Invitation for the APIE Program

Become the Next Internet Engineer from Vietnam

May 15, 2025

Noriatsu Kudo, Ph.D
Keio University / WIDE Project / SOI Asia

APIE

About me

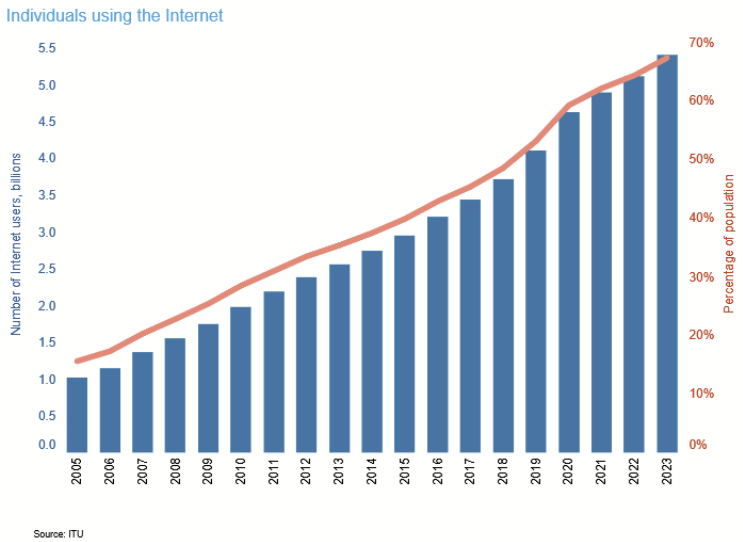
Noriatsu Kudo(People call me **kudo)**

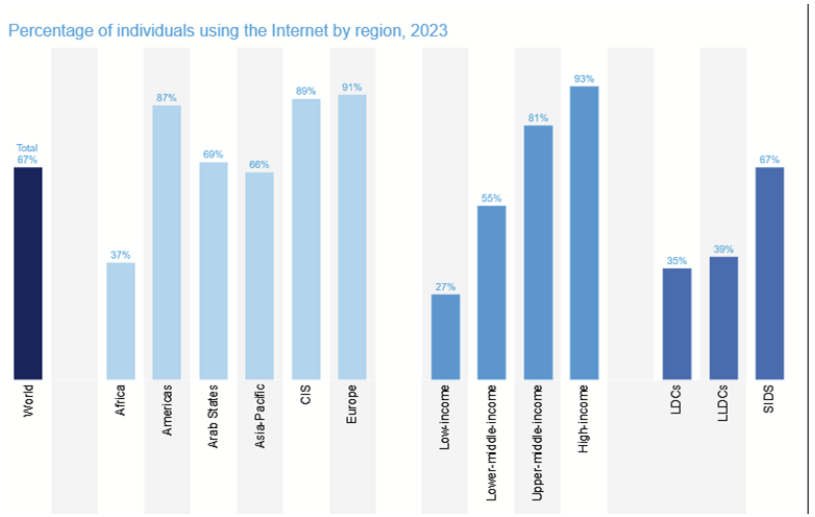
- Education
  - Ph.D from Graduate school of Media and Governance, Keio University, 2014(Japan)
- Work
  - 2014-2017 Mozilla Japan
  - 2014-2023 Project researcher @Keio Univ.
  - 2024- Project Assistant Professor@Keio Univ.
- Community activities
  - WIDE Project: Board member
  - SOI Asia: APIE project lead
  - ISOC-JP
  - Mozilla

Why my talk matters to you?

Networking still a frontier for you to jump in!

- Internet penetration rate is <u>still **70%**</u> today
  - 30% of population is coming to the Internet
  - More engineers are needed
- Digital economy is rapidly growing in Vietnam(over 20%/year)
- My journey: From student-> Global community contributor





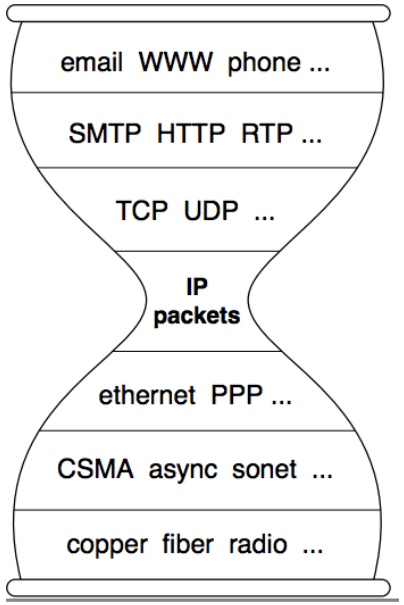
Asia Pacific Internet Engineering Program

- **Community based** education program
- University students and **young people** in the Asia Pacific
- Skills needed to meet the global demand for Internet engineers in industry and academia, including **RENs**.

4 Advisory members & 9 Curriculum Committee members from ..

What is the Internet?

- It is a Network of Networks
  - A platform which covers entire earth, and deliver digital data (IP packets)
  - Autonomous, Decentralized and cooperation
    - Variety of technologies are used
    - No one operates/controls the entire Internet
    - Difficult to destroy the whole system
    - Anyone(network) can join/leave the network anytime

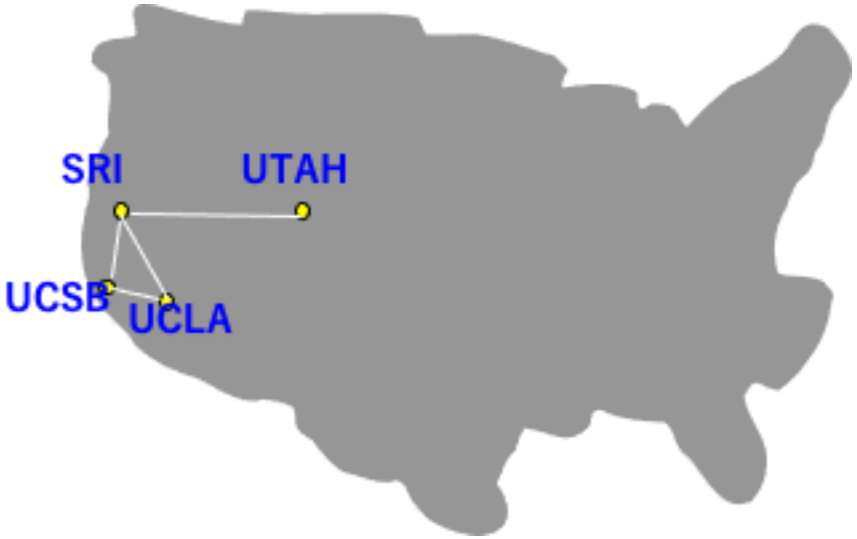


- History
  - Started in 1960 from **researchers** in the US
  - Academic only network until 1980's
  - Commercialization started in 1990's
  - Became the infrastructure for digital society now

History of the Internet Dec. 1969

4 nodes connected with 56Kbps

UCSB:University of California, Santa Barbara
UTAH:University of Utah



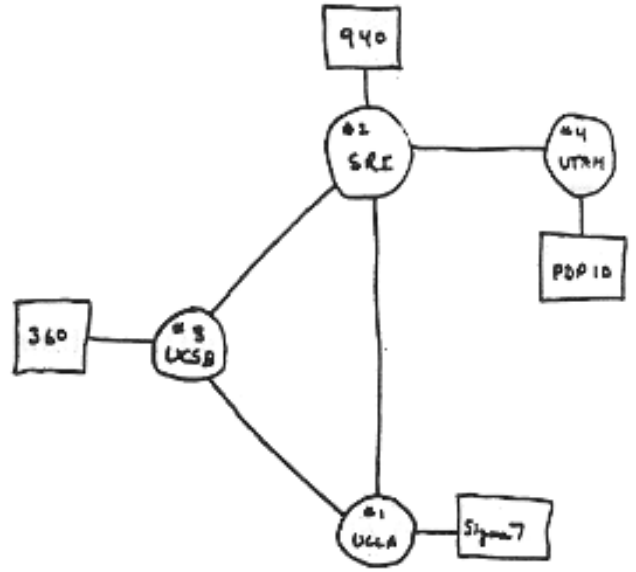
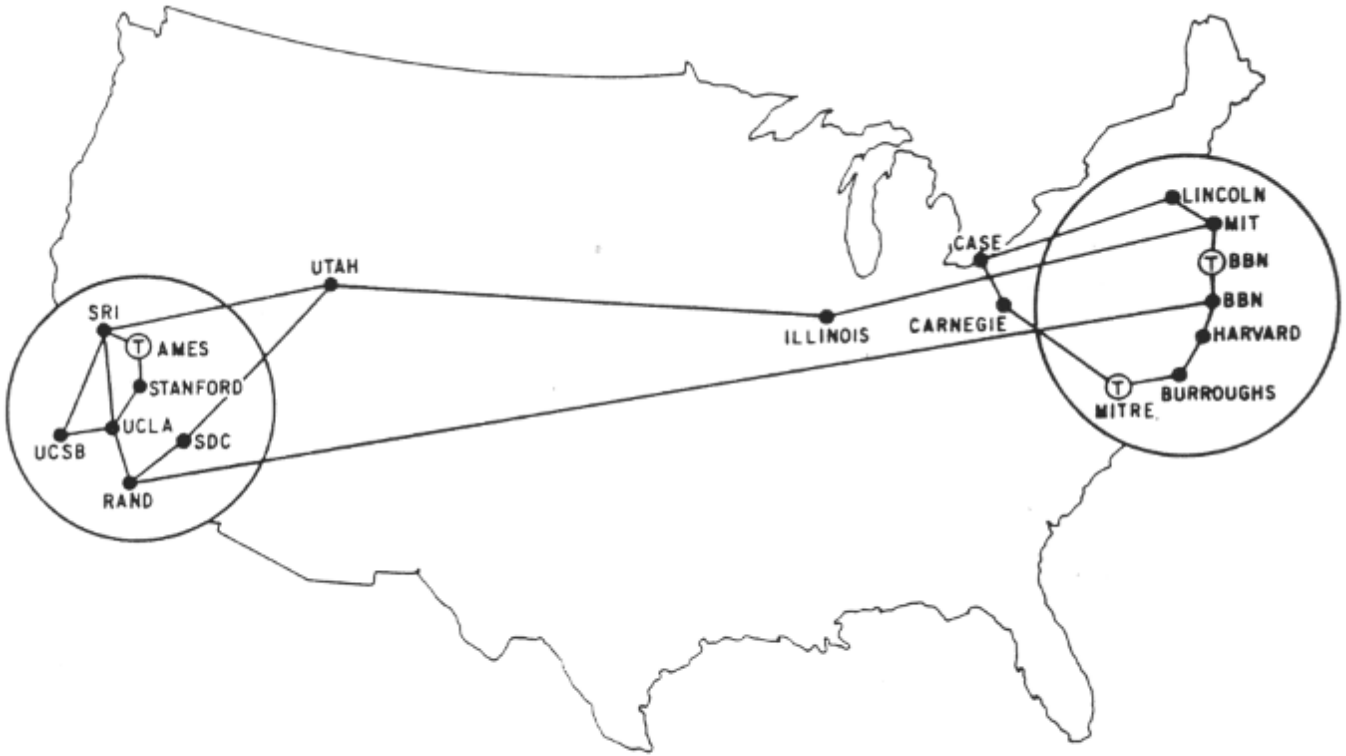


FIGURE 6.2 Drawing of 4 Node Network (Courtesy of Alex McKenzie)

Sep. 1971

Adding a site/month speed



MAP 4 September 1971

1974

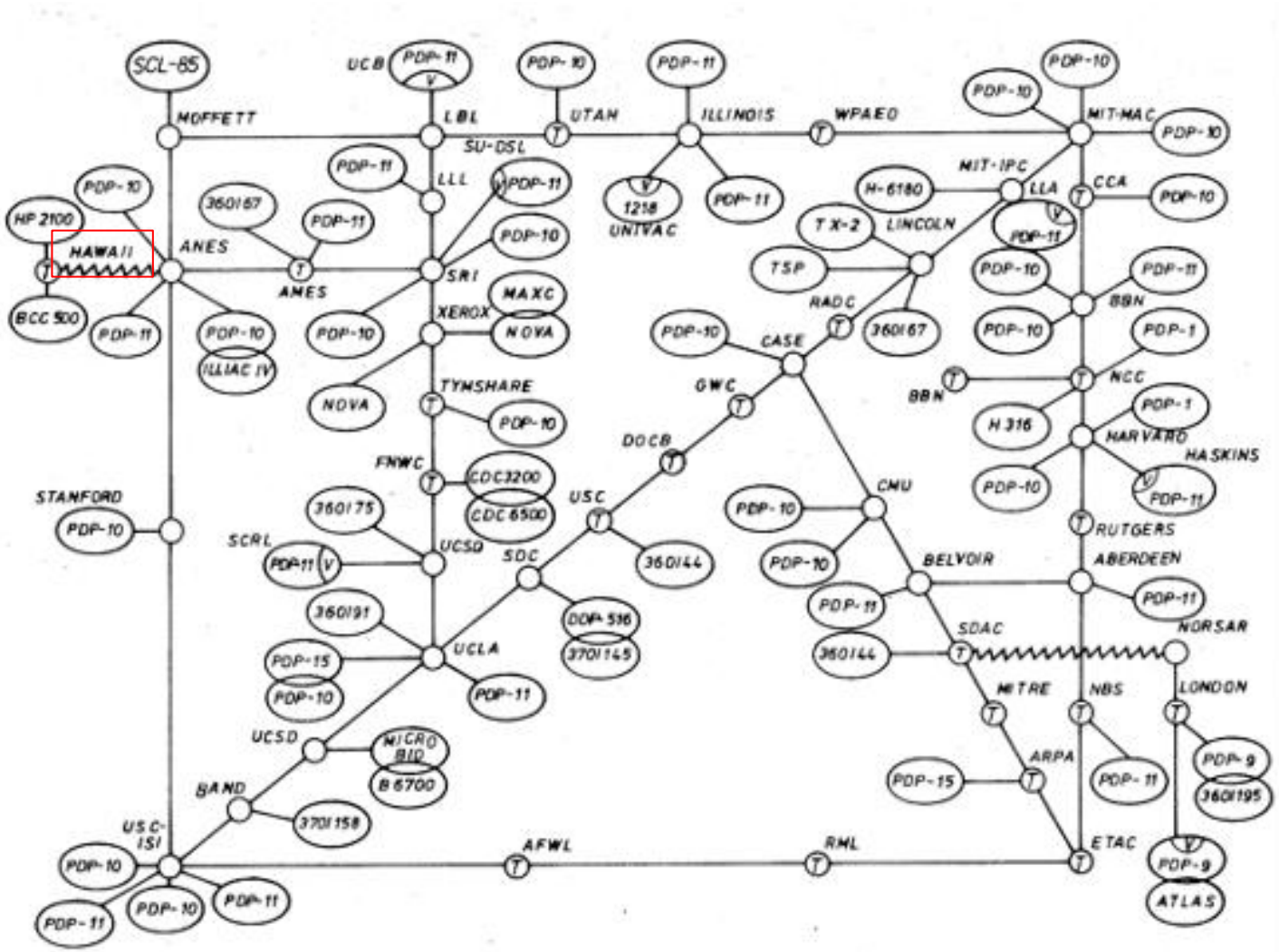
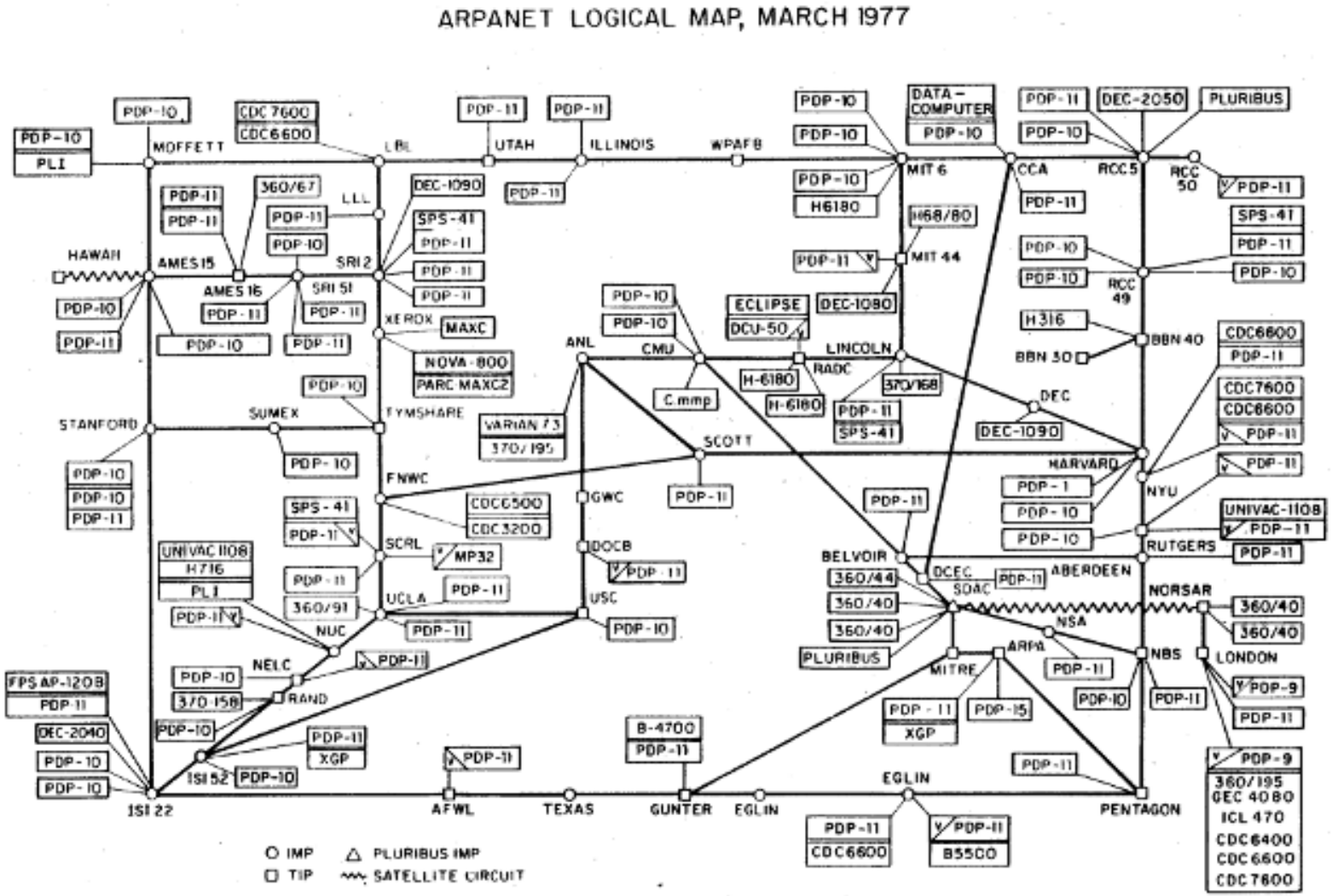
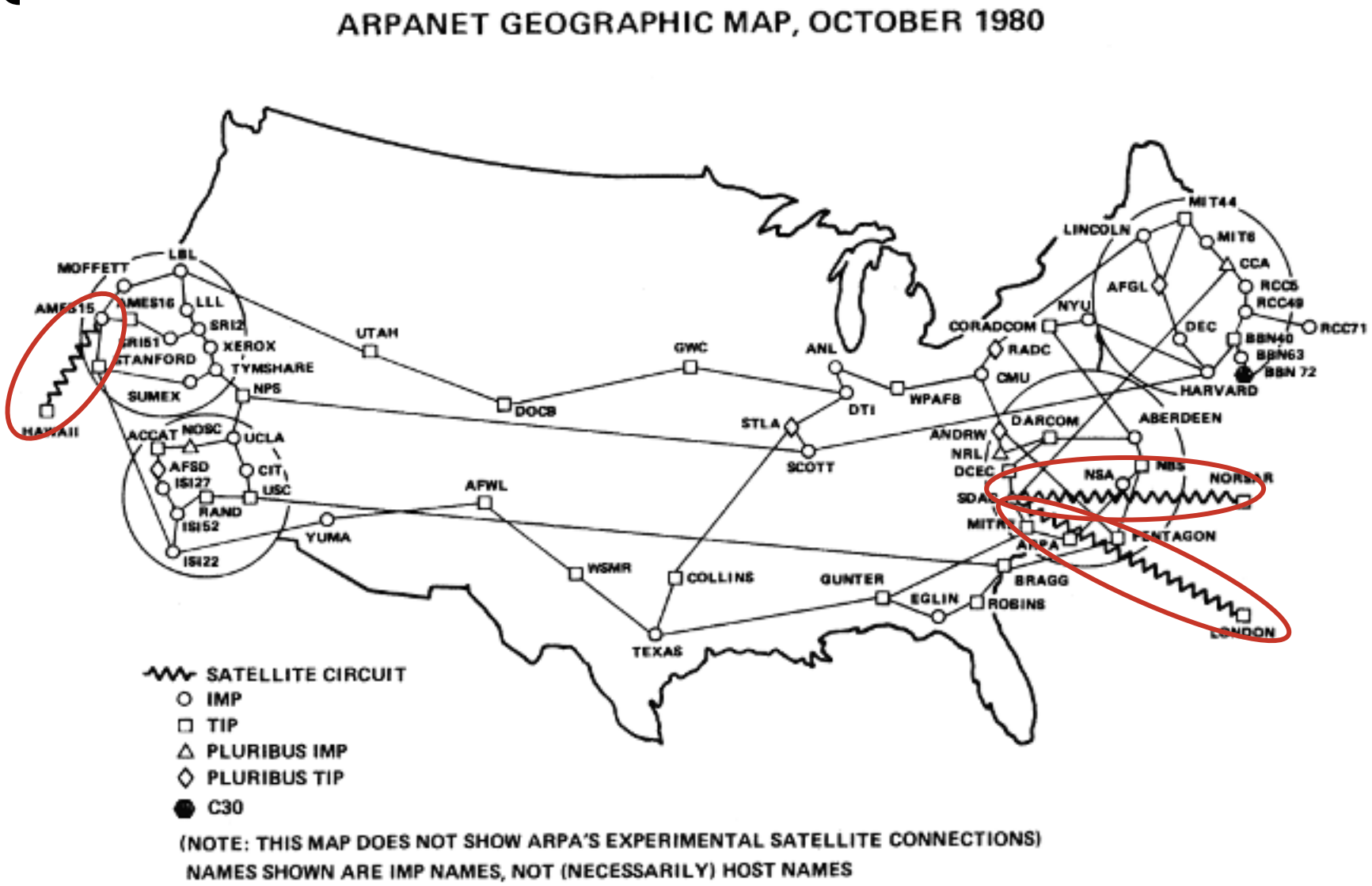


Abb. 4 ARPA NETwork, topologische Karte. Stand Juni 1974.

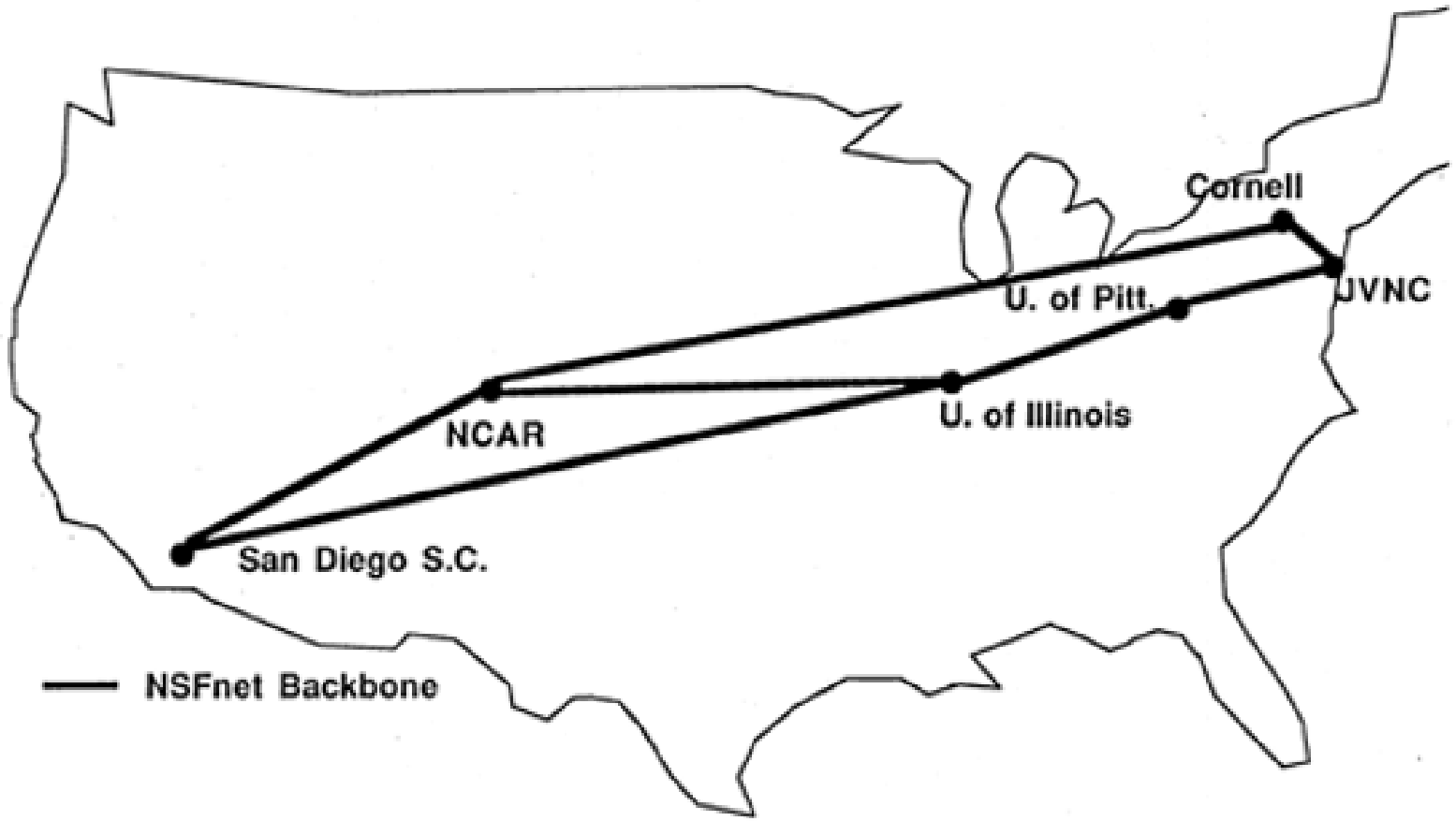
1977


ARPANET LOGICAL MAP, MARCH 1977
MOFFETT
LBL
UTAH
ILLINOIS
WPAFB
MIT 6
CCA
RCC 5
RCC 50
PLURIBUS
DEC-2050
DATA-COMPUTER
HAWAII
AMES 15
AMES 16
SRI 2
SRI 51
LLL
XEROX
MAXC
NOVA-800
PARC MAXC2
ANL
CMU
C.mmp
ECLIPSE
DCU-50
LINCOLN
RADC
MIT 44
RCC 49
H316
BBN 50
BBN 40
CDC6600
CDC7600
STANFORD
SUMEX
TYMSHARE
VARIAN 73
370/195
SCOTT
DEC
DEC-1090
HARVARD
NYU
RUTGERS
UNIVAC-1108
FNWC
SCRL
MP32
GWC
CDC6500
CDC3200
DOCB
UCLA
USC
360/91
NUC
NELC
RAND
BELVOIR
360/44
360/40
PLURIBUS
DCEC
SDAC
ABERDEEN
NORSAR
NSA
ARPA
MITRE
NBS
LONDON
FPSAP-120B
DEC-2040
ISI 22
ISI 52
AFWL
TEXAS
GUNTER
EGLIN
B-4700
XGP
PENTAGON
360/195
GEC 4080
ICL 470
CDC6400
CDC6600
CDC7600
B5500
IMP
TIP
PLURIBUS IMP
SATELLITE CIRCUIT
(PLEASE NOTE THAT WHILE THIS MAP SHOWS THE HOST POPULATION OF THE NETWORK ACCORDING TO THE BEST INFORMATION OBTAINABLE, NO CLAIM CAN BE MADE FOR ITS ACCURACY)
NAMES SHOWN ARE IMP NAMES, NOT (NECESSARILY) HOST NAMES

1980 ARPANET overview

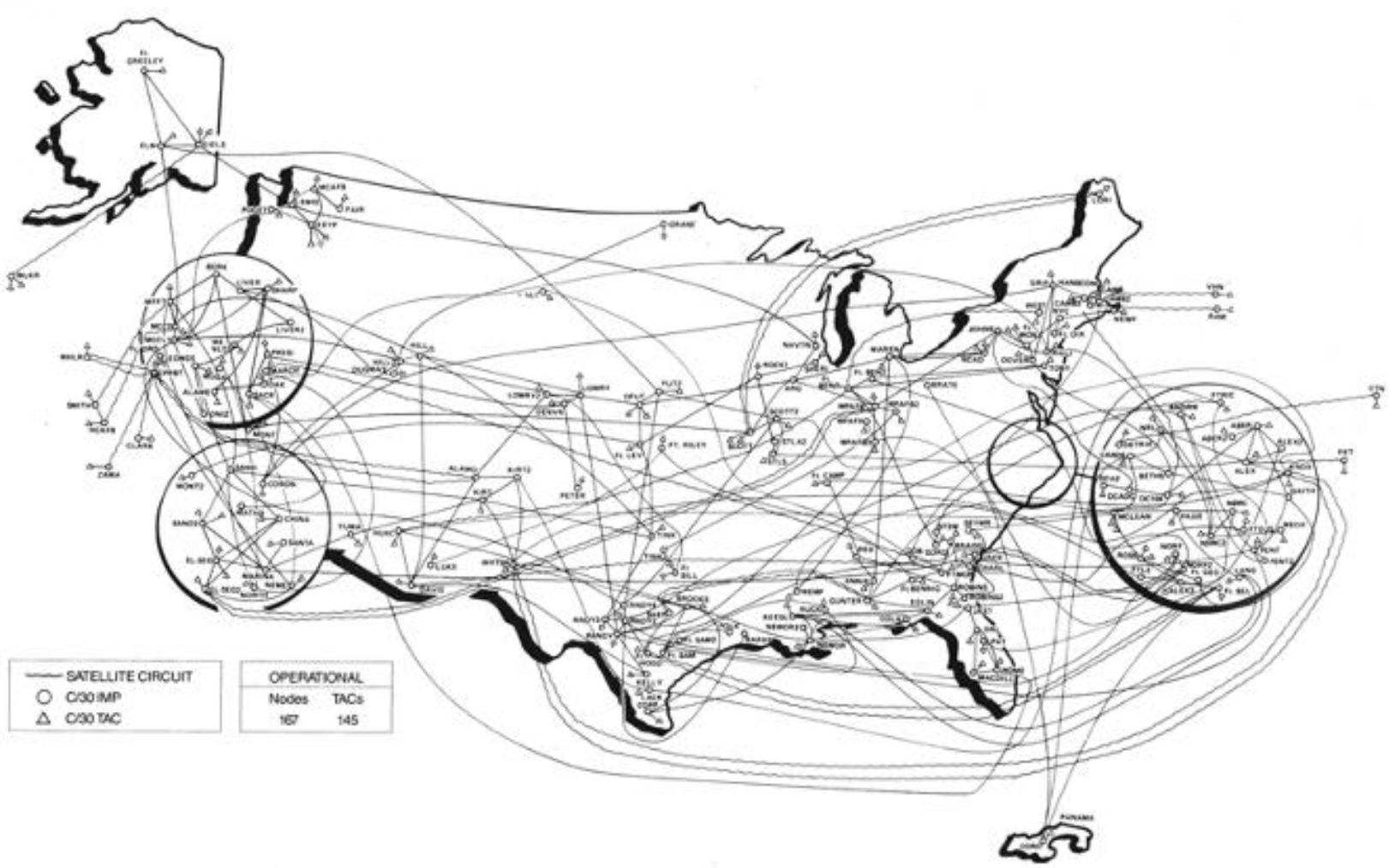


1981 Starting NSFNET



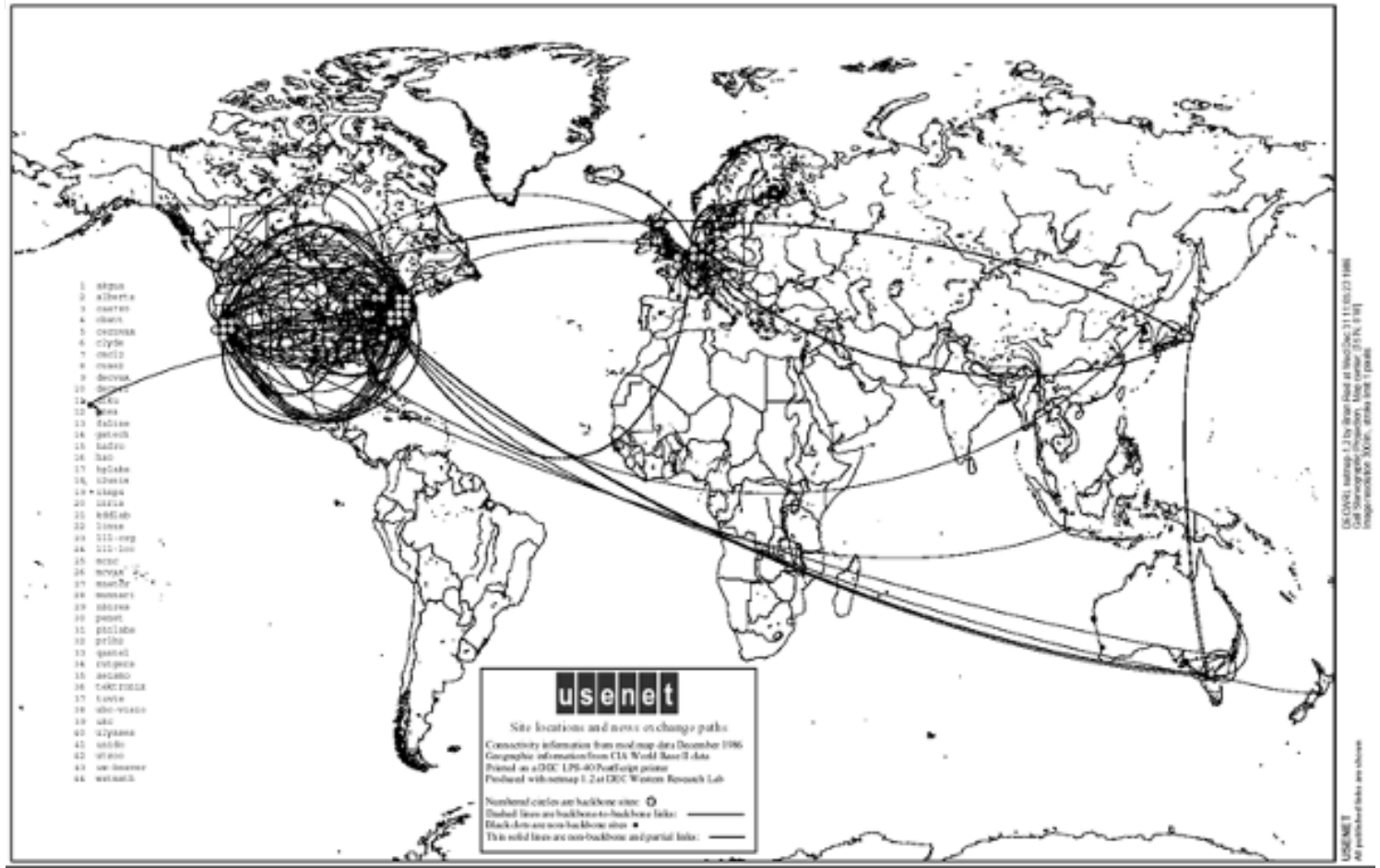
(National Science Foundation)

1983 ARPANET and MILNET separated

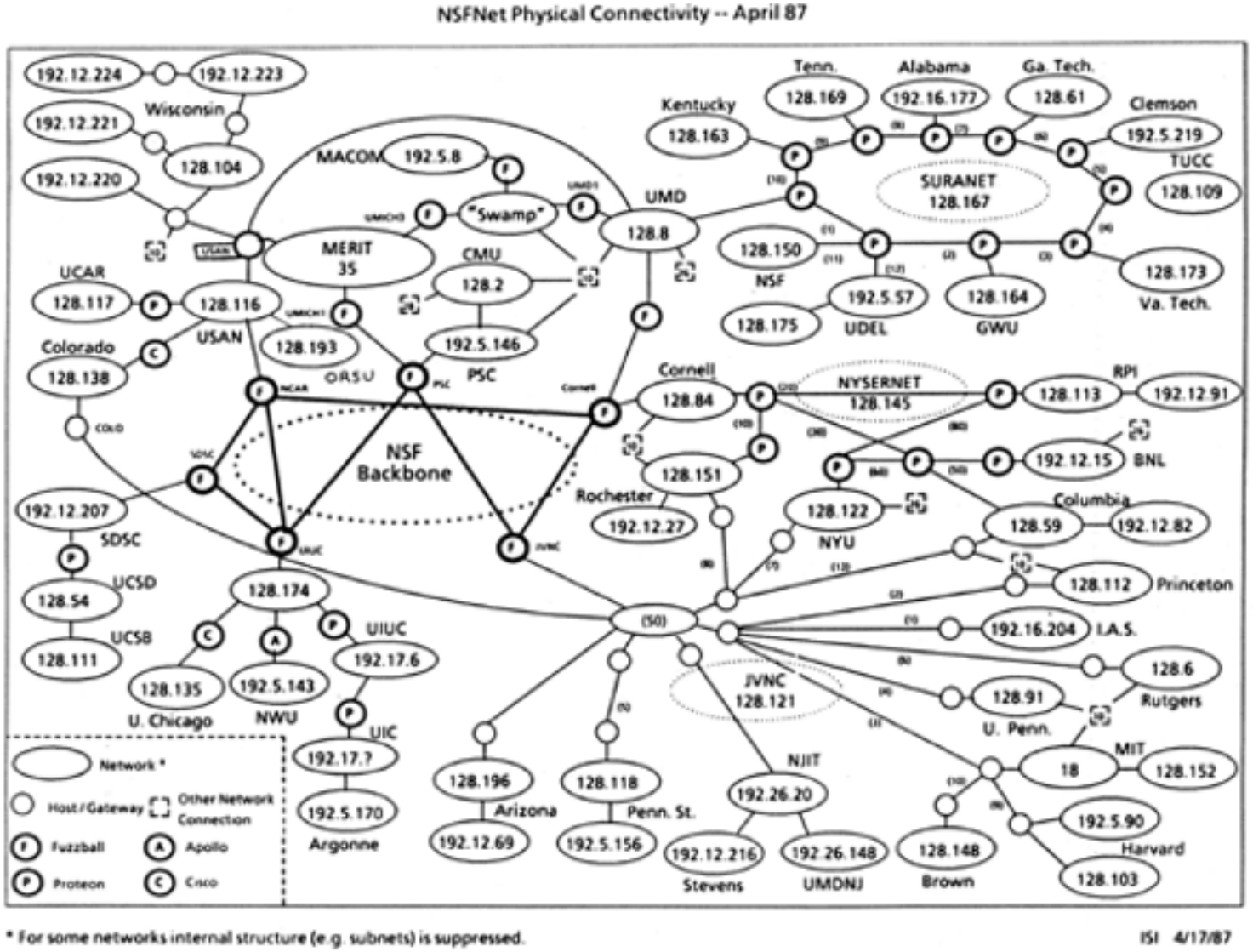


1986 USENET & NSFNET

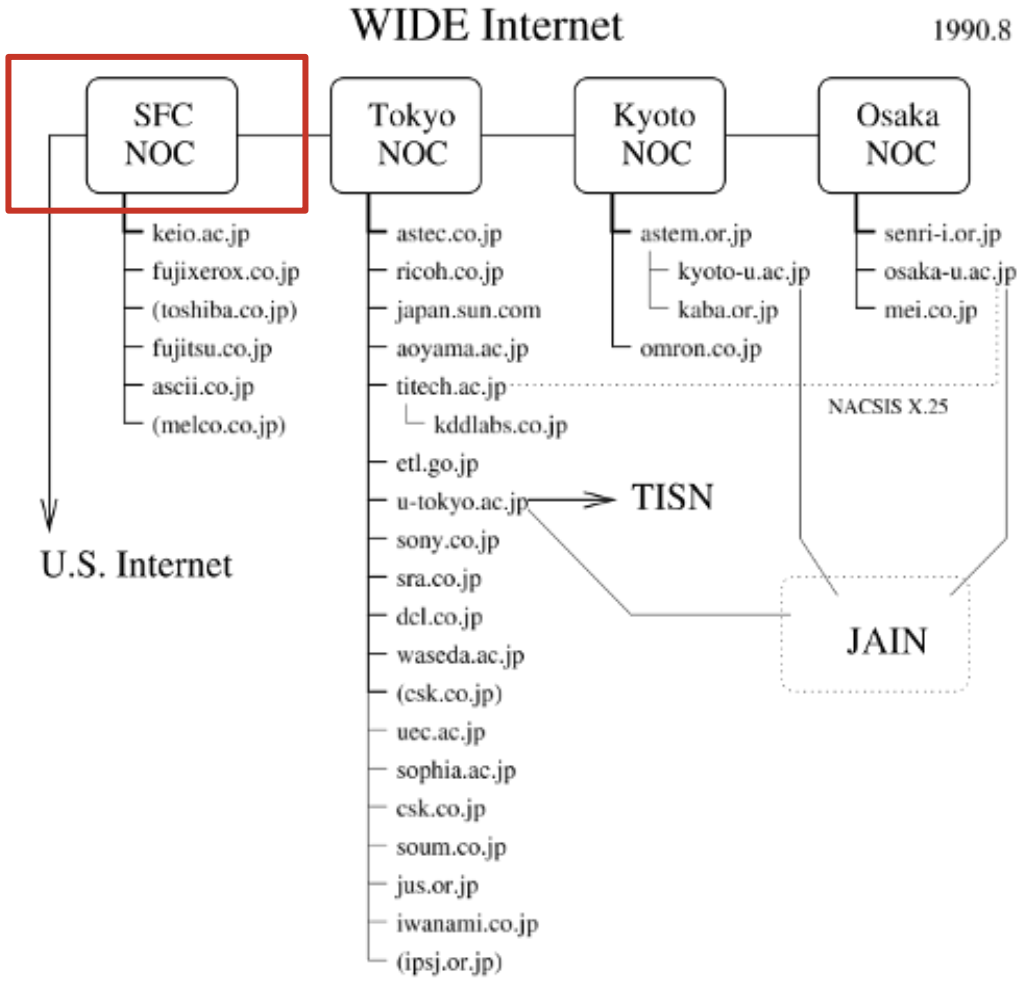
IETF and IRTF started under IAB this year



1987 NSFNET

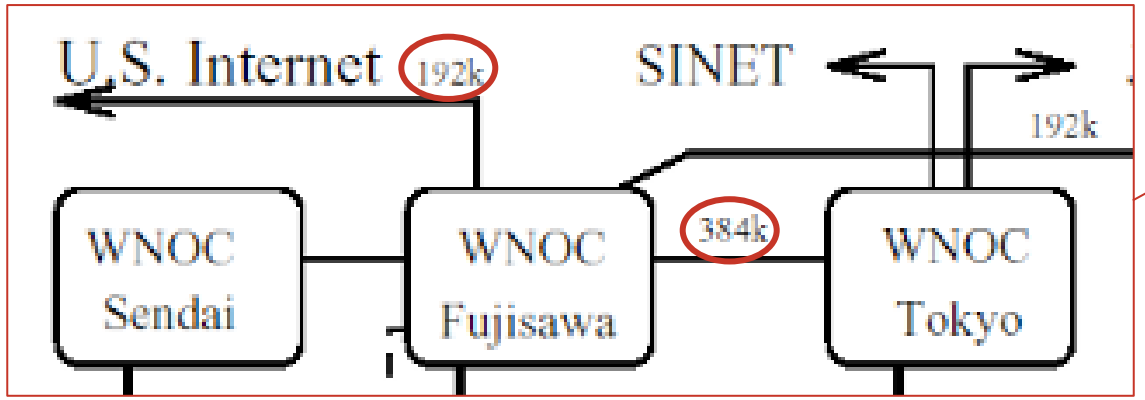

NSFNet Physical Connectivity -- April 87
192.12.224
192.12.223
Wisconsin
192.12.221
128.104
192.12.220
MACOM
192.5.8
"Swamp"
UMD
128.8
MERIT
35
CMU
128.2
UCAR
128.117
128.116
USAN
128.193
ORSU
192.5.146
PSC
Colorado
128.138
NSF
Backbone
Cornell
128.84
Rochester
192.12.27
128.151
192.12.207
SDSC
UCSD
128.54
UCSB
128.111
128.174
UIUC
192.17.6
128.135
U. Chicago
192.5.143
NWU
UIC
192.17.7
192.5.170
Argonne
128.196
Arizona
192.12.69
128.118
Penn. St.
192.5.156
(50)
Kentucky
128.163
Tenn.
128.169
Alabama
192.16.177
Ga. Tech.
128.61
Clemson
192.5.219
TUCC
128.109
SURANET
128.167
128.150
NSF
192.5.57
UDEL
128.175
128.164
GWU
128.173
Va. Tech.
NYSERNET
128.145
128.113
RPI
192.12.91
192.12.15
BNL
128.122
NYU
Columbia
128.59
192.12.82
128.112
Princeton
192.16.204
I.A.S.
128.6
Rutgers
JVNC
128.121
128.91
U. Penn.
NJIT
192.26.20
192.12.216
Stevens
192.26.148
UMDNJ
MIT
18
128.152
128.148
Brown
192.5.90
Harvard
128.103
Network *
Host/Gateway
Other Network Connection
Fuzzball
Apollo
Proteon
Cisco
* For some networks internal structure (e.g. subnets) is suppressed.
ISI 4/17/87

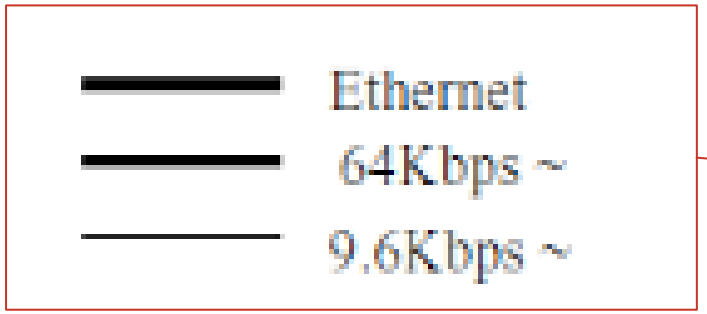
1990 WIDE Internet backbone

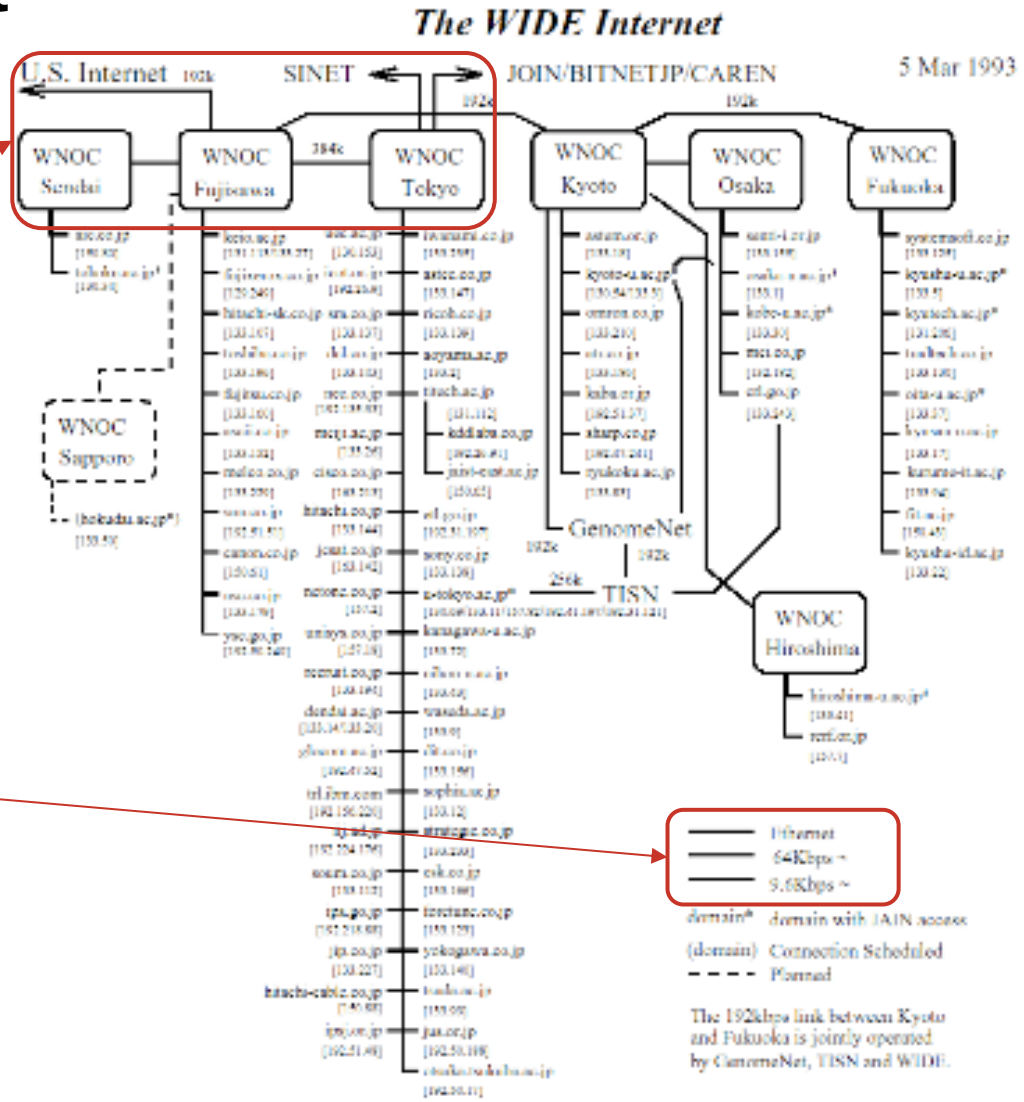


Very early stage of entire Internet in Japan

1993 WIDE Internet backbone







What happened after 1990's?
-Commercialization of the Internet-

Before

- User
  - research community only
- business
  - Academic only, no business
- Resource management
  - Researchers and engineers driven(even individual controlled everything)

After

- User
  - Everyone
- business
  - business allowed
- Resource management
  - multi-stakeholder governance started at ICANN

Current Internet is mixture of business and **academic networks called RENs(Research and Education Network)**

Why RENs in the IoT/Big data/AI/etc era?

- What is the Infrastructure for AI operation?
  - Ultra high speed network, data centers
- How do you collect IoT data from all over the world?
  - LEO satellites(starlink), HAPS or other NTN(Non Terrestrial Network)
  - 100% coverage for “NO OUT OF RANGE” service
- How do you connect device on the Moon/Mars ?

High speed, Highly available, and Secure network covering entire earth, or even beyond, is needed!

Let’s design, develop and deploy such network **together** with your new friends in the global space.

Asia Pacific: REN community

APAN

AARNet - Australian NREN
AfgREN - Afghanistan NREN
BDREN - Bangladesh NREN
CamREN- Cambodia NREN
CSTNET - China Science and Technology Network
CERNET - China Education and Research Network
DrukREN – Bhuban NREN
ERDEMNET – Mongolian NREN
ERNET – Indian NREN
JGN - Japanese testbed network (NICT)
HARNET - Hong Kong NREN
KOREN - Korean NREN
KREONET- Korean NREN
IDREN - Indonesian NREN
LEARN - Sri Lankan NREN
LERNet – Lao NREN
MAFFIN – Japanese Agriculture Network
mmREN – Myanmar NREN
MYREN - Malaysian NREN
NKN - Indian NREN
NREN - Nepal NREN
PERN - Pakistani NREN
PREGINET - Philippine NREN
REANNZ - New Zealand NREN
SINET - Japanese NREN (NII)
SingAREN - Singaporean NREN
TLREN – Timor-Leste NREN
TWAREN - Taiwanese NREN
ThaiREN - Thai NREN
VinaRen - Vietnamese NREN

APAN
Asia-Pacific Advanced Network

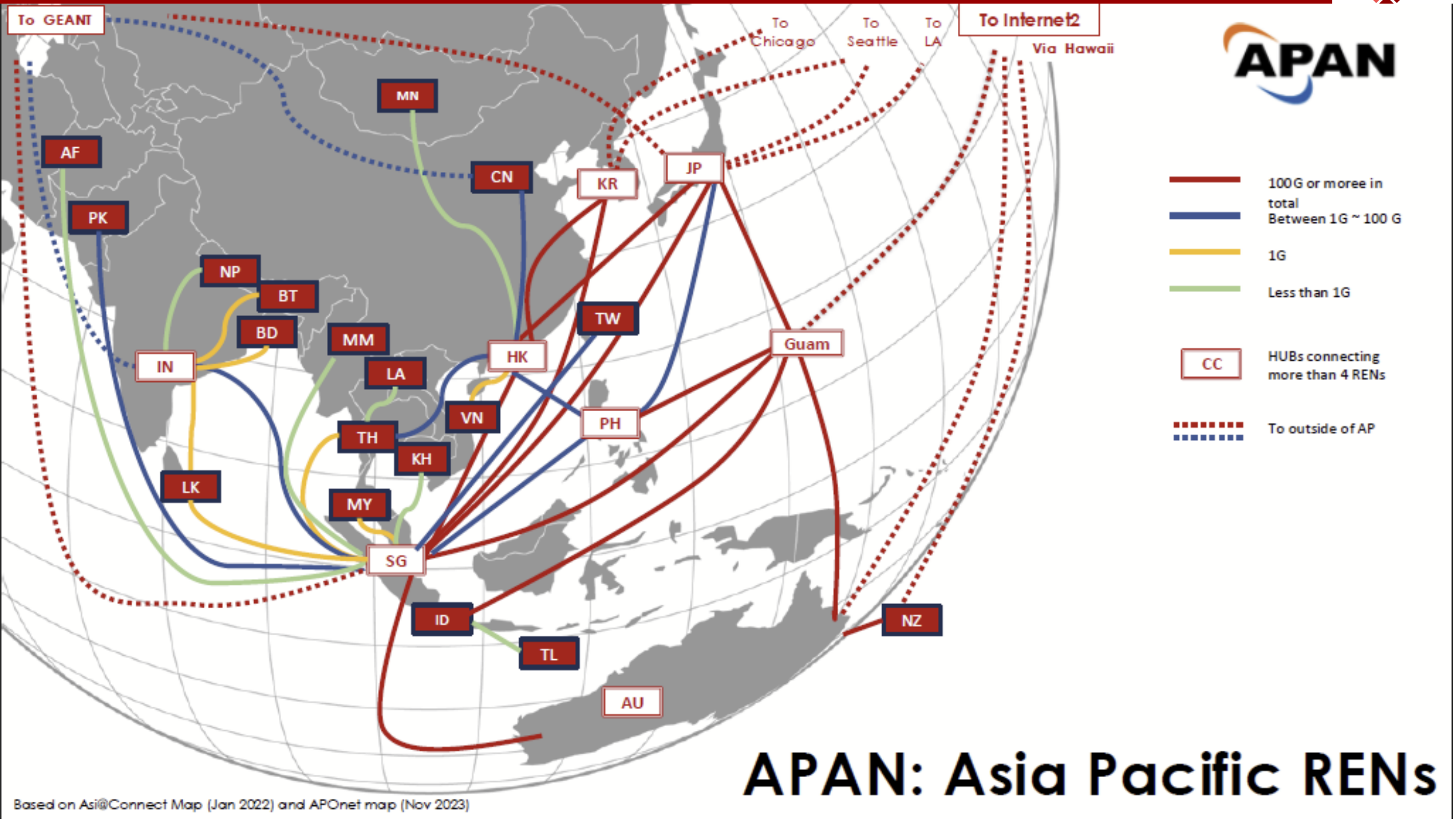
TEIN / Asi@Connect
Trans Eurasia Information Network

ARENA-PAC
Arterial Research and Educational Network in Asia-Pacific

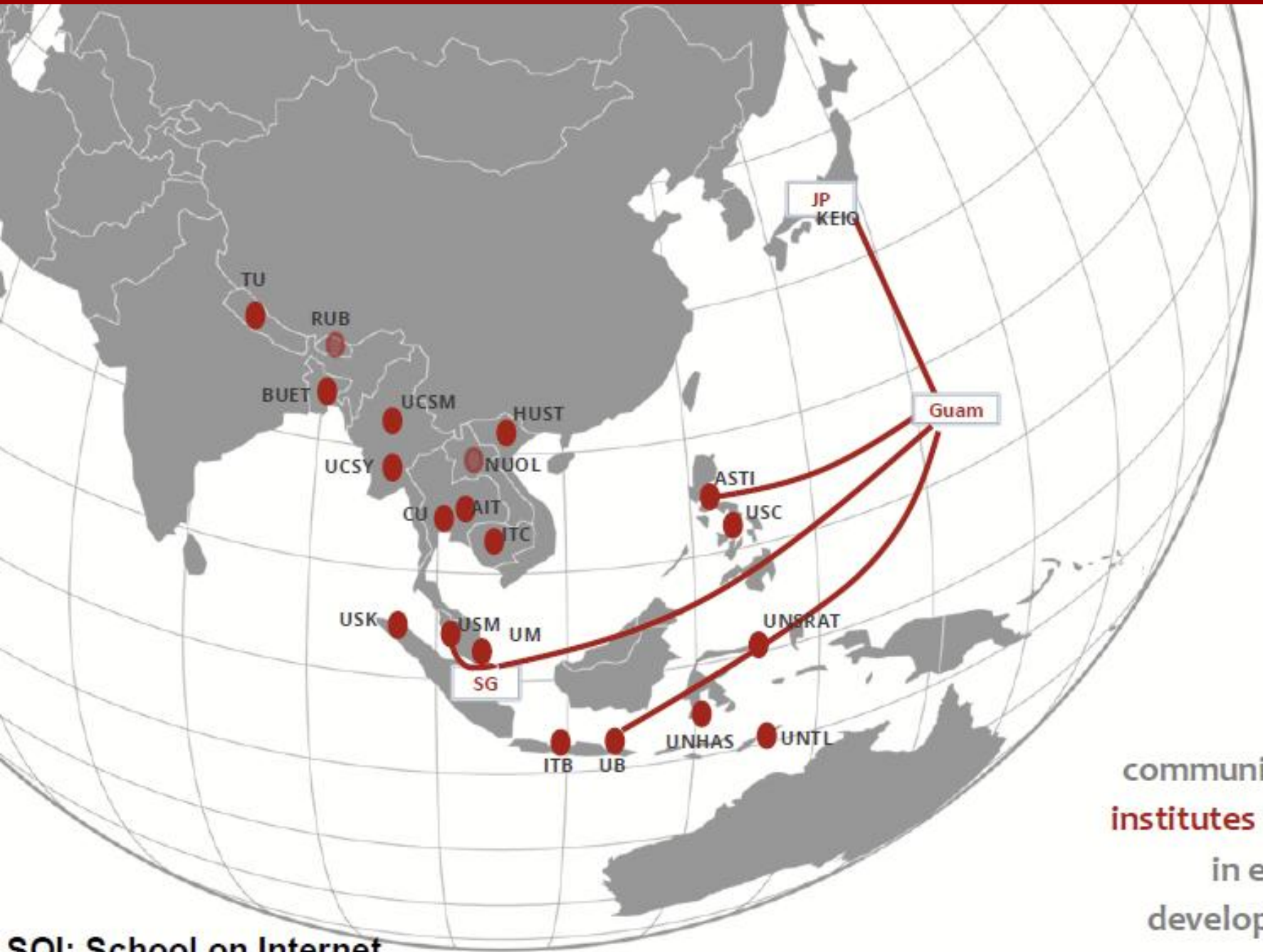
WIDE Project
International Internet research organization based in Japan

Based on the APNIC service region, APAN members, and our project partners

REN: Research and Educational Network


To GEANT
To Chicago
To Seattle
To LA
To Internet2
Via Hawaii
APAN
MN
AF
CN
KR
JP
PK
NP
BT
BD
MM
IN
LA
HK
TW
Guam
VN
PH
TH
KH
LK
MY
SG
ID
TL
NZ
AU
100G or moree in total
Between 1G ~ 100 G
1G
Less than 1G
CC
HUBs connecting more than 4 RENs
To outside of AP
APAN: Asia Pacific RENs
Based on Asi@Connect Map (Jan 2022) and APOnet map (Nov 2023)

APIE



SOI

NREN-PAC

SOI Asia:

community of **universities & research institutes** in Asia Pacific to collaborate in education, research, and REN development for **regional resiliency**

SOI: School on Internet

Research

Internet Operation

Education

How can we connect the Internet among universities in Asia?

How can we share knowledge among universities in Asia over the Internet?

1995 (0.4%)

1988 WIDE PROJECT

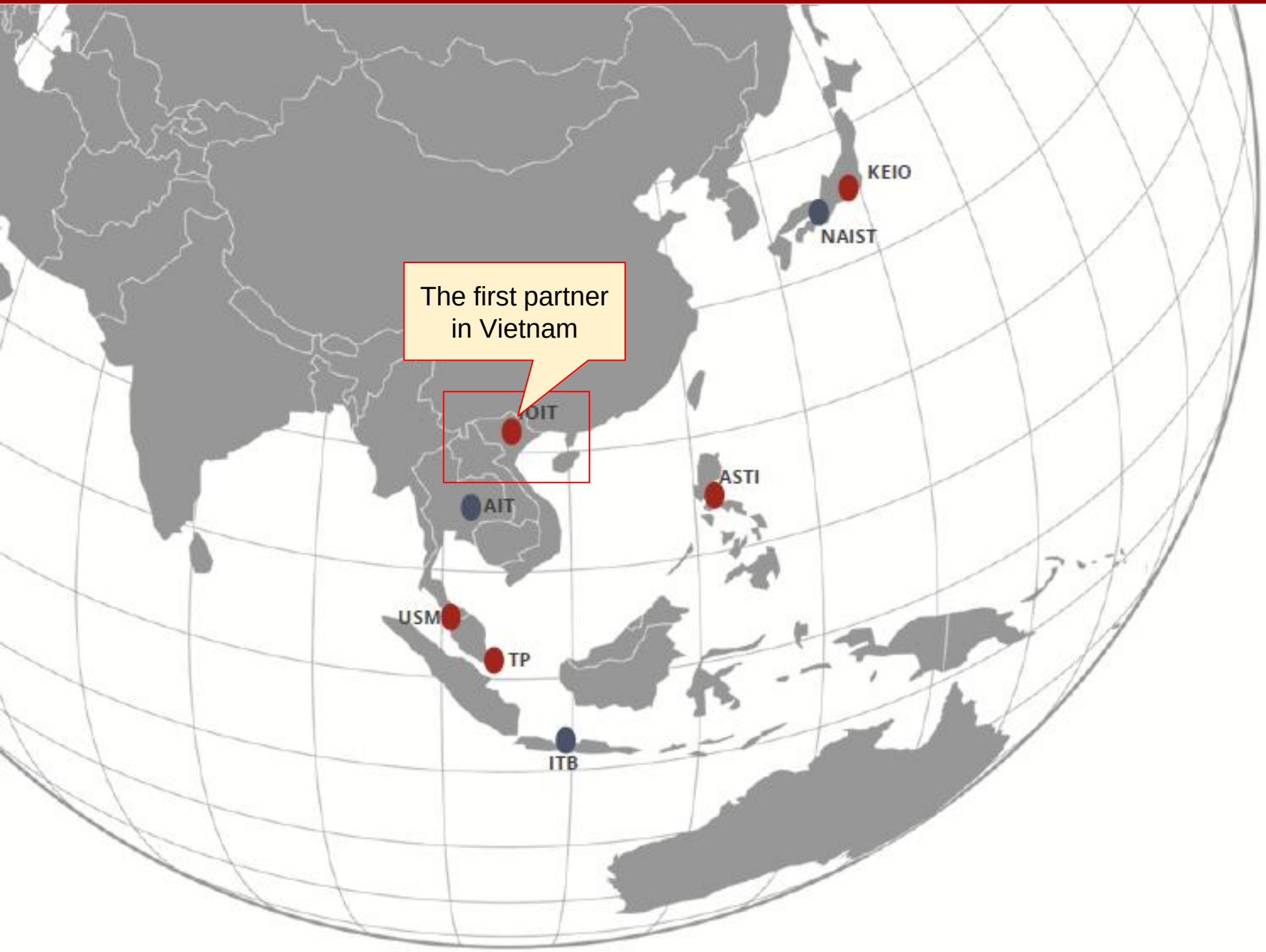
2001 (8.6%)

1997

1.7%

Phase I
4 KU-band sites

Satellite-based communication infrastructure



SOI Asia

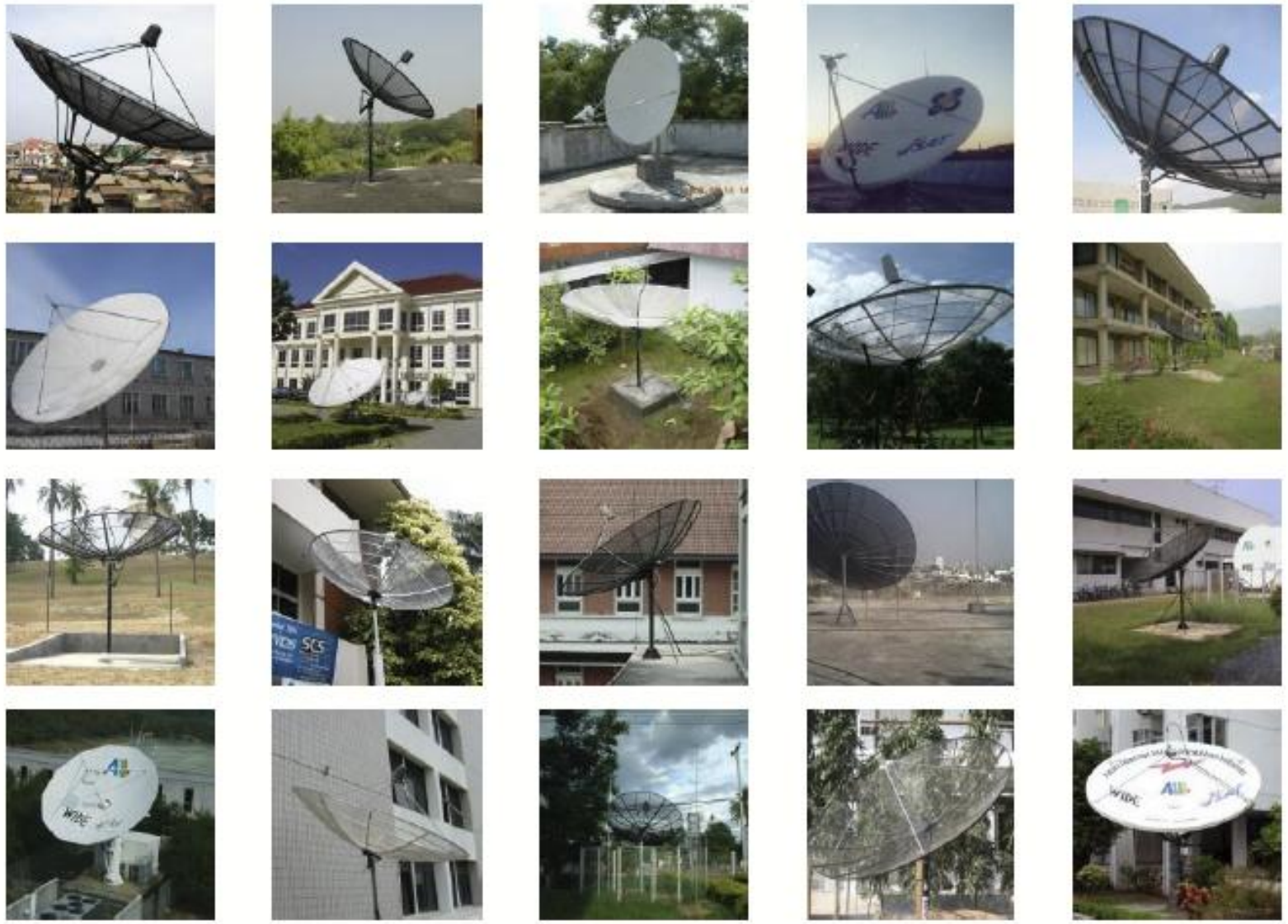
2001

8.6%

Phase II
3 KU band sites
5 C bands

UDL
/32 IPv6 sTLA
Multicast PIM-SIM
IPv6 Multicast

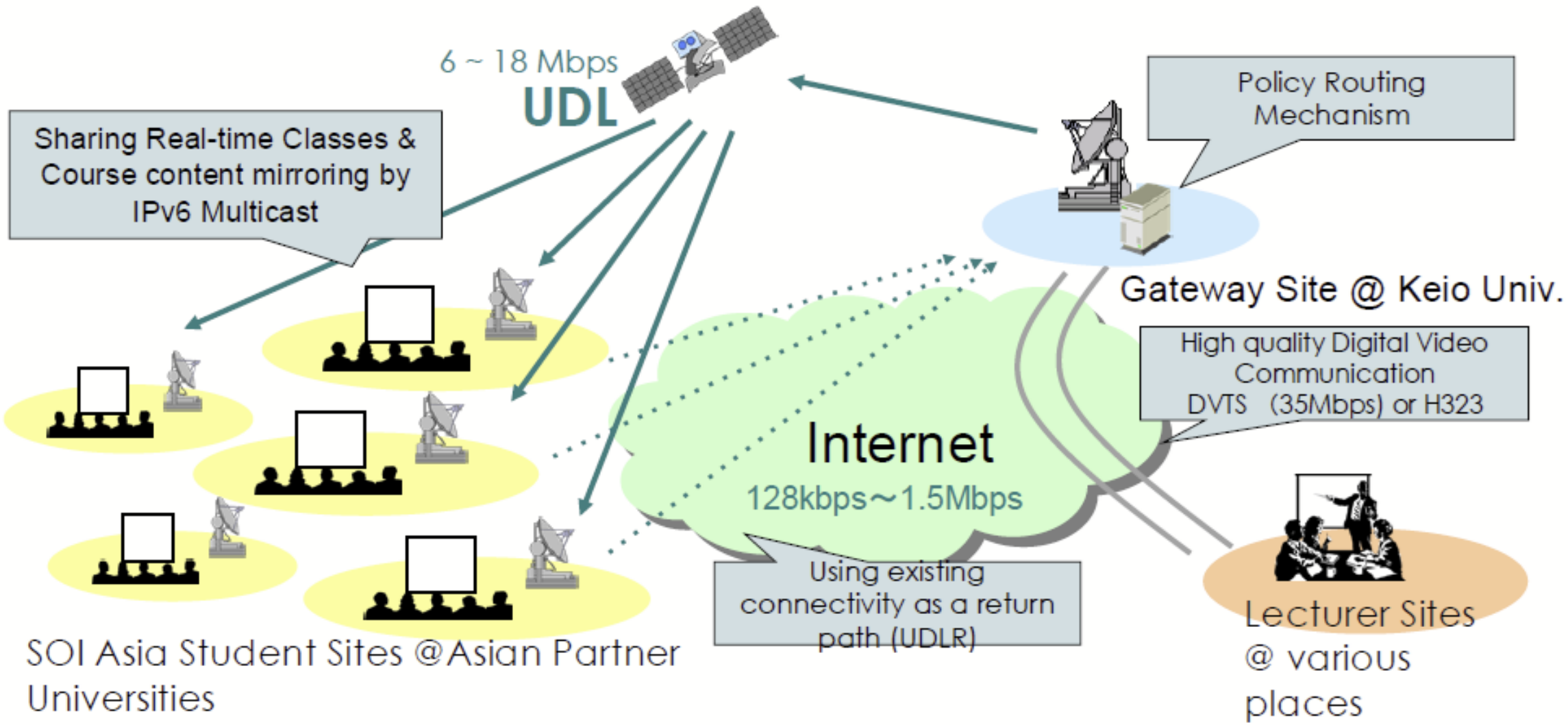
Satellite-based communication infrastructure



UDL
/32 IPv6 sTLA
Multicast PIM-SIM
IPv6 Multicast

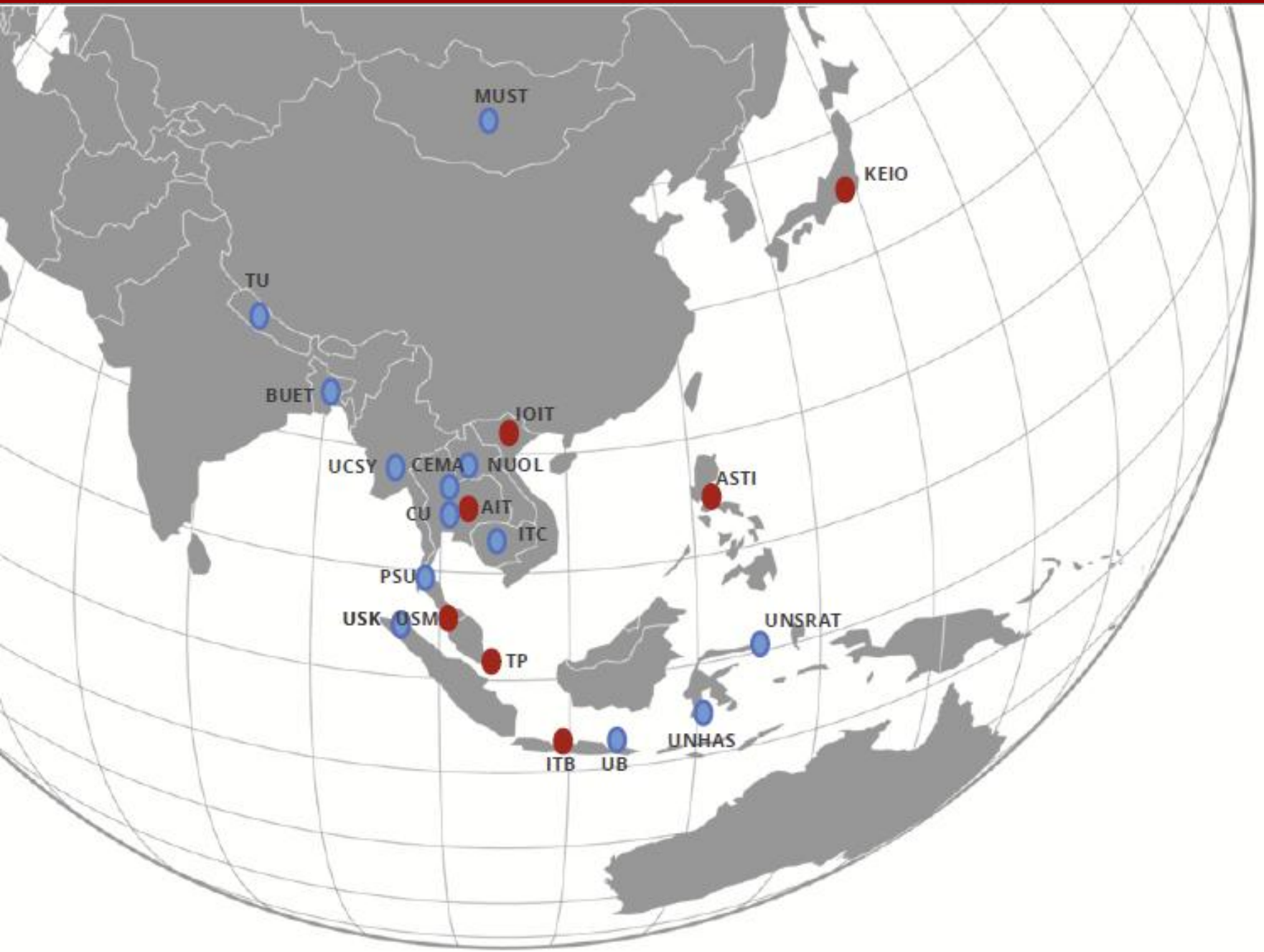
2007 (20%)

Lecture & Symposium Sharing Environment Design



1st Operators Workshop @ SFC 2002

APIE



SOI Asia

2006

16.7%

Phase III

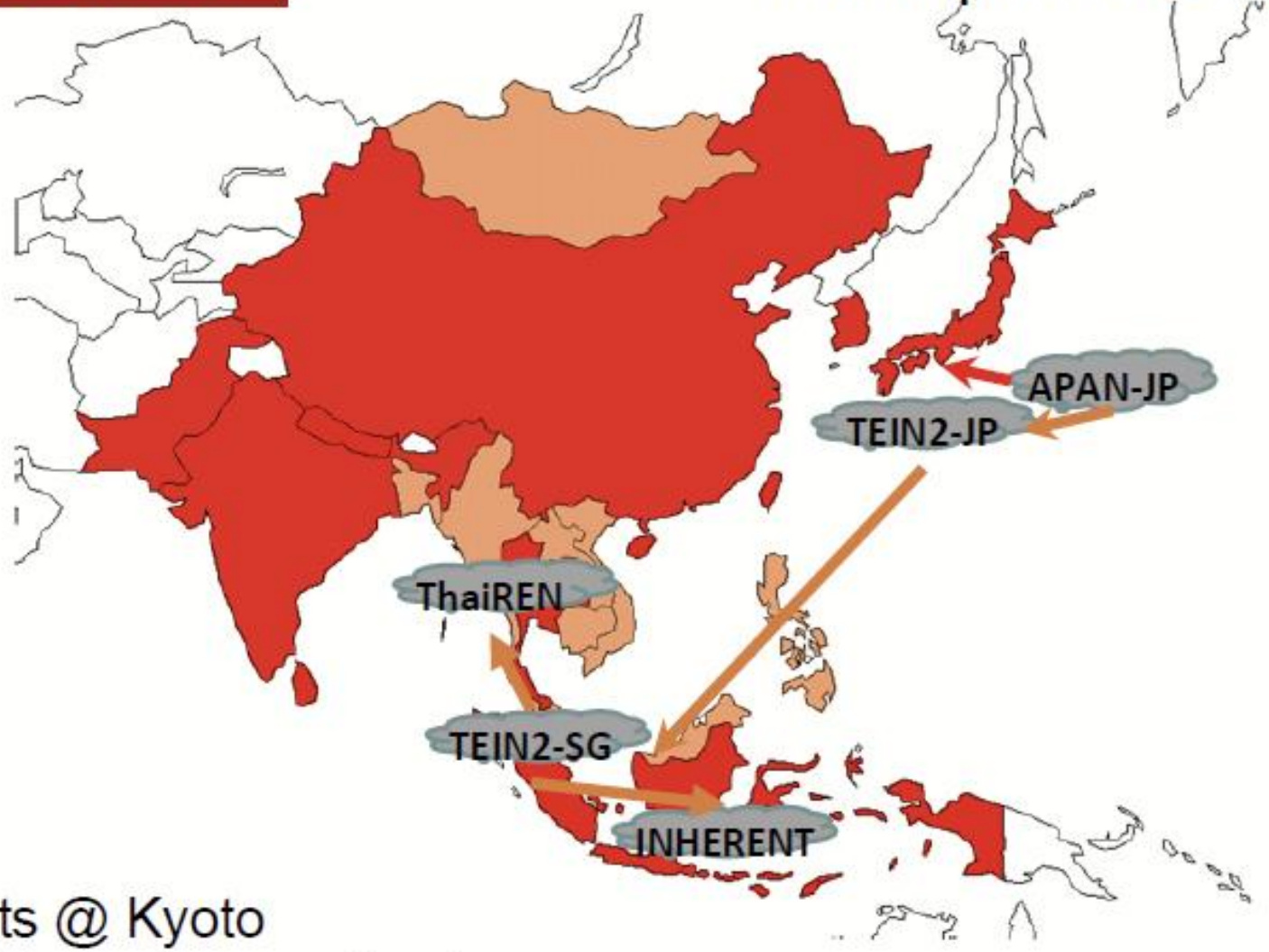
7 C band sites

13 UDL sites

Satellite-based communication infrastructure

2007 - 20.0%

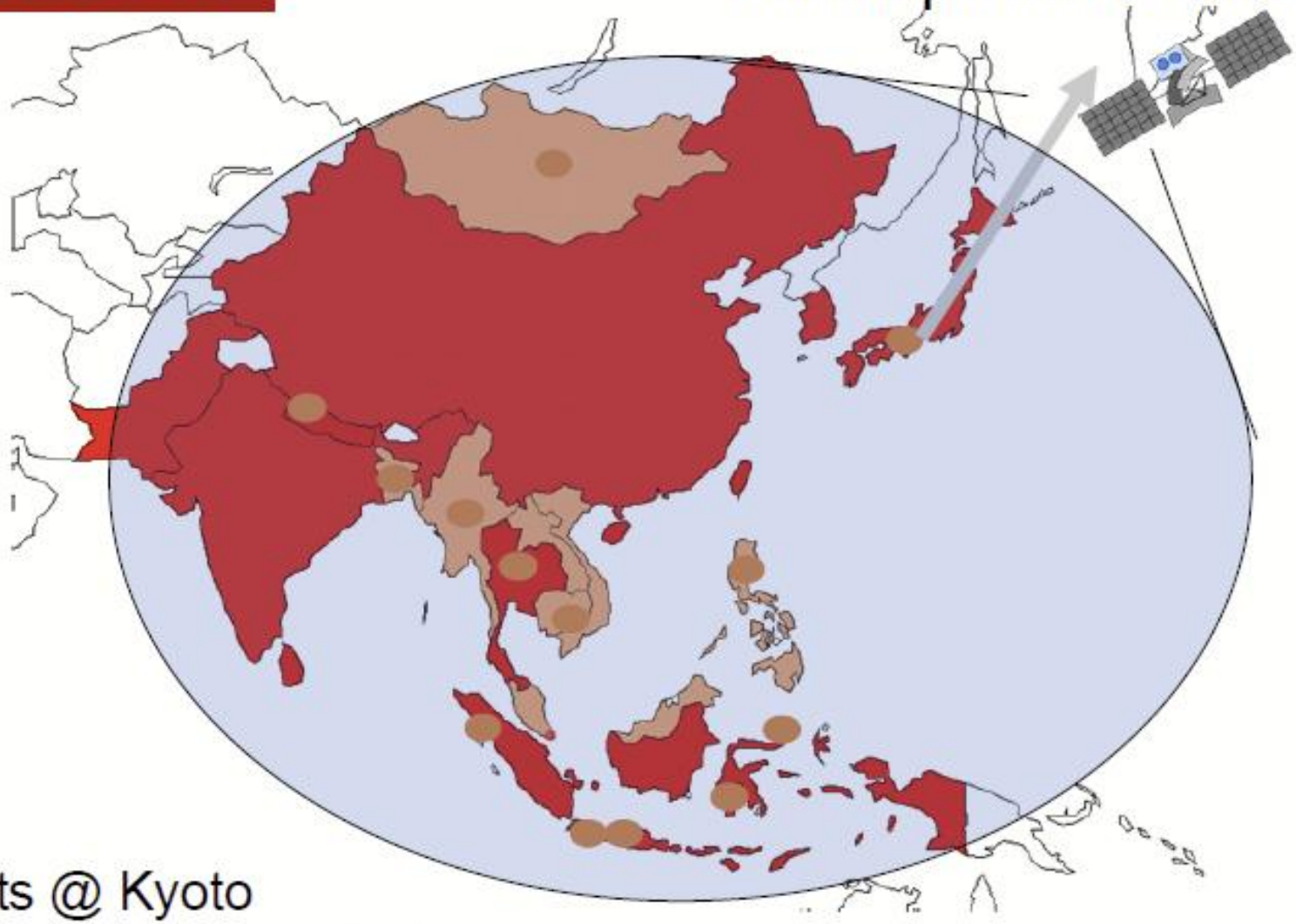
SIGCOMM 2007 Kyoto streaming
Participated Asian Countries



Participants @ Kyoto
Multicast Streaming received

2007 - 20.0%

SIGCOMM 2007 Kyoto streaming
Participated Asian Countries



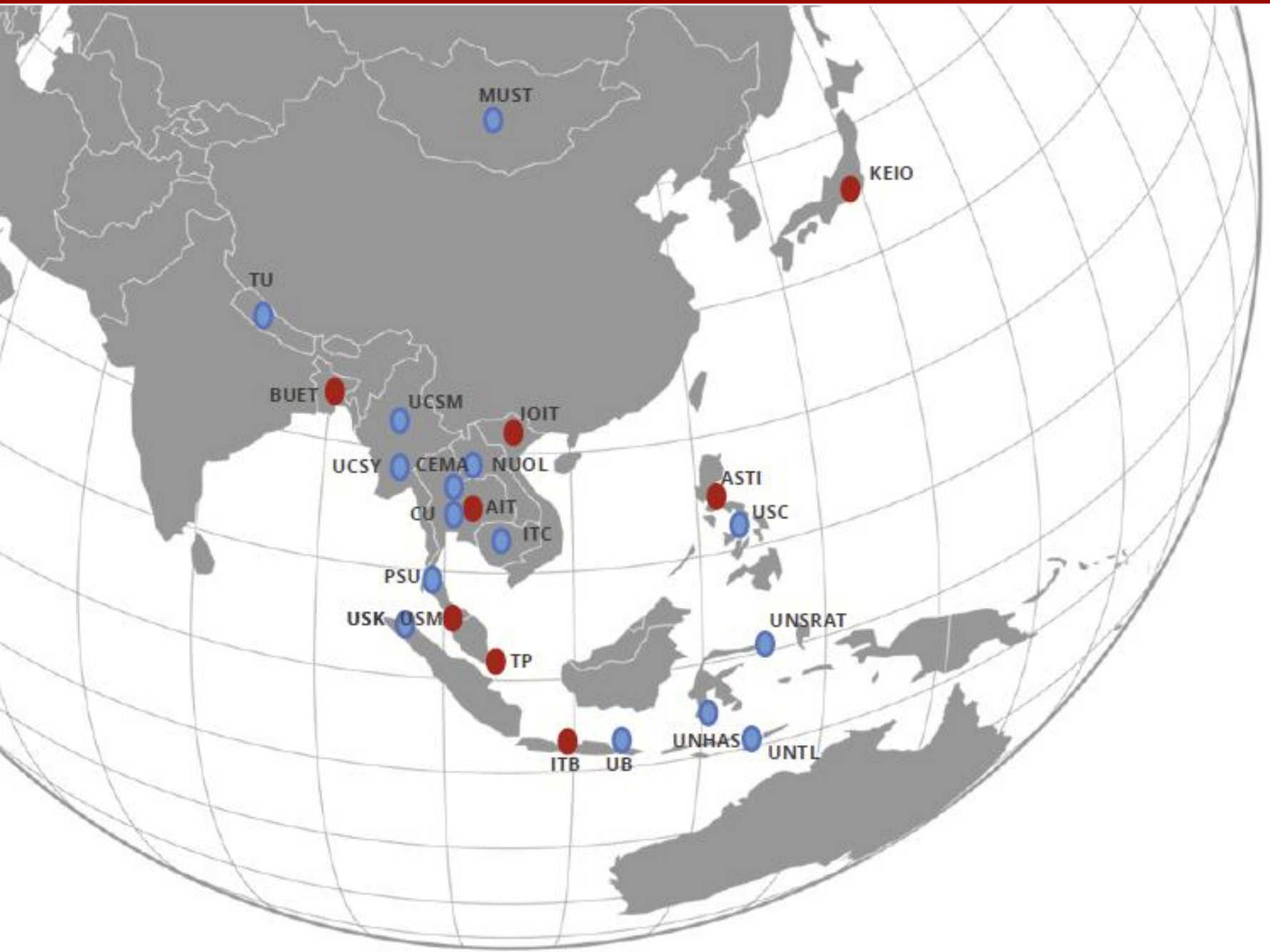
Participants @ Kyoto
Multicast Streaming received

2009 - 26.6%

Global Kids Eclipse
2009. 7. 22

More than
500 children
from 8 countries
in 13 locations

APIE



SOI Asia

2011

32.7%

Phase III

8 C band sites

15 UDL sites

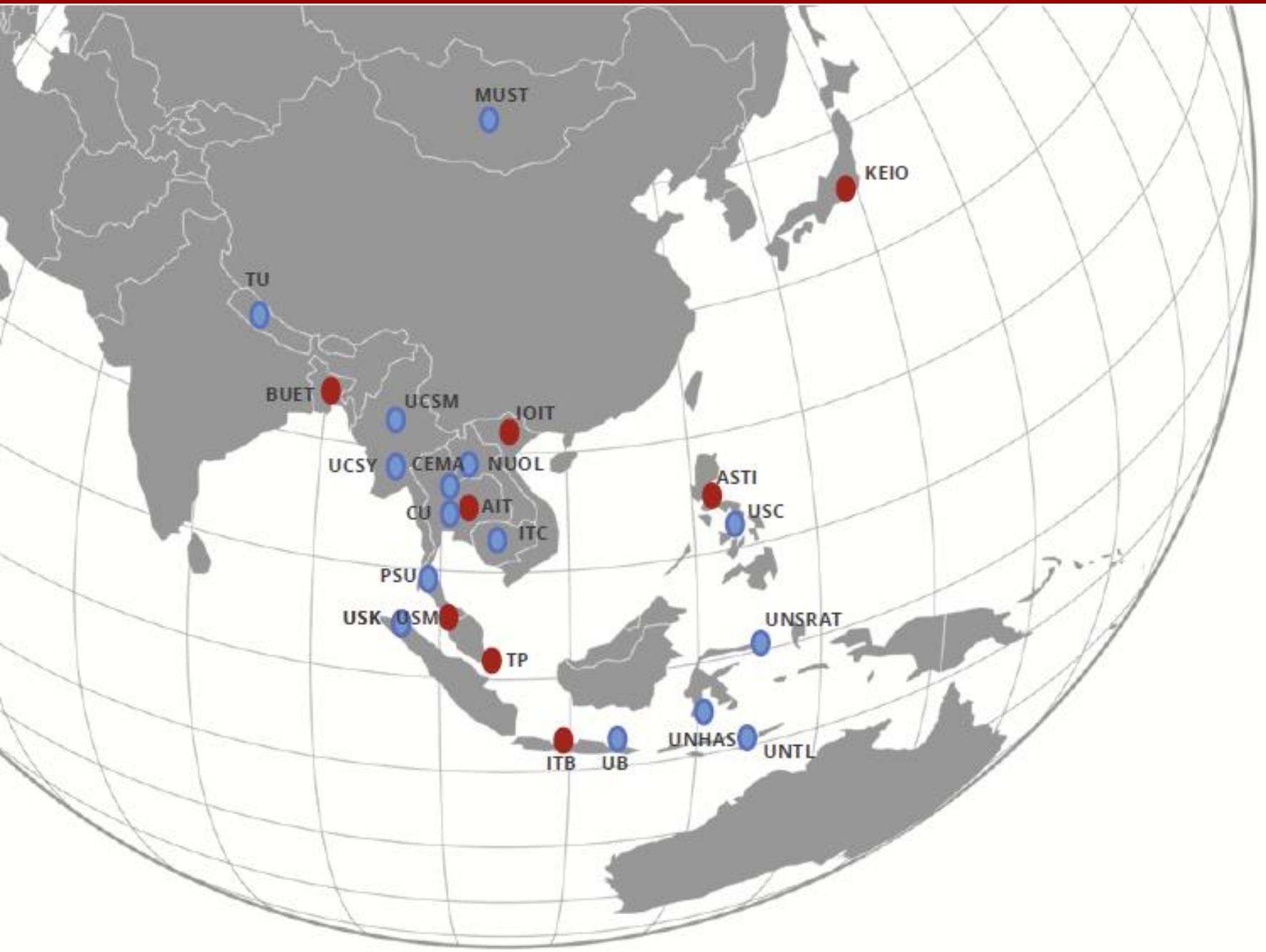
Satellite-based communication infrastructure

2011 - 32.7%

CONNECTivity with UNESCO

- 2011.11.25
- Guinness World Records-Claim Id:371504
  'The largest online ecology seminar involved **2,592** participants and was achieved by UNESCO Jakarta & CONNECT-Asia in Jakarta, Indonesia on 25 November 2011.'

APIE



SOI Asia

2016

32.7%

Phase III

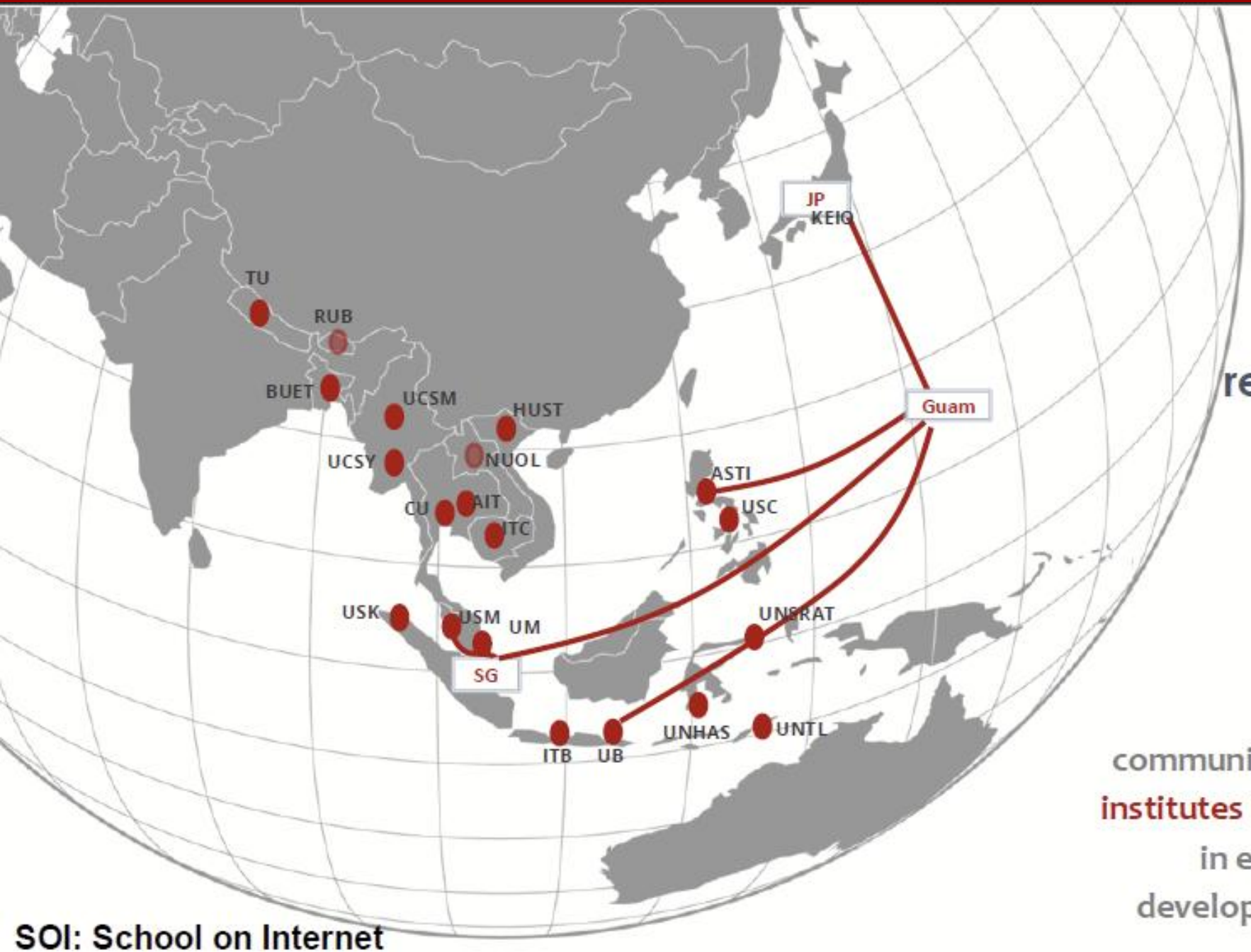
8 C band sites

15 UDL sites

Satellite-based communication infrastructure

The AI^3 research community will move on to the next phase of the research utilizing space & non-terrestrial communication technology in various ways for 100% internet coverage of the earth.

By Haruhito Watanabe, senior researcher
Keio Research Institute at SFC
Aug 2022



SOI NREN-PDC

2021

68%

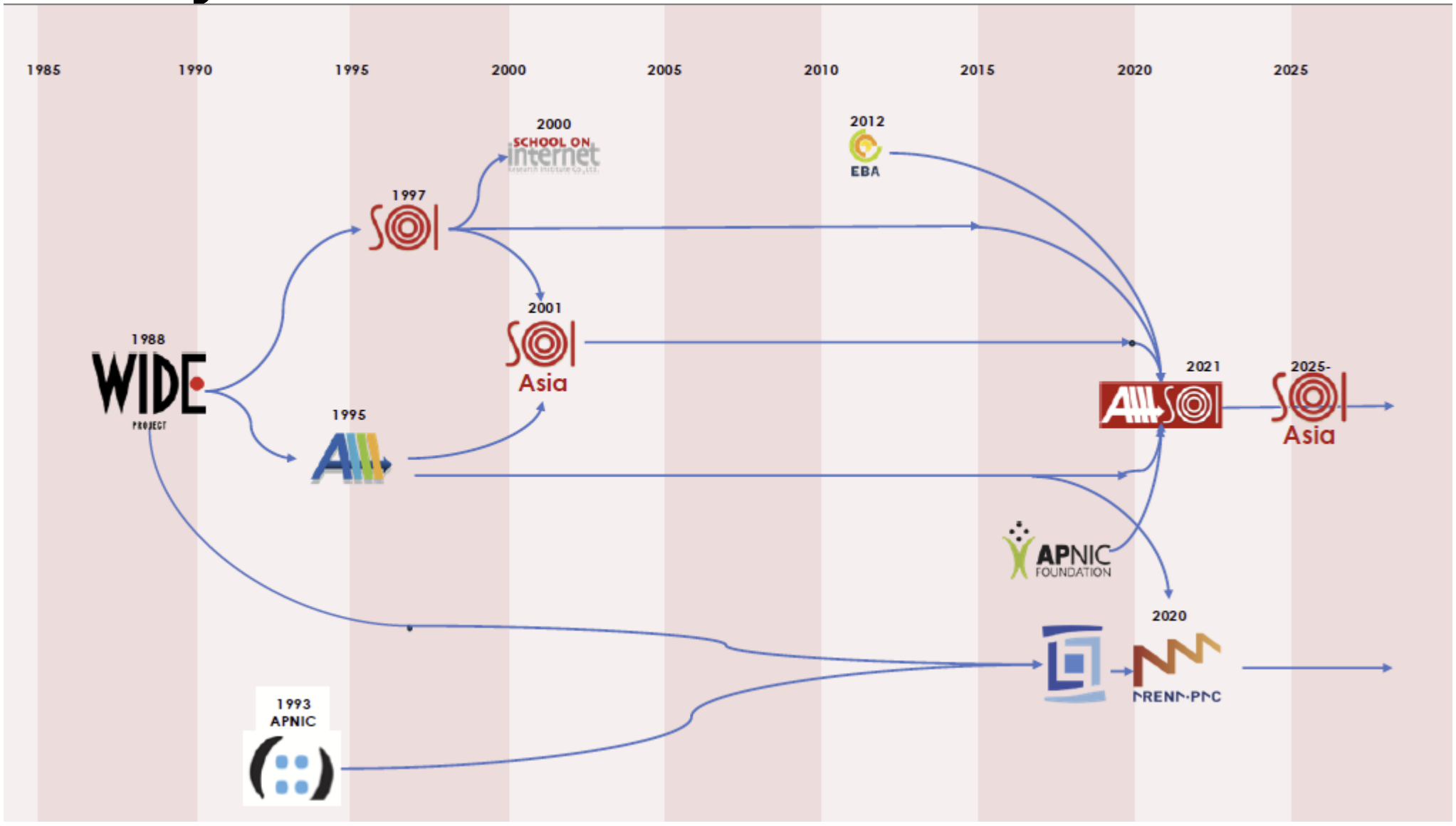
New form of research & education community

SOI Asia:

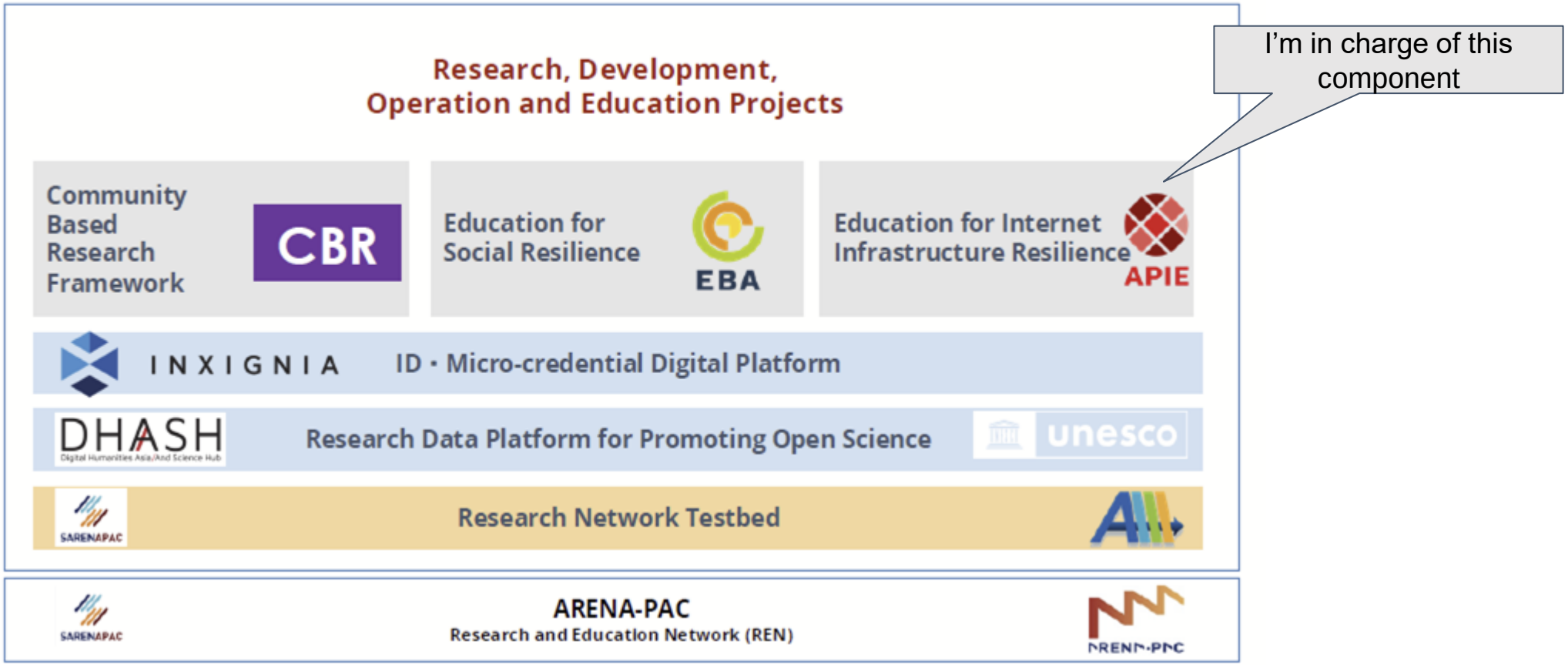
community of **universities & research institutes** in Asia Pacific to collaborate in education, research, and REN development for **regional resiliency**

SOI: School on Internet

History of SOI Asia/WIDE and APIE



SOI Asia's mission:
Design a Resilient Future in Asia Pacific



Asia Pacific Internet Engineering Program

- **Community based** education program
- University students and **young people** in the Asia Pacific
- Skills needed to meet the global demand for Internet engineers in industry and academia, including **RENs**.

4 Advisory members & 9 Curriculum Committee members from ..

Objectives

Understand the philosophy and practical skills of Internet operation and engineering.

Join a community and build a human network in APAC for the Internet operation, engineering, and research for the future.

Build connections to the industry in the Asia Pacific region for your future career.

APIE CORE COURSES

APIE Online Course #1

Understanding the Internet

4 weeks x **3** hours

APIE Online Course #2

Operating the Internet

5 weeks x **5** hours

APIE e-Workshop

1.5 hours x Bi-weekly Meet-ups

APIE Camp

5 days x **7** hours

APIE Internship

APIE Online

Storytelling & Conversation

Project based

#1 Understanding the Internet

- w1: **What** is the Internet?
- w2: **How** is the Internet Working?
- w3: **Application** on the Internet
- w4: Internet Based **Society**

+ Virtual Labs

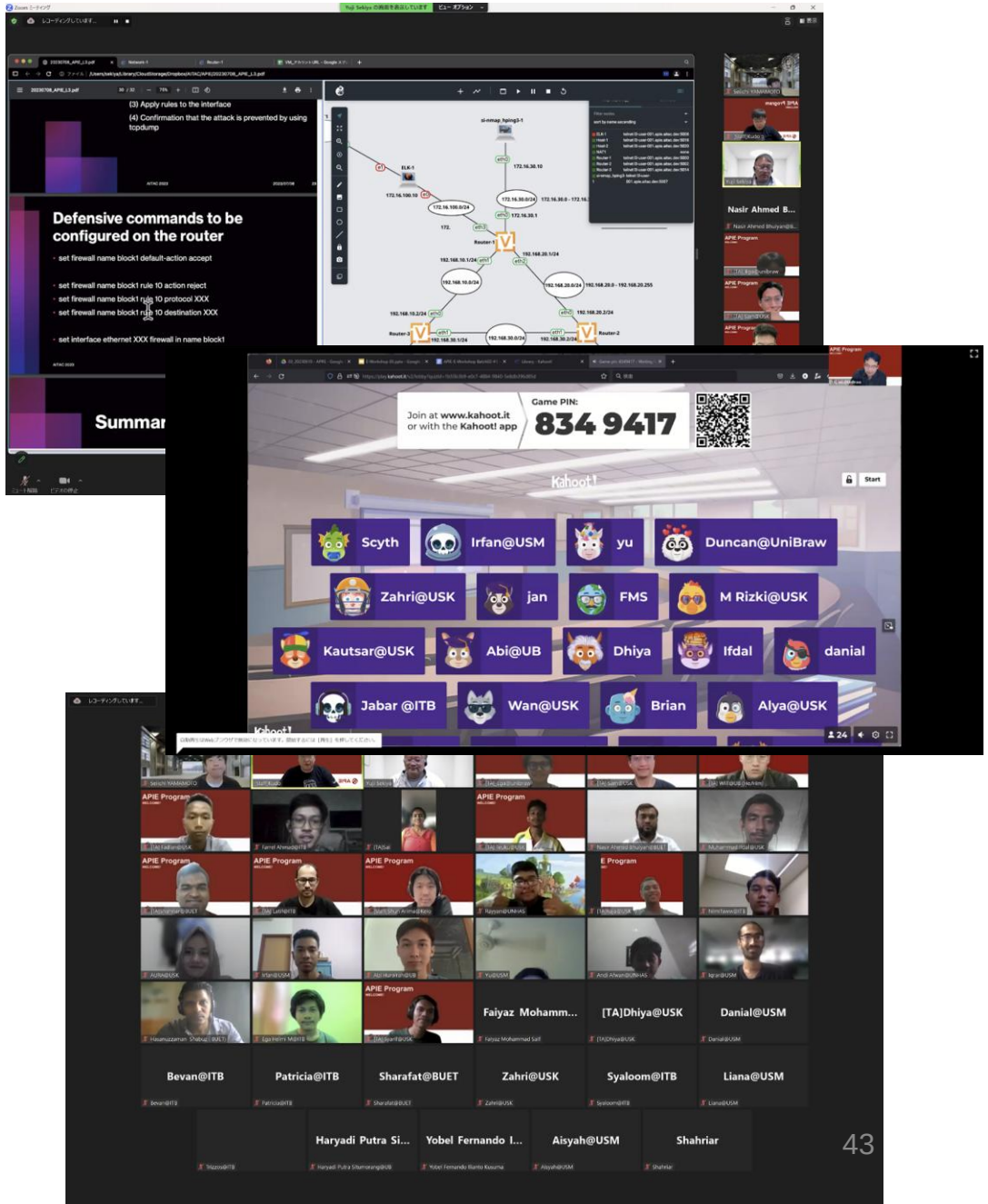
APNIC Academy & AITAC

#2 Operating the Internet

- w1: **Plan** your network
- w2: **Routing** and routers
- w3: **Switching** and physical connectivity
- w4: Managing the **name and address**
- w5: **IPv6** fundamentals

APIE E-Workshop

- Objectives
  - Community
  - Career
  - Hands-on
- Bi-Weekly session
  - Saturday 16:00-17:30(UTC+9)
- Contents
  - Guest lectures
  - Hands-on session by AITAC
    - Batch01,02
  - Interop Tokyo Shownet virtual visit (video and VR tour)
  - QA and discussion in breakout room
  - Quiz session by TAs



APIE Camp:
5-day project-based hands-on program

Day1

Network deployment

Day2

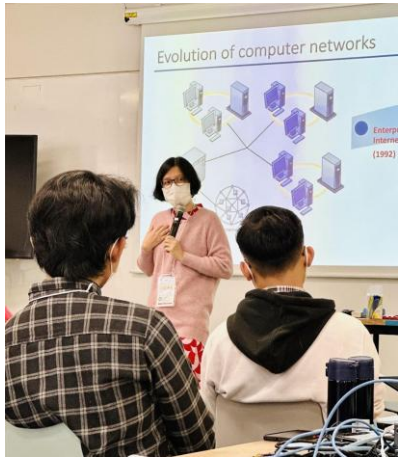
Virtualization

Day3

DNS

Day4

Cloud computing & AWS



Day5

Summary & SOC visit


APIE
05TH
ASIA PACIFIC INTERNET
ENGINEERING CAMP

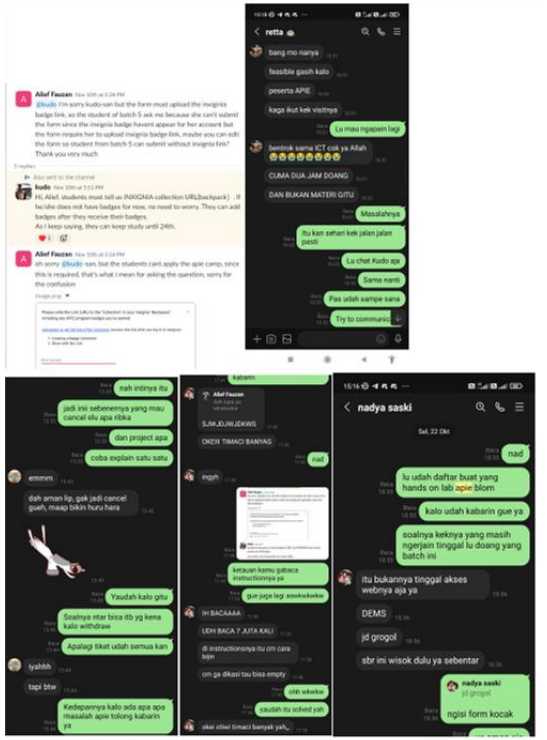
APIE-Internship

Stay connected with the community and provide opportunity to use the skills and knowledge from our learning.

- TA Internship for Batch#02/Batch#03
  - 11 interns for Batch#02
  - 8 interns for Batch#03
- Camp TA Internship
  - 6 interns for APIE Camp#02 @ ITB
- WIDE Camp network team Internship
  - 4 interns in September, 2023

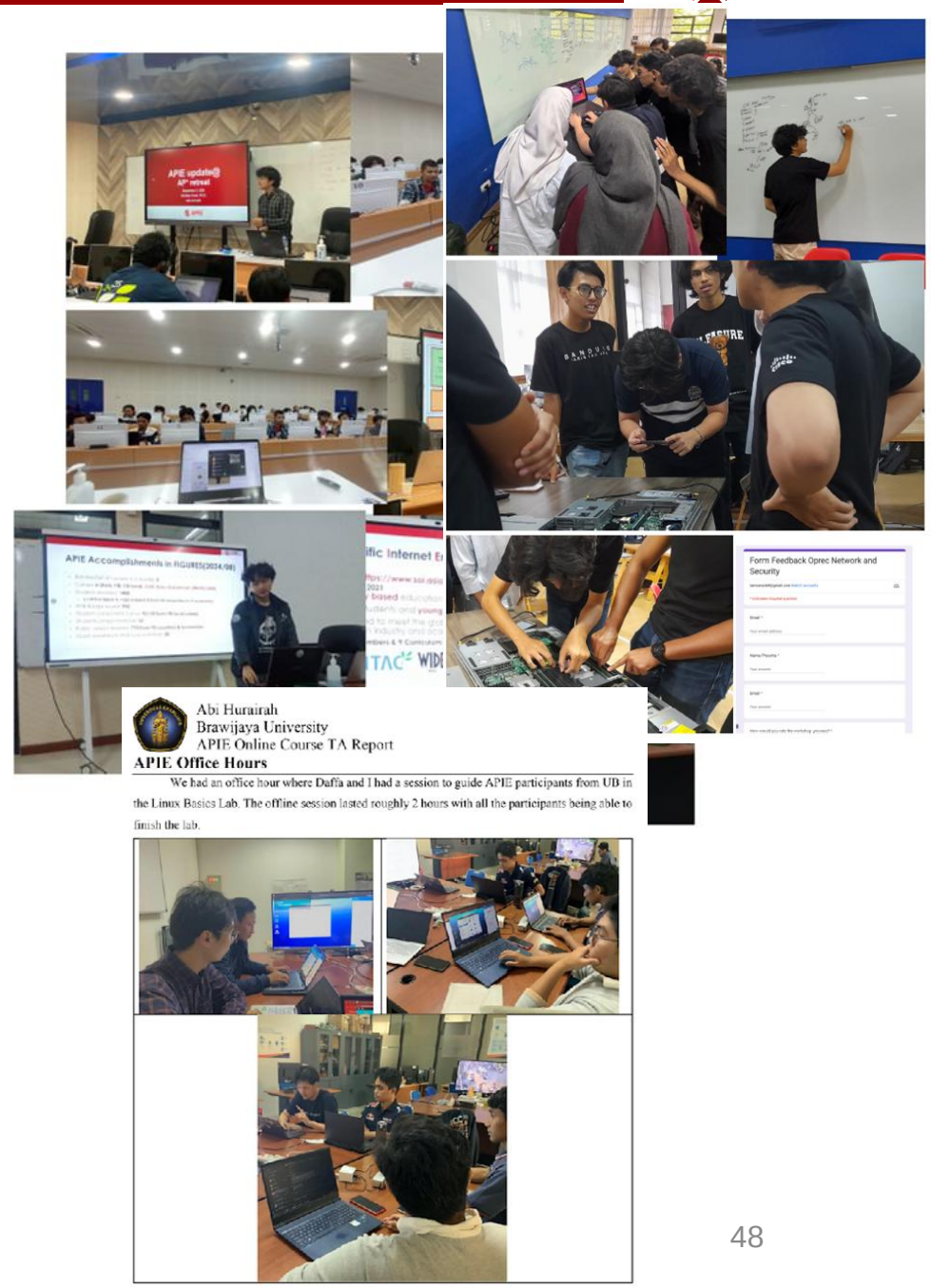
Teaching Assistant Internship

- About
  - To support learners, APIE camp alumnis are hired as TAs(10-12 TAs in each batch)
- How
  - Help students in E-Workshop/Hands-on
    - Breakout room support
  - Motivate students(Face to face, local whatsapp group etc)
    - Motivate them to stay in the activity
    - Answer questions in local language
    - Local chat/communication group
  - Local events to promote the program
    - Invite more students to program



Local events by TAs

- ITB case
  - Information session in the ITB courses
  - Face to Face event to setup network in Lab.
- UB case
  - APIE office hours in UB
  - IDREN network setup events
- USM case
  - TA wanted to host APIE Camp!
- Other cases
  - Local AITAC OSPF lab session



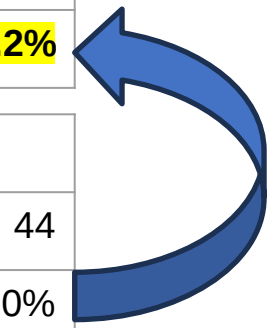
Teaching Assistant Internship

- Important results
  - Number of students completing the program increased.
  - Also, staff can monitor status of learning, problems or request from learners at each university more carefully
  - TAs are also re-learning skill/knowledge and get more practical skills to operate their knowlege!

From APIE entry to Completing the Understanding the Internet

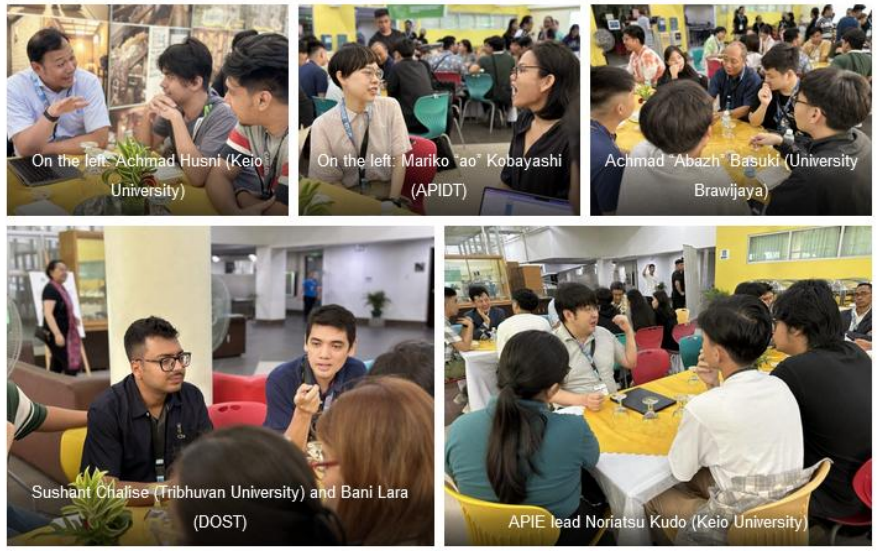
Batch04	Registered for batch	FL_registration	FL_used	FL_complted
Number	564	470	383	204
Transition rate	100.0%	83.3%	67.9%	**36.2%**

Batch03	Registered for batch	FL_registration	FL_used	FL_complted
Number	293	136	101	44
Transition rate	100.0%	46.4%	34.5%	15.0%



Meet the engineer at USC

- June 2024 at USC
- Invite APIE learners at USC to the SOI Asia meeting
  - To discuss freely with engineers, researchers, and SOI Asia people
- Local coordination by one of TA in Batch04.



APIE Camp NOC team

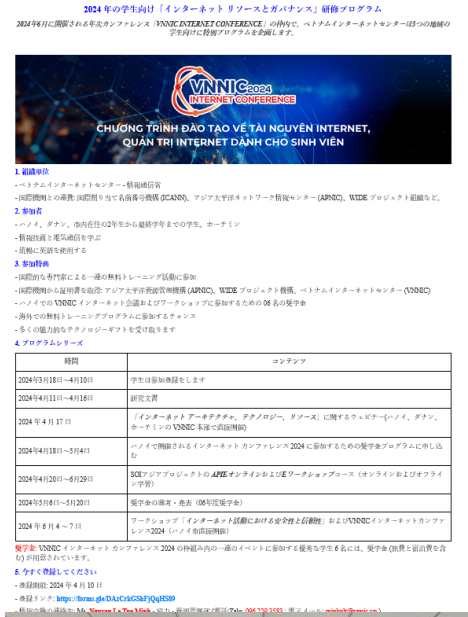
- About
  - APIE Camp alumni team to provide APIE camp exercise infrastructure (network, hypervisor, documents) and lecture hands-on.
  - **Camp contents is now updated by past learners**
- Activity
  - Design and deploy network for APIE camp
  - Design and Provides hands-on in Day 2 as lecturers
- Result
  - Started from APIE camp05(USK, November 2024)
    - NOC team(**USK**/host, **UNHAS**/past, **UB**/next, and **Keio(iU))**
    - Higher-level engineer who can operate camp network infrastructure
    - A network which students can try something new and field for the research

Hayabusa's research on Camp Network (NOC outputs)

- AINTEC
  - Kurazumi, Y., Uchida, Y., Arima, S., Kudo, N., & Okawa, K. (2024, August). Examining Technologies to Reduce Response Time in Hands-on Exercise Environment Over Widely Distributed Computer Network Utilizing RENs. In *ASIAN INTERNET ENGINEERING CONFERENCE 2024* (pp. 36-45)
- Poster presentation about NOC activity in Open Research Forum at Keio Univ (2023,2024)

VNNIC collaboration in 2024

- VNNIC promoted the program and provided support for learners
  - Promote APIE program Batch04 to VNNIC related universities
  - Office and engineer who support learners in local language during the batch 04 (April-June,2024)
- VNNIC also nominated students to APIE Camp
  - 2 students participated APIE Camp UNHAS
  - 1 student participated APIE Camp USK
  - 1 student participated APIE Camp UB


2024 年の学生向け「インターネット リソースとガバナンス」研修プログラム

2024年6月に開催される年次カンファレンス「VNNIC INTERNET CONFERENCE」の枠内で、ベトナムインターネットセンターは3つの地域の学生向けに特別プログラムを企画します。

VNNIC2024 INTERNET CONFERENCE

CHƯƠNG TRÌNH ĐÀO TẠO VỀ TÀI NGUYÊN INTERNET, QUẢN TRỊ INTERNET DÀNH CHO SINH VIÊN

1. 組織単位
- ベトナムインターネットセンター - 情報通信省
- 国際機関との連携: 国際割り当て名前番号機構 (ICANN)、アジア太平洋ネットワーク情報センター (APNIC)、WIDE プロジェクト組織など。

2. 参加者
- ハノイ、ダナン、市内在住の2年生から最終学年までの学生、ホーチミン
- 情報技術と電気通信を学ぶ
- 流暢に英語を使用する

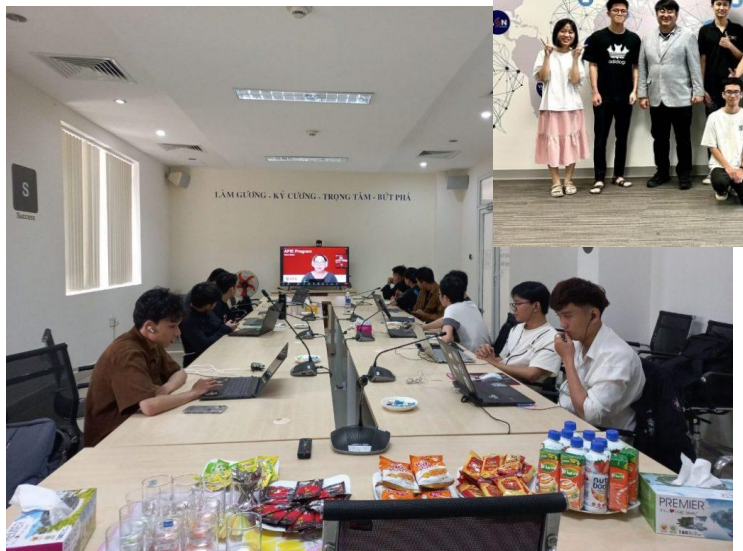
3. 参加特典
- 国際的な専門家による一連の無料トレーニング活動に参加
- 国際機関から証明書を取得: アジア太平洋資源管理機構 (APNIC)、WIDE プロジェクト機構、ベトナムインターネットセンター (VNNIC)
- ハノイでの VNNIC インターネット会議およびワークショップに参加するための 06 名の奨学金
- 海外での無料トレーニングプログラムに参加するチャンス
- 多くの魅力的なテクノロジーギフトを受け取ります

4. プログラムシリーズ

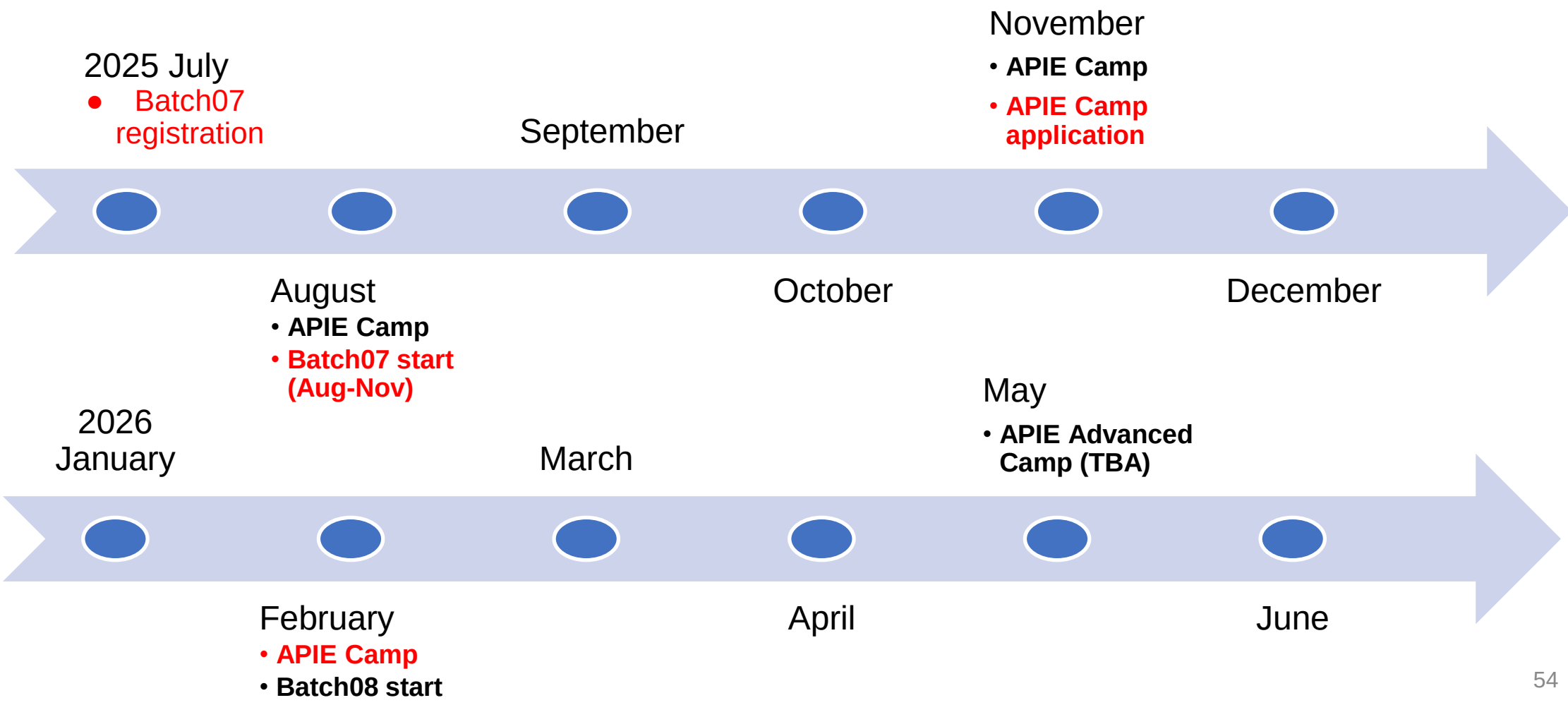
時間	コンテンツ
2024年3月18日～4月10日	学生は参加登録をします
2024年4月11日～4月16日	研究文書
2024 年 4 月 17 日	「インターネット アーキテクチャ、テクノロジー、リソース」に関するウェビナー(ハノイ、ダナン、ホーチミンの VNNIC 本部で直接開催)
2024年4月18日～5月4日	ハノイで開催されるインターネット カンファレンス 2024 に参加するための奨学金プログラムに申し込む
2024年4月20日～6月29日	SOJアジアプロジェクトの APIE オンラインおよび E ワークショップコース（オンラインおよびオフライン学習）
2024年5月6日～5月20日	奨学金の展示・発表（06年度奨学金）
2024 年 6 月 4 ～ 7 日	ワークショップ「インターネット試験における安全性と信頼性」および VNNIC インターネット カンファレンス 2024（ハノイ市直接開催）

奨学金: VNNIC インターネット カンファレンス 2024 の枠組み内の一連のイベントに参加する優秀な学生 6 名には、奨学金 (旅費と宿泊費を含む) が用意されています。

5. 今すぐ登録してください。
- 登録期限: 2024 年 4 月 10 日
- 登録リンク: https://forms.gle/DAzCvkCSkFjQqHS89



2025-2026 Schedule (Tentative)

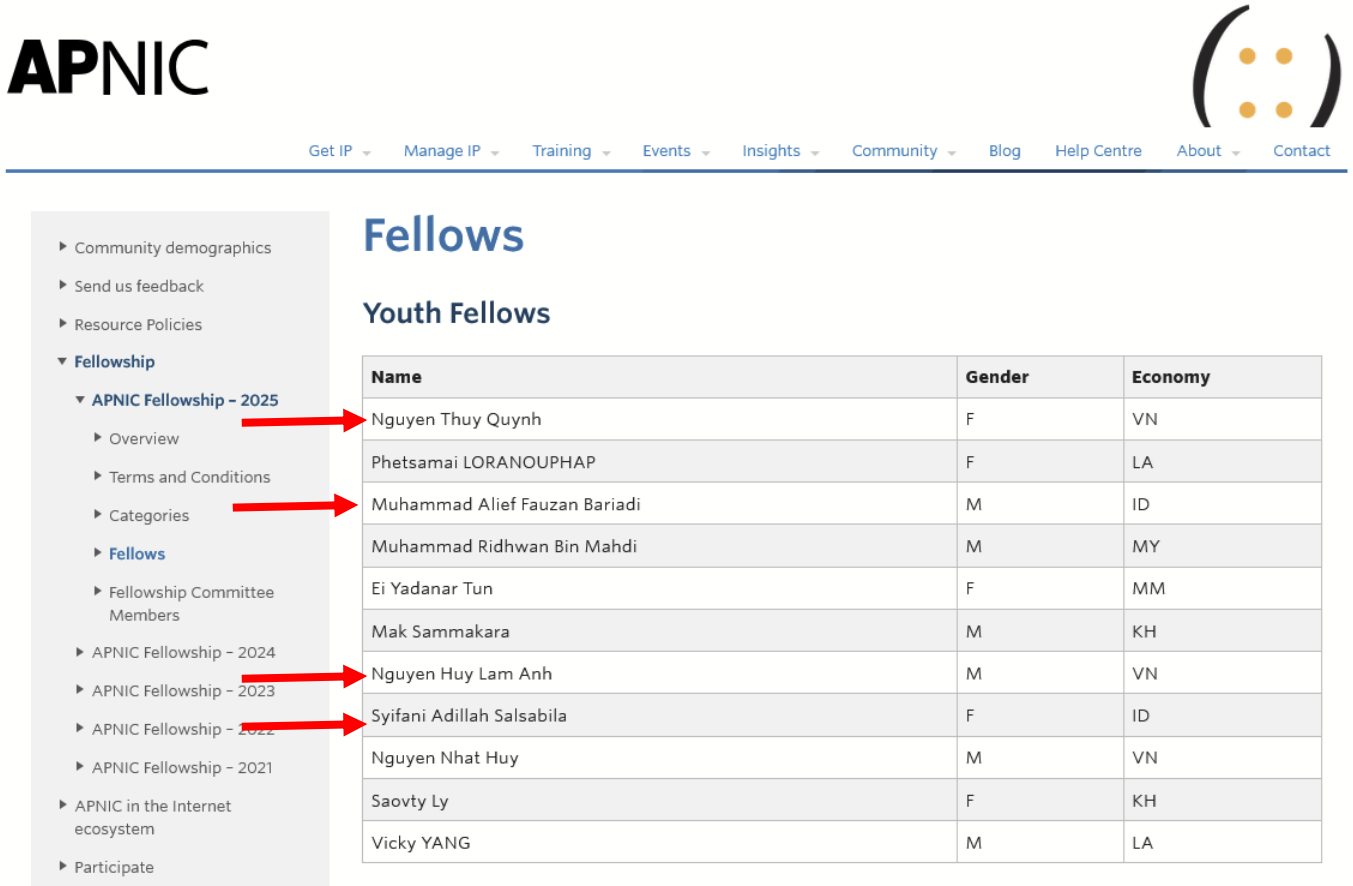


Batch07 details

- Registration and program guide will open in **July**
- We will make announcement when it becomes available via VNNIC.

More chances to participate the Internet

This year, many APNIC Fellows have studied in APIE program!



Thank You!

if you have questions, feel free to contact

apie-info@soi.asia