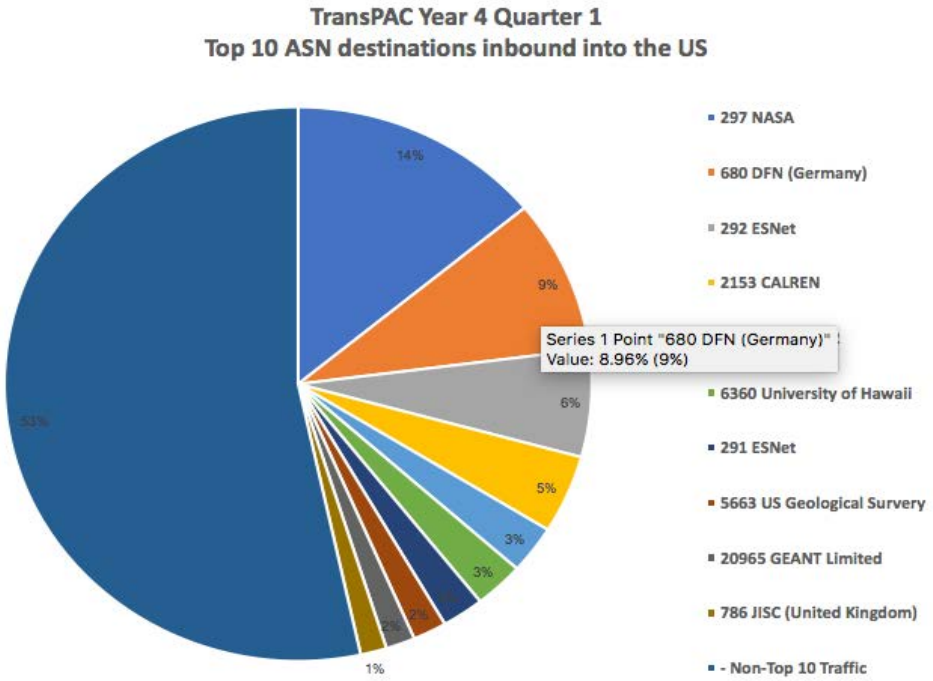
- Of 249 Countries (ISO 3166-1)
  - NEAAR: 166 (17)
  - TransPAC: 181 (32)
  - Both: 198
- Just looking at the map, some things seemed odd
  - African and European countries showing up on the TransPAC circuit
  - Traffic for countries that don't have an established NREN

DNS Strangeness

- DNS Traffic between South Africa and WIDE-Japan M-Root Servers?
  - DNS misconfiguration? There are closer servers.
  - Purposefully done?
  - Anycast issue?
    - Routing misconfiguration?
    - Global best practices may be needed to keep Anycast in Region
  - Africa-GEANT-ANA/NEAAR-Internet2-TransPAC-Japan?
    - Why not over the TEIN or other links between EU and Asia.

Routing thru US for traffic destined to Asia?

- European hosts consistently show up in Top 10 reports.
  - Are there possible routing changes that could be employed? 15 vs 25 or more hops in some instances.
  - Steer traffic to TEIN?
  - Political / Financial choice?
- Some Asian NRENs specifically AS pad their announcements to European NRENs to steer traffic to US.



nren.slack.com

- There exists already an R&E focused slack channel
- Send me a note – leea@iu.edu – and I can invite

Thanks

- **Group Website:**

  http://www.in.iu.edu/

- **Facebook:**

  https://www.fb.com/InternationalNetworksatIU/

- **Andrew Lee – leea@iu.edu**

- **Questions/Comments?**

Acknowledgements

- IN@IU is funded by
  - NSF awards #0962968, #0962973, #1450904, #1540933, #1638863
- The TransPAC PacificWave 100gb/s network fabric is provided by Pacific Northwest GigaPop

- More information: leea@iu.edu
- www.in.iu.edu