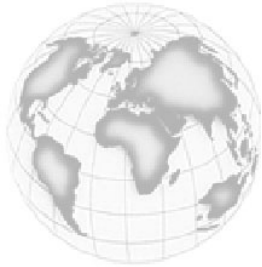


Internet Educational Equal Access Foundation



IEEAF Update

International ICFA Workshop HEP Networking, Grid and Digital Divide Issues for Global e-Science

**Daegu, Korea
May 24, 2005**

Dr. Donald R. Riley
Chair, IEEAF (www.ieeaf.org)
Univ. of Maryland
drriley@umd.edu

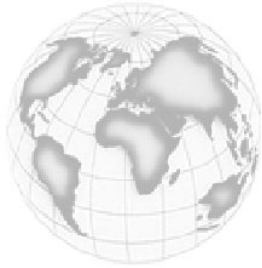
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IEEAF - What is it?

- U.S. 501.c.3 Not-for-profit corporation
<http://www.ieeaf.org/>
- Formed from original MOU between GEO (private sector) and CENIC (Corporation for Educational Networking in California)
- Vision: **Accelerate the global growth of Internet2 to achieve "universal educational access"** to:
 - Enable and stimulate the rapid **expansion of research and educational collaboration** in many forms between teaching and learning institutions around the world.
 - Cultivate and promote practical solutions to delivering scalable, **universally available and equitable access to suitable bandwidth and necessary network resources** in support of these collaborations.

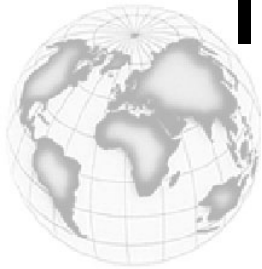
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New Public-Private Partnership: IEEAF

- The IEEAF goal is to leverage unique private sector relationships to obtain donations of international bandwidth to enable a global collaboration in research and education.
- Current donations have already linked US and Europe, US and Asia-Pacific, and produced fiber assets in US and Europe.
- This bandwidth helps enable global collaborations in research and education, in the true spirit of the “Global Quilt.”

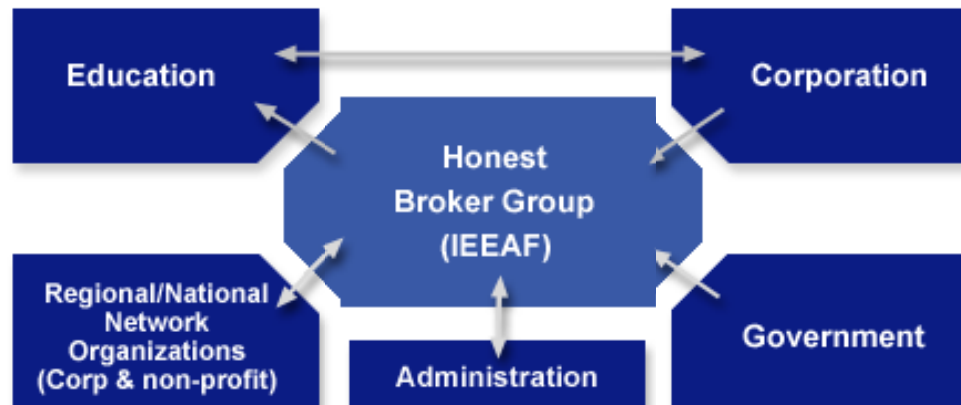
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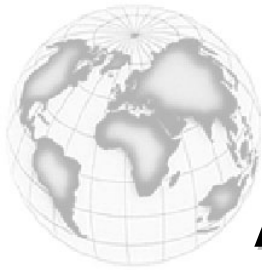
IEEAF Organization

Honest Broker Group (IEEAF)

- Accepting assets
- Matching Corp assets w/Educational needs
- Advocate for assets on behalf of Education
- Granting of assets as Free Use licenses



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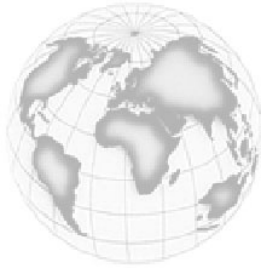
IEEAF Vision: The Global Quilt

A Network of Networks, “stitched together” to create a common single fabric, and shared equally by all. This will be achieved through collaboration and community effort, until it covers the globe.

The IEEAF has no boundaries of “home” territory.....

"Non Nobis Solo"
(Not by ourselves alone)

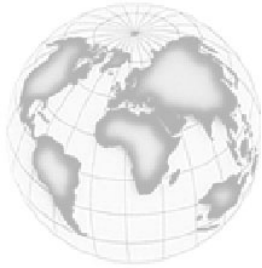
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IEEAF - How does it work?

- Partner with various organizations on strategies, specific initiatives
- Leverage global deregulation and new entrants into telco business
- Leverage private sector business relationships
 - Geographic Network Affiliates, Inc. (GEO)
- Build donations into business deals (contracts) as no-cost IRUs

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GEO - The Catalyst

GEO builds carrier hotel buildings and supports the IEEA Foundation goals which include helping to solve the digital divide.



Government
“The Need”



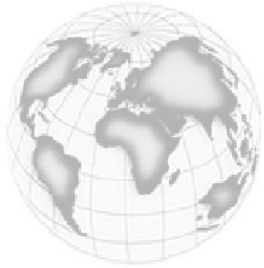
+

Universities

Submarine Fiber
“The Wet”

Terrestrial Fiber
“The Dry”

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IEEAF - What does it do?

- Gets donated communications assets
- Makes them available to existing institutions and networking organizations to put to work
- Vehicle: Asset Steward Agreement

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Think Globally – Act Locally

Strategic

Opportunistic



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Successes: The Netherlands Model

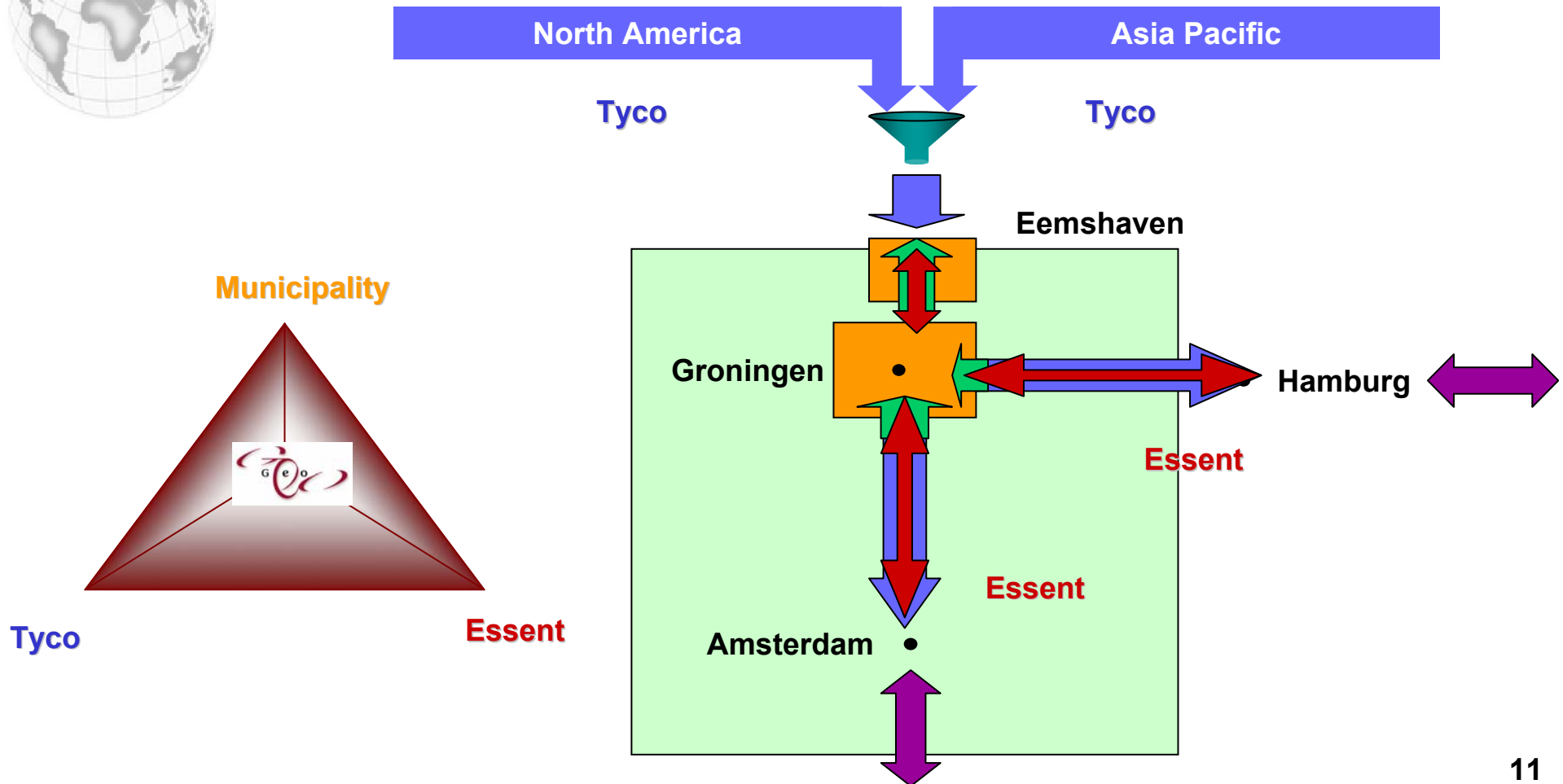
- New cable landing: Eemshaven
- New carrier hotel: Groningen
 - Zernicke Research Park adjacent to University of Groningen
 - Groningen Internet Exchange (GNIX)
- New fiber backhaul to major Internet exchanges
 - Essent Kabelcom
 - Amsterdam to Groningen to Hamburg
- New R&D and Economic Development Opportunities



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Groningen: Wet meets Dry = Opportunity



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Groningen Carrier Hotel: March 2002

- March 2002

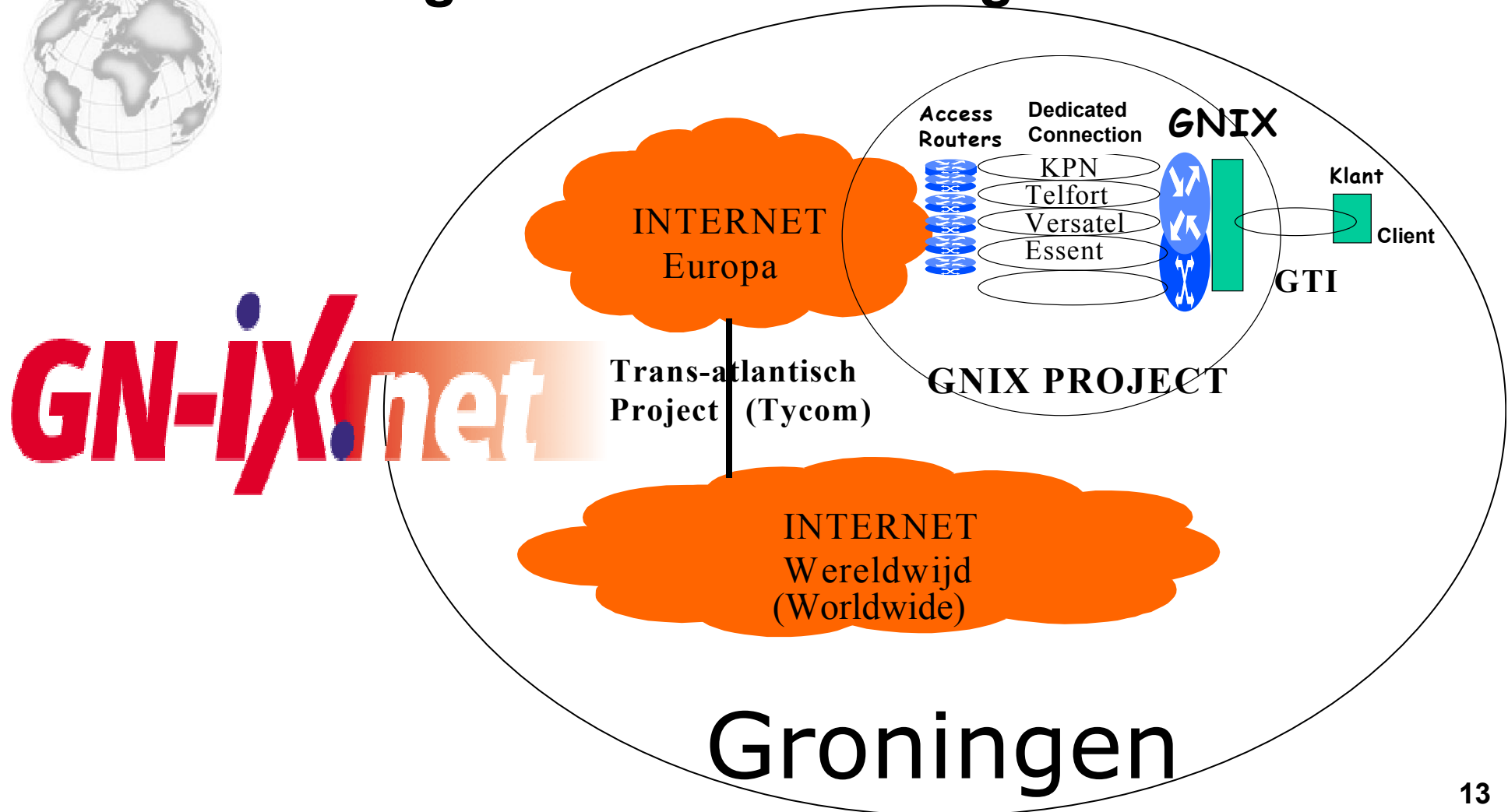
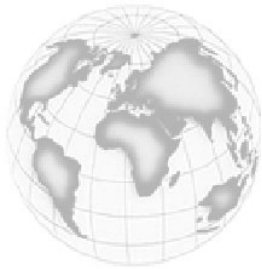
- February 2001



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GroNingen Internet eXchange





Zernike Science Park Technology Park

Technology Gateway to the Netherlands and Beyond



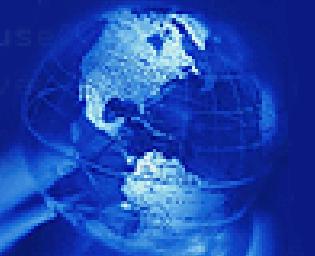
Internet Educational Equal Access Foundation



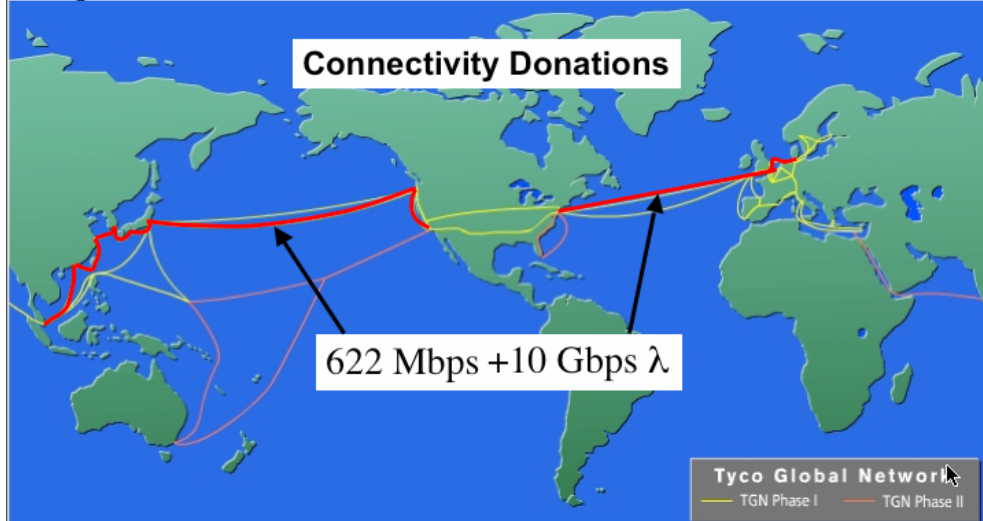
Tyco Telecomm Donation Summary

- Co-location space in NYC for Expanded International Exchange Point
- Production R&E Bandwidth: 622 Mbps
 - NYC-London-Groningen (Netherlands)
 - Connects to IEEAF fiber to Amsterdam and Hamburg
 - Seattle-Tokyo
- Research 10 Gbps optical wavelength
 - NYC-London-Groningen (Netherlands)
 - Seattle-Tokyo
- 200sq.ft. Co-location space in each of global facilities
- Additional donations committed
 - Seoul, Shanghai, Taipei, Hong Kong, and Singapore

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Tyco Global Network



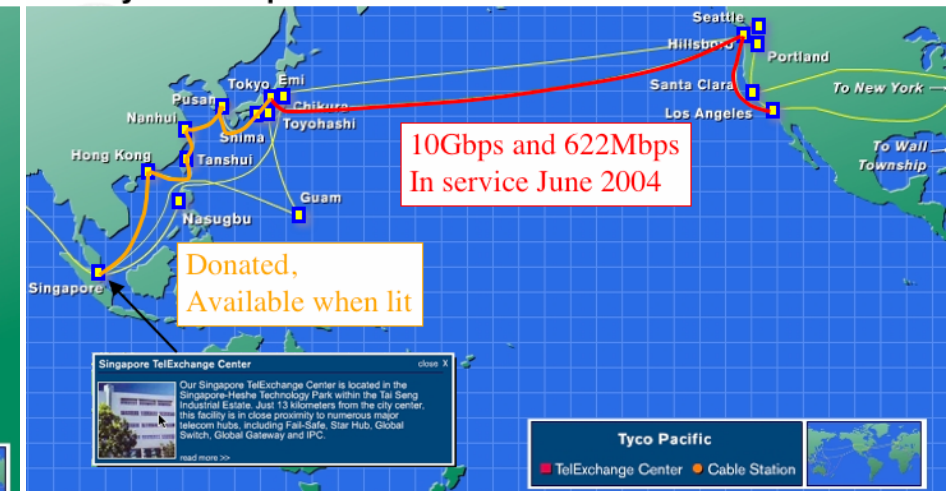
Tyco Atlantic Donation



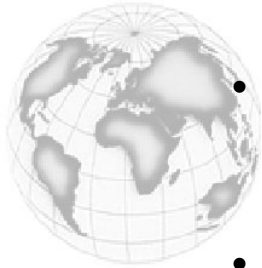
Tyco Northern Europe Donation



Tyco Transpacific Donation



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IEEAF Donation Summary

- 10 Gbps λ (OC-192 wavelength) plus separate 622 Mbps STM-1.
 - New York - London - Groningen (Netherlands)
 - Seattle - Tokyo
- Fiber pair: from Tyco Cable Station Groningen-Amsterdam, Groningen-Hamburg
- Fiber pair: Hamburg facility to 379 Weinderstrasse carrier hotel, where “German rings” meet
- Fiber pair: UK
- 8,000 miles of trans-USA fiber donated by AT&T to the Southeastern Universities Research Association (SURA) as SURA-IEEAF partnership.
- Submarine bandwidth in progress:
 - To Lisbon
 - UK-Bilbao-Madrid-Valencia-Barcelona-Marseilles
 - To Copenhagen and St. Petersburg
- A new 10 gigabyte trans-Atlantic connectivity which GEO will use specifically for telemedicine and HEP initiatives.

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More Donations Pending

- The IEEAF is currently in negotiations for 40+ pending donations that may potentially double the size of the Global Quilt Initiative.
- Negotiations for donations are being supported by a global community of Research and Education Visionaries:
 - to Southeast Asia
 - in Eastern Europe
 - to Scandinavian/Nordic countries
 - to India and South Asia
 - to Africa

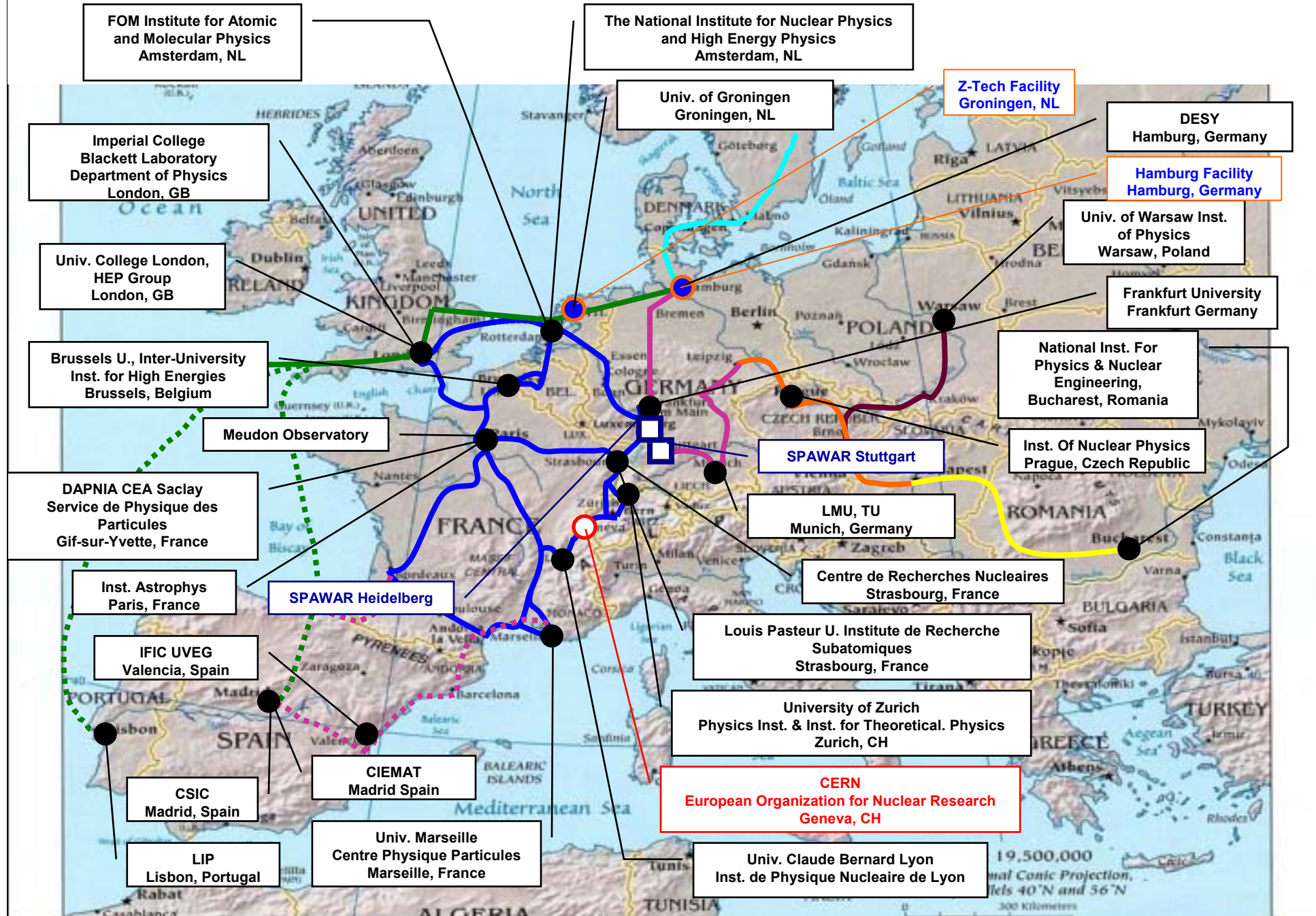
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Partnerships Create Donations

- We're here to help any community trying to establish educational networks
- We're successful because of the partnerships with leaders who share our vision
- It's the partnerships that make it happen. Joining hands completes the ring.....
 - A network of networks....
 - Community to community and village to village...
 - **The Global Quilt**

IEEAF 7,000 Kilometer Trans-European Donation



Internet Educational Equal Access Foundation



GEO has Acquired More New Assets:



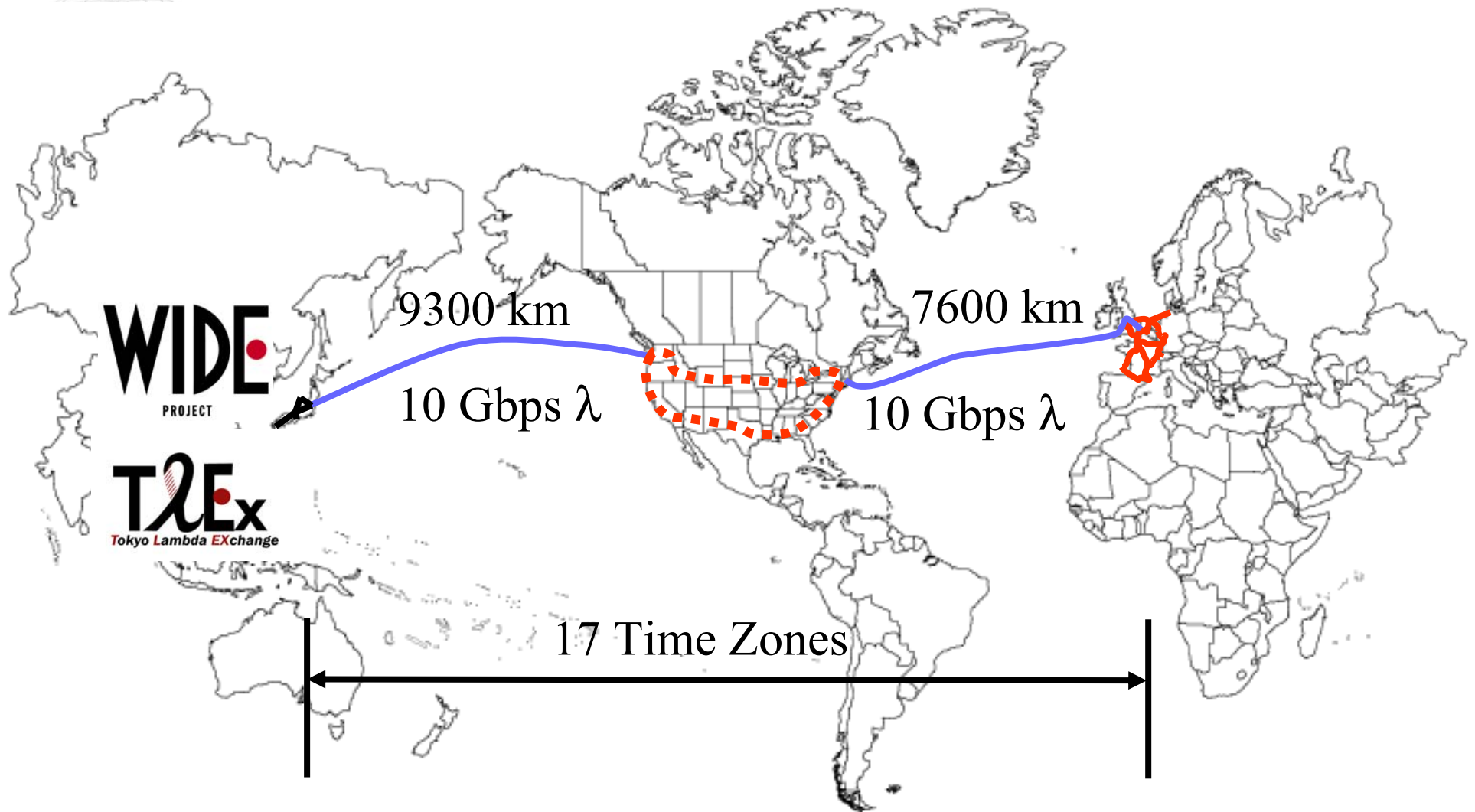
1. A new 10 gigabyte trans-Atlantic connectivity which GEO will use specifically for telemedicine and HEP initiatives.
2. 40 strands of fiber from the Tyco Cable Station to Hamburg, Germany.
3. A new 30 million dollar 70,000 square foot tech facility in Hamburg.



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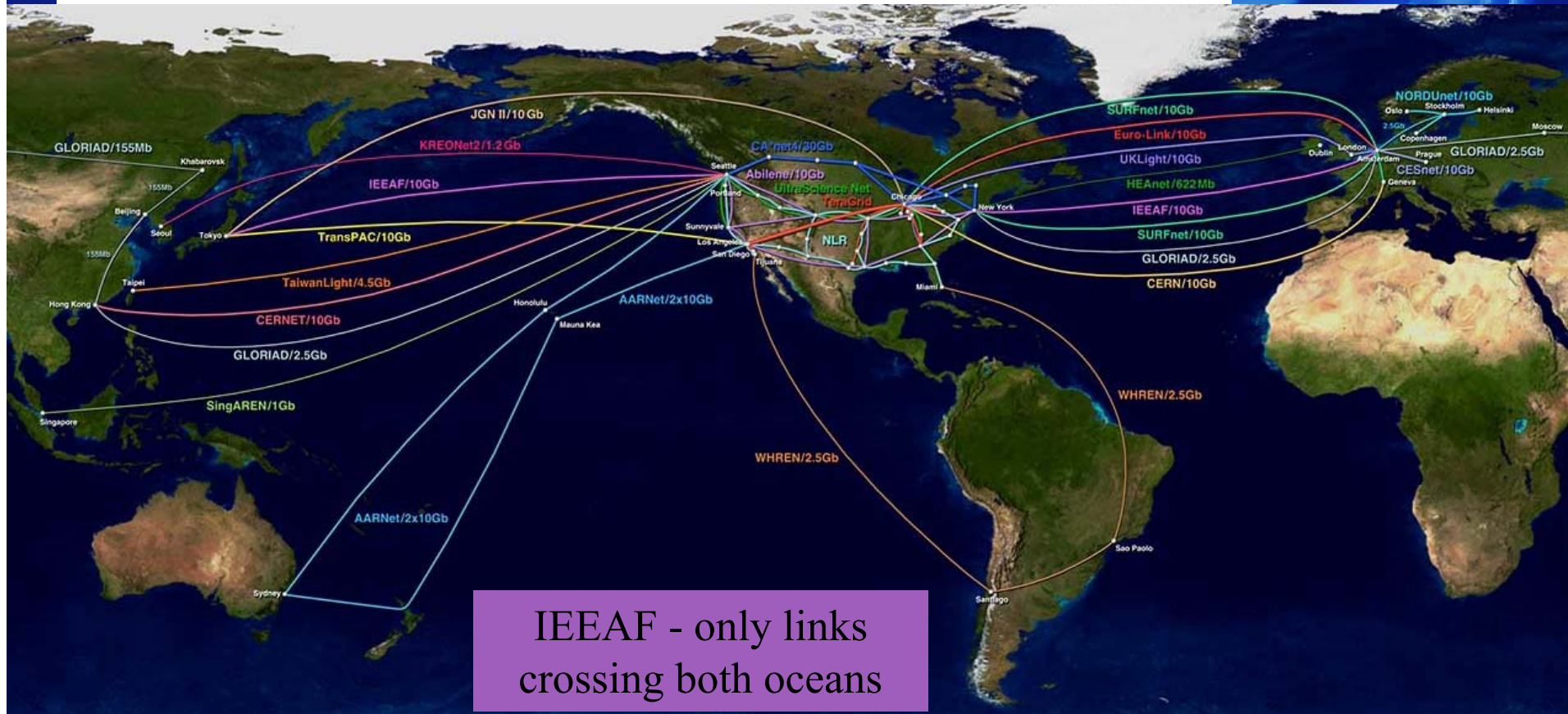


IEEAF Global Quilt Initiative



Internet Educational Equal Access Foundation

Global Lambda Integrated Facility: GLIF World Map – December 2004



Predicted international Research & Education Network bandwidth, to be made available for scheduled application and middleware research experiments by December 2004.

www.glif.is

Visualization courtesy of
Bob Patterson, NCSA.

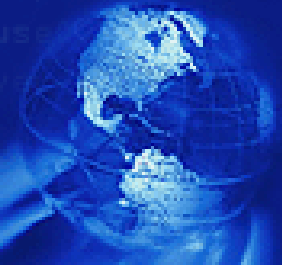
Internet Educational Equal Access Foundation



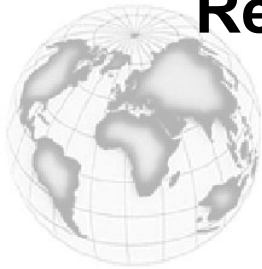
Impact of IEEAF TransPacific Link and Partnership with WIDE

- Enabling of Research and Testbeds between Asia Pacific and U.S.
- Tokyo Lambda Exchange (T-LEX)
- Asian Extensions

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Recent Global Collaborations over IEEAF Links



2005.01.18

Presentation by Prof. Larry Smarr for JGN Symposium over uncompressed HD Video Conference, Seattle-Osaka

2005.01.14

International Collaboration results in successful transfer of Huygens space probe data from Australian telescopes to the Netherlands

<http://mail.canarie.ca/MLISTS/news2005/0134.html>

2004.11.09

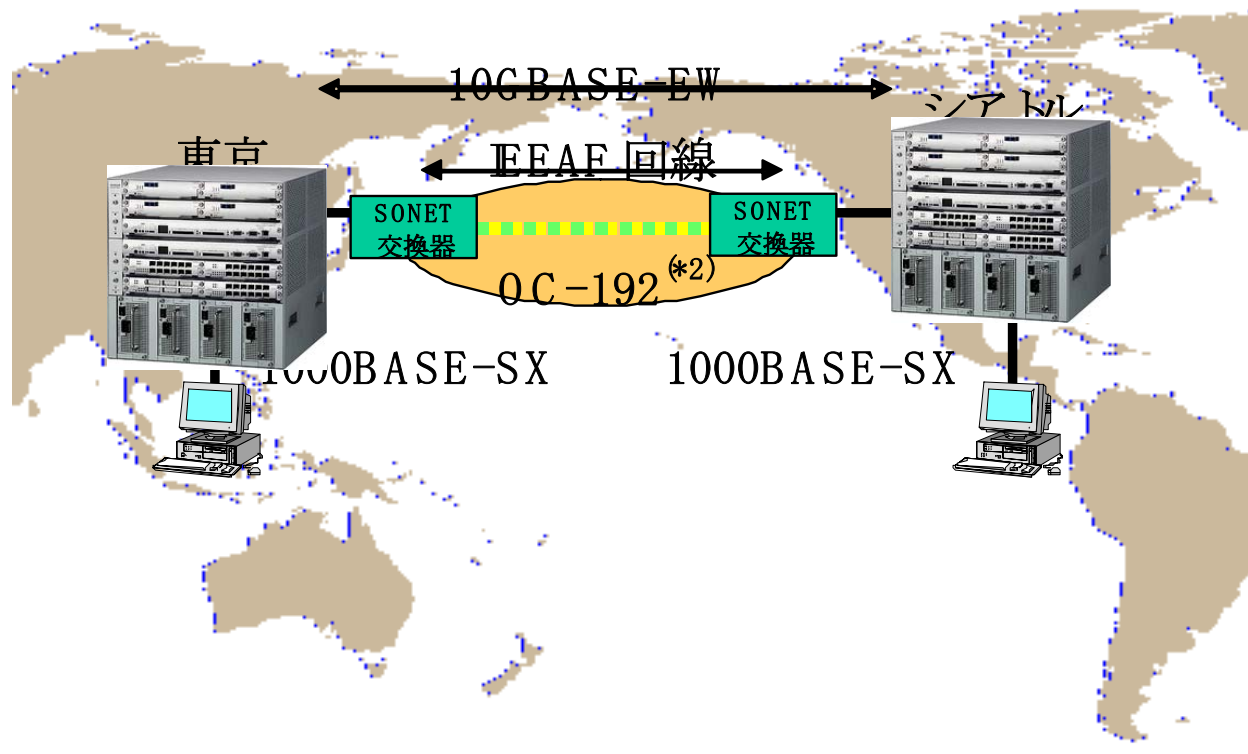
Supercomputing '05, Pittsburgh. Internet2 Single Stream TCP Land Speed Record.

<http://data-reservoir.adm.s.u-tokyo.ac.jp/lsr/>

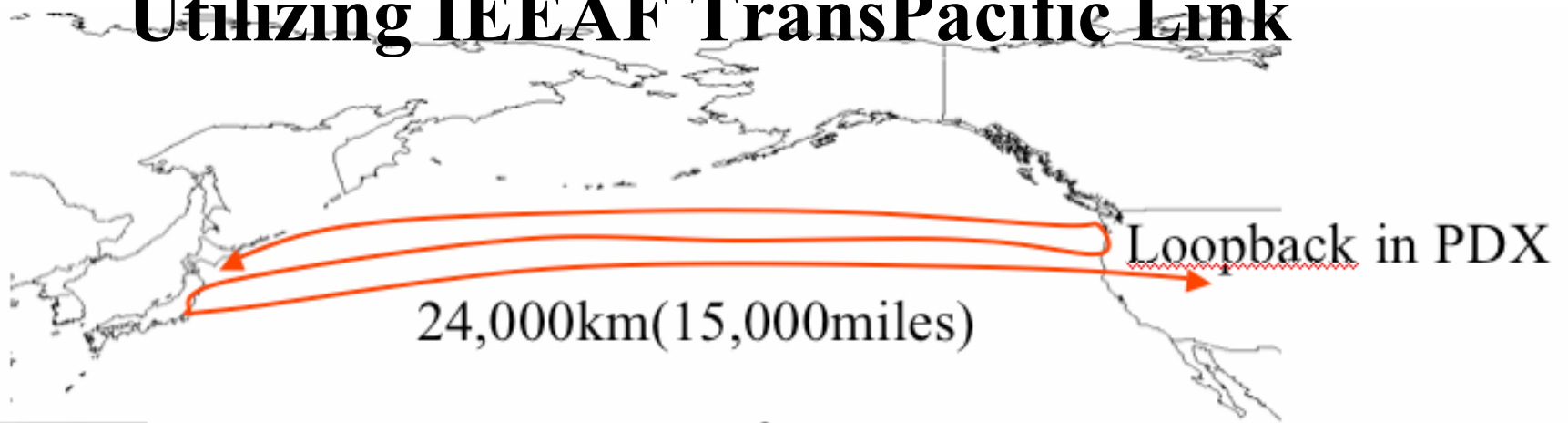
<http://members.internet2.edu/newsletter.cfm?date=2005-01-01#18>

IEEAF Wan-Phy test: Seattle-Tokyo

- The first 10GbE WAN-PHY between US-JP
- On IEEAF OC-192 Tokyo-Seattle TransPacific link
- Hitachi GS4000 10GE-WANPHY



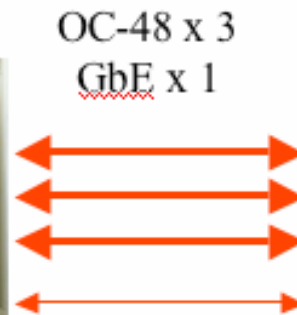
Data Reservoir Project (U-Tokyo) at SC2003: One of Land-Speed Record Awardees Utilizing IEEAF TransPacific Link



15,680km (9,800miles)



Juniper
T320



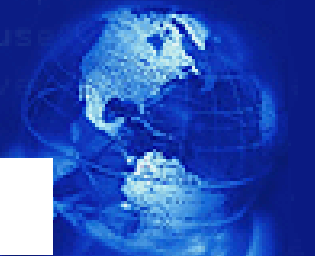
8,320km
(5,200miles)



iSCSI testing used IEEAF

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Data Reservoir Project - Prof. Kei Hiraki



SC2004

CERN - [AMS] - [ORD] - [SEA] - [T-LEX] - APAN/JP - TransPAC/ORD - Abilene/ORD - Abilene/PIT - SCinet

31,248km total length -- **measured at 20,645km by LSR rule**

7.21Gbps, 148.85 Pbit-m/s

Dec 2004

Retry with ***improved*** configuration

T-LEX - [SEA] - ORD - AMS - Abilene/JFK - Abilene-ORD - TransPAC/ORD - APAN/JP - T-LEX

One in Christmas evening -- Least usage on Abilene expected

Measured at 30,000km by LSR rule

7.21 Gbps, 216.3 Pbit-m/s

Won LSR award

Single TCP IPv4

Multiple TCP IPv4

Oct 2004

First long-haul OC-192 test

U-Tokyo - T-LEX- [SEA] - [ORD] - [AMS] - CERN

[] indicate layer-1 relay

NI40G WANPHY's between T-LEX and CERN

18,500km

7.57 Gbps single TCP memory - memory

between a set of Opteron servers

9 Gbps multiple TCPs disk - disk

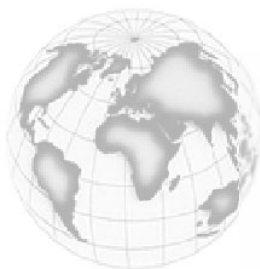
between a set of 9 Xeon servers



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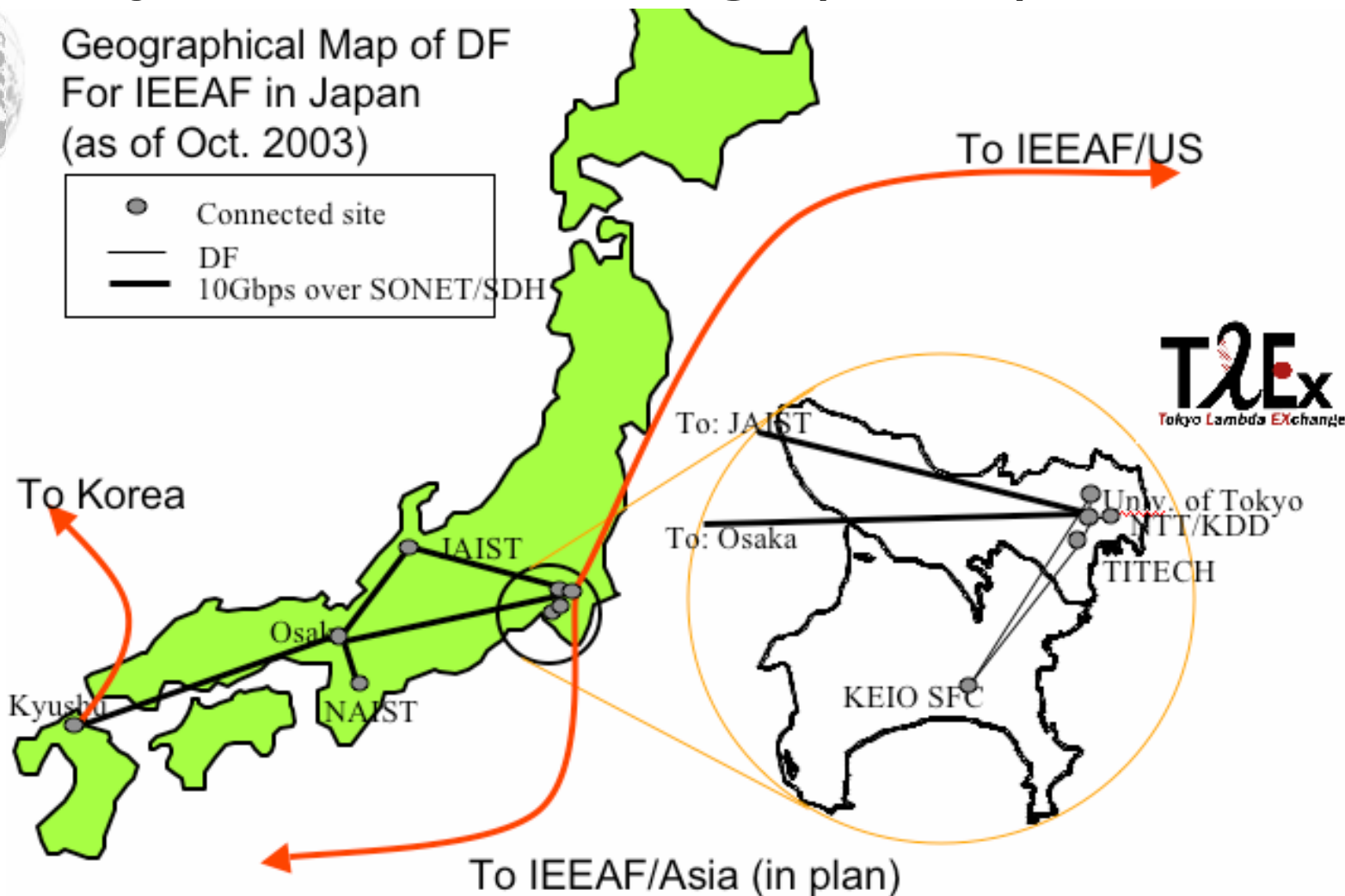


Tokyo Lambda Exchange (T-LEX)

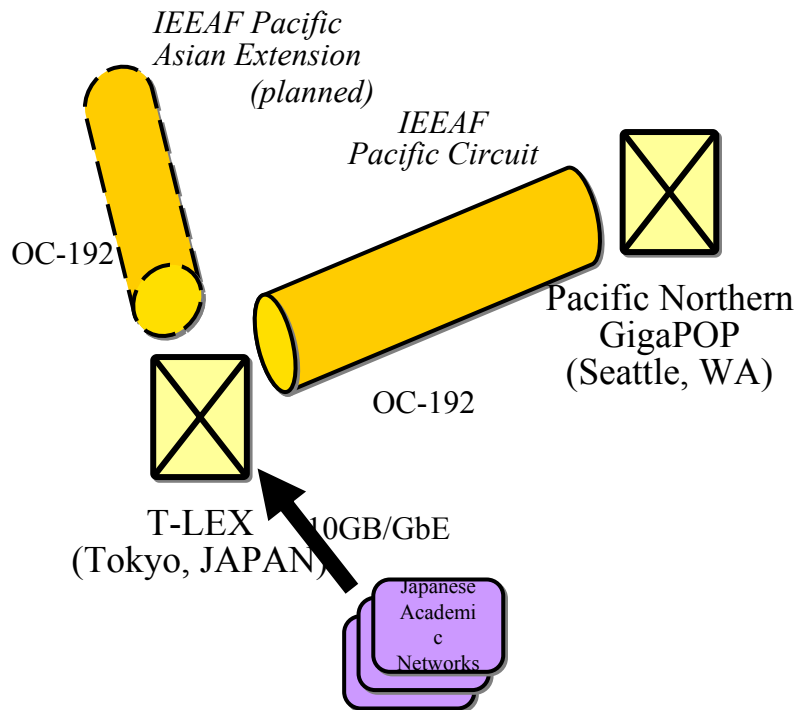


Geographical Map of DF
For IEEAF in Japan
(as of Oct. 2003)

- Connected site
- DF
- 10Gbps over SONET/SDH



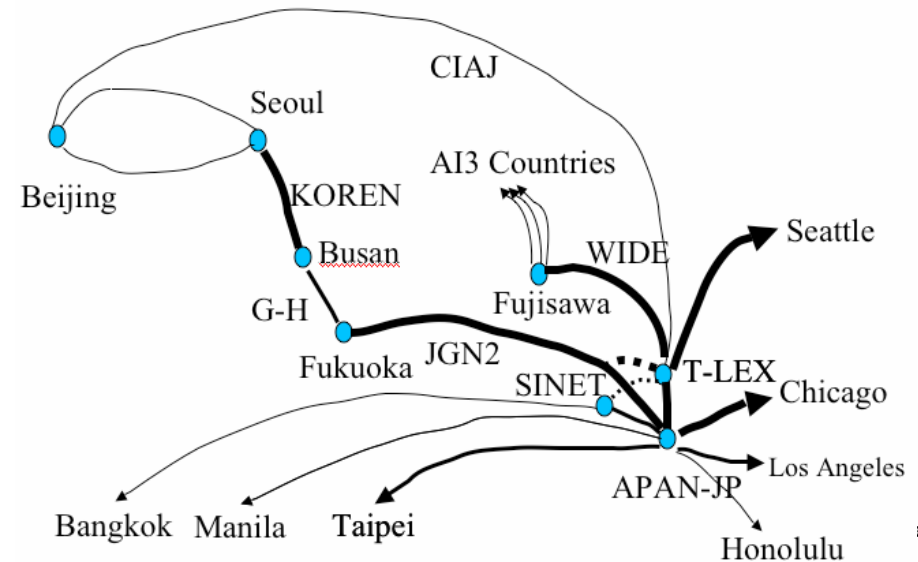
Tokyo Lambda Exchange(T-LEX)



Current Participants of T-LEX

Participant	ASN	Access	IPv4	IPv6	Status
WIDE Project	2500	10GE	YES	YES	Operational
Dragon Tap	9407	FE	YES	YES	Operational
APAN-JP	7660	10GE	YES	YES	Operational
MAFFIN	18125	GbE	YES	YES	Operational
SINET	2907	GbE	YES	?	connected soon
JGN2	N.A.	10GE	N.A.	N.A.	connected soon

Connectivities from Tokyo



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JGN2 Symposium 2005

January 17-19, 2005
Osaka, Japan



The Keynote Presenter

Professor Larry Smarr



- Director of the California Institute for Telecommunications and Information Technology (Calit2)
- Principal investigator of the National Science Foundation-funded OptIPuter project.

The Keynote Presenter (another HD)

Professor Jun Murai



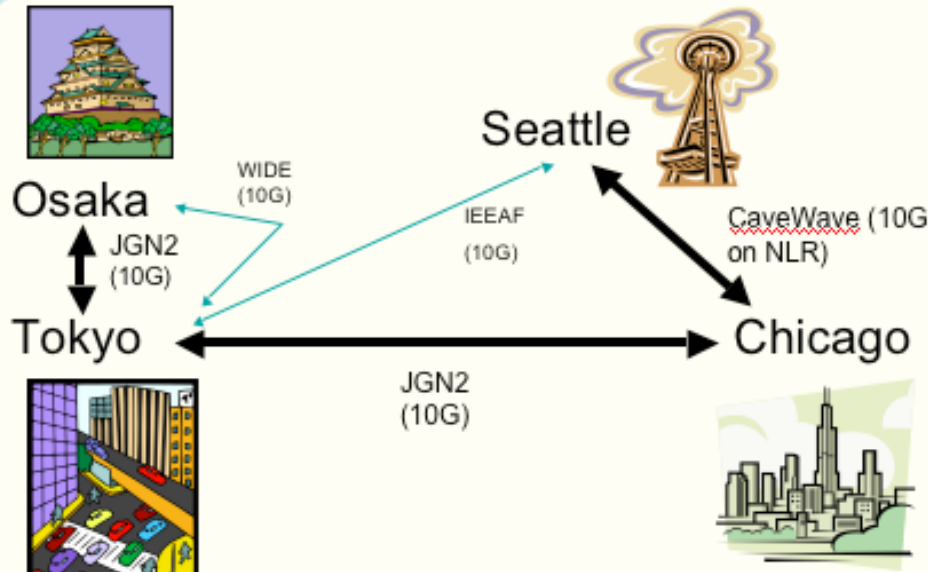
- Executive Director of KEIO SFC Research Institute.
- Adjunct Professor at the Institute of Advanced Studies, United Nations University
- President of the Japan Network Information Center (JPNIC)
- General Chairperson of the WIDE Project (a Japanese Internet research consortium)



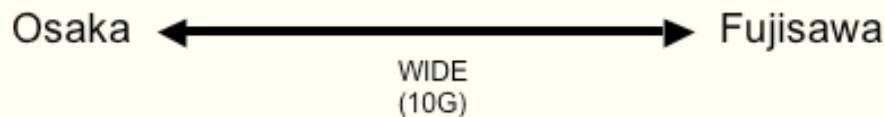
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Proposed Network Path



Proposed Network Path (another HD)



Presentation Time Zones

Osaka & Tokyo	GMT +9
Chicago	GMT -6
Seattle	GMT -8
Honolulu	GMT -10

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JGN2 Int'l circuit fiber cut (in Utah)

The News

Date: **Tue, 11 Jan 2005** 11:52:52 +0900
From: Jin Tanaka
To: Chris Robb, Linda Winkler
Subject: Re: (ieeaf-tokyo 1467) Re: Fwd: Re: Networking Request/Jan 17th 8:30PM HDVC Event

We APAN have assigned and configured two subnets on tpr4(Procket 8812) that terminates both the domestic and international JGN2 10G link as follows... **However, unfortunately, JGN2 international link has been downed due to the trouble in US local carrier now...**

Weather Report

January 11, 2005
St. George, Utah
Mostly Cloudy



St. George, UT (UPI) -- Flooding in southwestern Utah has washed away homes and led to evacuations as heavy rains and melting snow engorged the Santa Clara River...

What's Happening in the Area



What Happened to the Fiber

Fiber supporting the **JGN2 circuit to Chicago is cut**. No repair date/time available. The under river cable was carried away by the heavy rainfall. (It will take two days before a temporary fix is in place.)

AFTER

BEFORE



Internet Educational Equal Access Foundation



Video Transport Plan

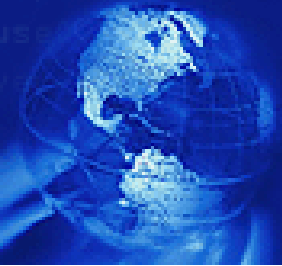
- **JGN2/CaveWave circuits**
 - primary 1.5Gbps uncompressed HD video (Seattle→Chicago→Tokyo)
- **IEEAF transpacific circuit**
 - compressed bidirectional 30Mbps MPEG2 HD video on a fully independent (minus last mile to the venue) link (Seattle←→Tokyo)
- **The IEEAF and JGN2/CaveWave paths** constructed to back each other up.
- **Video Backup:** Standard definition DVTS

IEEAF Circuit to Support All Video

New Configuration:

- IEEAF transpacific circuit as follows...
 - 2 GbE links for uncompressed HD video
 - 1 GbE link for compressed MPEG2 video & DVTS
 - 1 GbE link <backup>
 - JGN2 transpacific circuit
- The configurations done to-date for this path will be kept in place allowing this path to be used as a backup when/if the U.S. fiber cut repair is implemented and stable.

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Murai Keynote to Osaka

Smarr Keynote to Osaka



And Hawaii Group Watches



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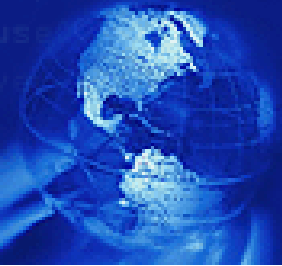
Smarr Keynote from Seattle



Prof. Smarr's Keynote

- "Using OptIPuter Innovations to Enable LambdaGrid Applications"
- www.researchchannel.org/jgn2

Internet Educational Equal Access Foundation



Jun Murai @ KEIO Univ



Date: September, 2004

JCSAT-3
C-band



KEIO

NAIST

TU

IOIT

NUOL

ASTI

AIT

USM

TP

ITB

UNIBRAW

Point-to-Point

C-band

Japan to Asia: 1.5 Mbps
 Asia to Japan: 512 Kbps
 (Keio to NUOL: 128 Kbps
 NUOL to Keio: 128 Kbps)

WIDE

JCSAT-3
C-band

Date: September, 2004

WIDE

KEIO

MUST

TU

BUET

IOIT

UCSY

NUOL

ASTI

CRMA

AIT

ITC

CHULA

PSU

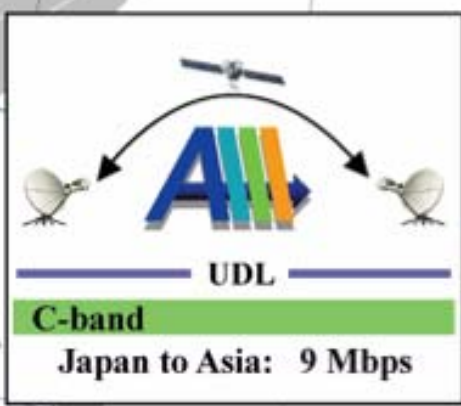
UNSRAT

AYF

UNHAS

ITB

UNIBRAW



AI3/School of the Internet Asia Partners

- 19 partners in 12 countries - SOI Asia partners (not including Japan/US/Europe and WIDE universities/facilities)
- SOI Asia Partners since 2001 (11)
 - Brawijaya University / Indonesia
 - Hasanuddin University / Indonesia
 - Sam Ratulangi University / Indonesia
 - Institute of Technology, Bandung / Indonesia
 - HELP Institute & AYF / Malaysia
 - University of Computer Studies, Yangon / Myanmar
 - National University of Laos / Laos
 - Asian Institute of Technology / Thailand
 - Chulalongkorn University / Thailand
 - Institute Of Information Technology / Vietnam
 - Advanced Science and Technology Institute / Philippines
- SOI Asia New Partners joining in 2004 (6)
 - Prince of Songklan University / Thailand
 - Chulachomklao Royal Military Academy / Thailand
 - Institute of Engineering, Tribhuvan University / Nepal
 - Bangladesh University of Engineering and Technology (BUET) / Bangladesh
 - School Of telecommunications and Information Technology / Mongol
 - Institute of Technology of Cambodia(ICT) / Cambodia
- AI3 Partners
 - Universiti Sains Malaysia (USM) / Malaysia
 - Temasek Polytechnic (TP) / Singapore


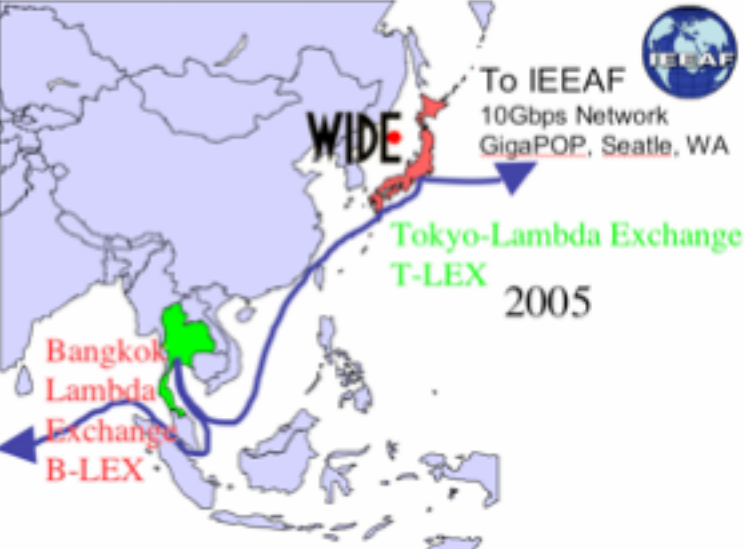


SOI-ASIA Partners Satellite Antenna

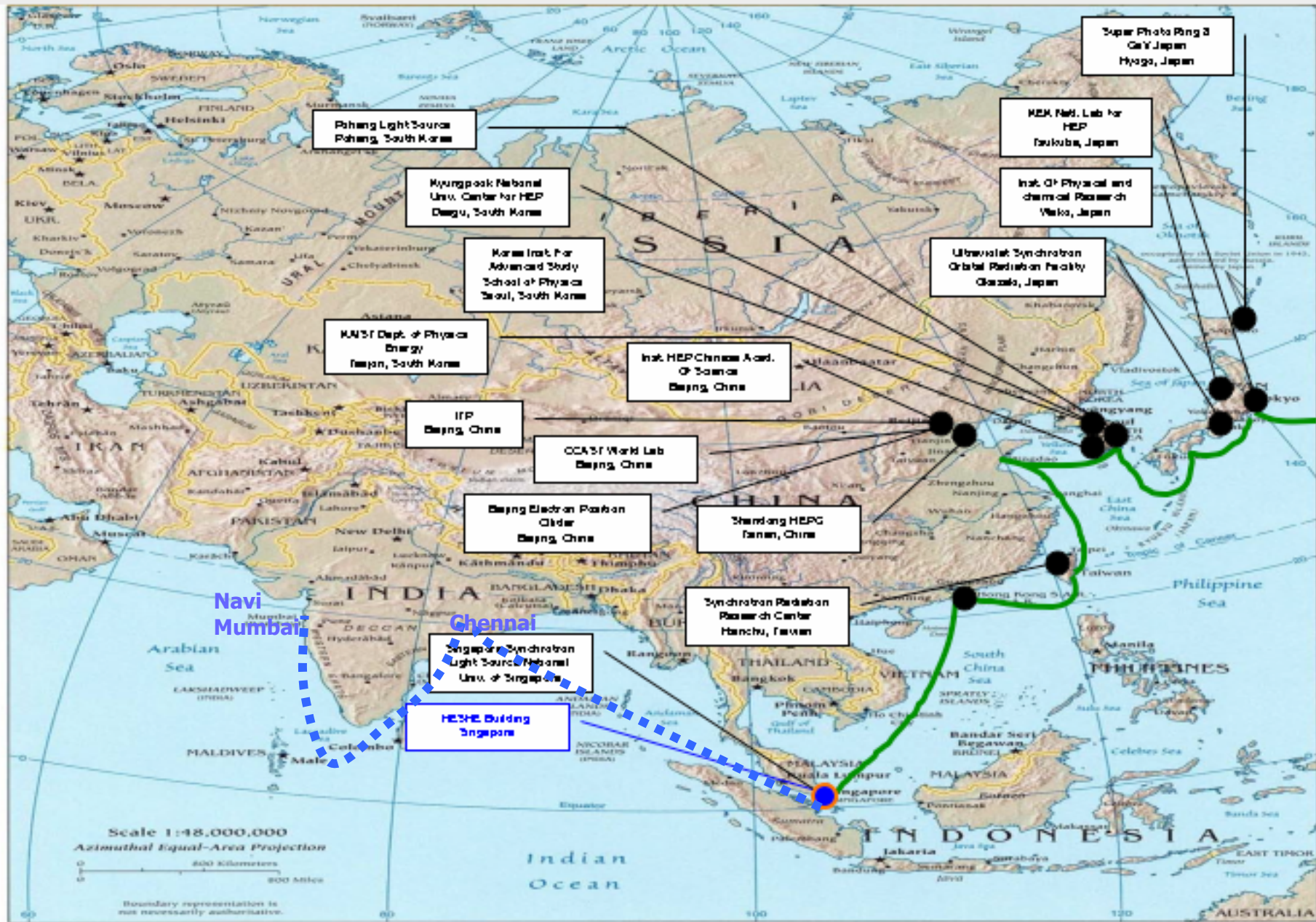


Thailand Regional Initiative: Next Generation Internet

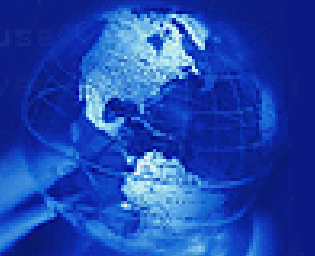
Announced by H.E.Dr. Surapong Suebwonglee, Minister of ICT, Thailand
January 26, 2005

<h3>Research, Education and Development Networks</h3>	<h3>Digital Gap: R&E networks</h3>	<h3>Bangkok Lambda Exchange (B-LEX)</h3>
<ul style="list-style-type: none"> • Next generation Internet testbed • Experimental and development labs • Human resource development 	<ul style="list-style-type: none"> • Asia-Pacific <ul style="list-style-type: none"> - Lambda Networks <ul style="list-style-type: none"> • North Asia and Australia - ATM (155 Mbps) or lower - Commodity networks 	<ul style="list-style-type: none"> • HRD for network engineers • Extend the Lambda link further to ICT Corridor • Our experiences can be shared to other South East Asian countries • Hub of intra-ASEAN R&E network
<h3>Digital Divide</h3> <ul style="list-style-type: none"> • Universal access • Research, Education and Development 		
<h3>Target: Lambda ICT Corridor</h3>		<h3>Thailand Global Quilt Initiative Collaboration WIDE and IEEAF 2005</h3>
	<p>Information Superhighway for the Greater Mekong Subregion.</p> <ul style="list-style-type: none"> • Creating ultra broadband network in GMS area <ul style="list-style-type: none"> - Cambodia - China - Laos - Myanmar - Vietnam - Thailand • Enhancing GMS's activity 	 <p>To IEEAF 10Gbps Network GigaPOP, Seattle, WA</p> <p>To IEEAF 10Gbps Network Future Plan</p> <p>WIDE</p> <p>Tokyo-Lambda Exchange T-LEX 2005</p> <p>Bangkok Lambda Exchange B-LEX</p>

IEEAF Donations and Correlating HEP Facilities



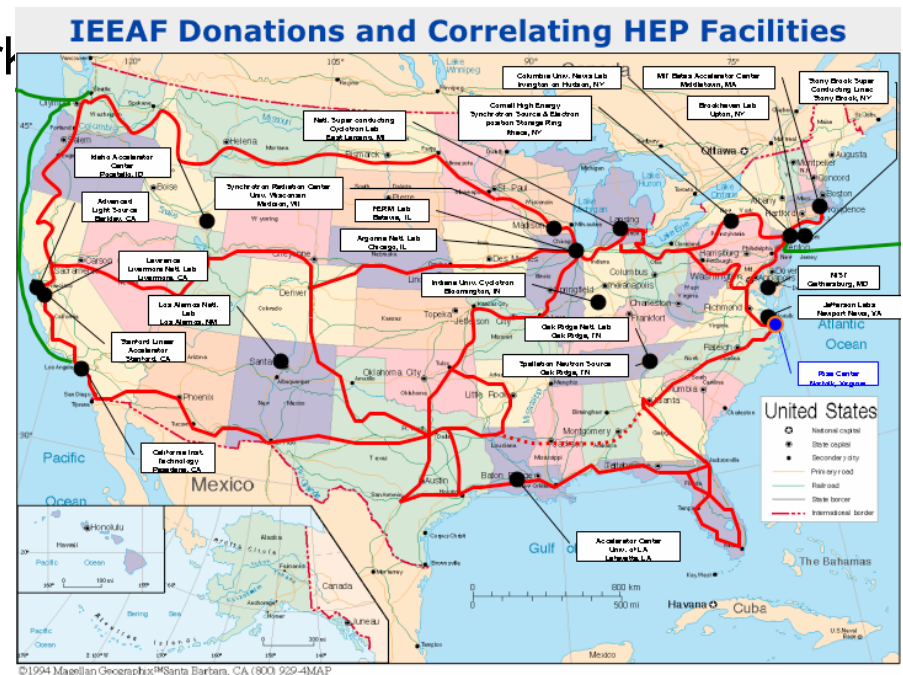
Internet Educational Equal Access Foundation



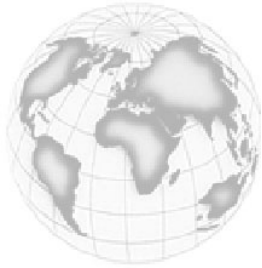
Key Elements of the SURA - AT&T “GridFiber” Collaboration



- No-cost lease of 6,000 miles of dark fiber pair on NexGen network
- No-cost lease of additional 2,000 miles of NexGen fiber (O&M costs waived) - optical research pilot testbed projects
- Very low cost IRUs (lease) for additional dark fiber



Internet Educational Equal Access Foundation

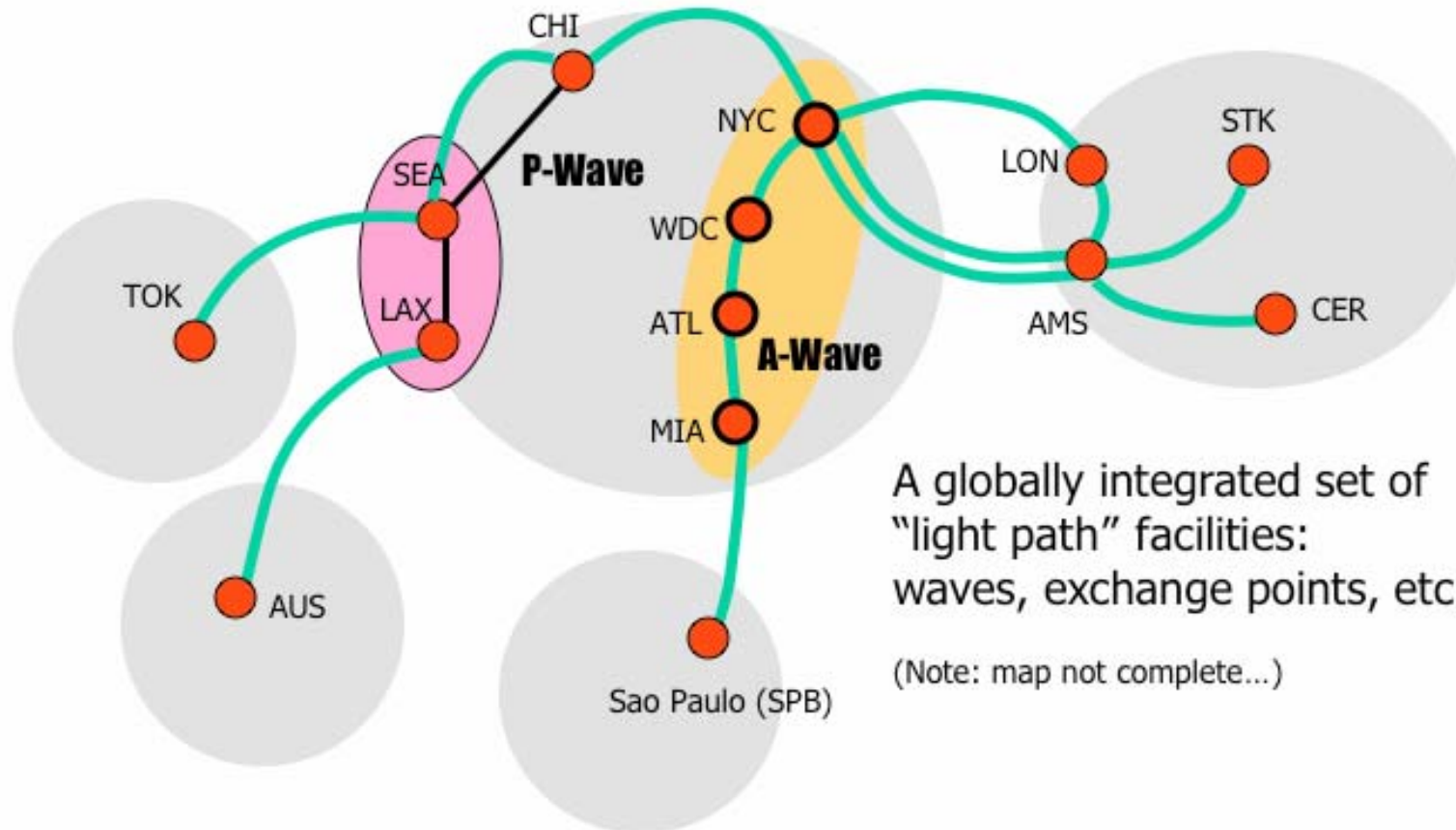


IEEAF is a partner in MAN LAN: The “Manhattan Landing” Exchange Point in NYC

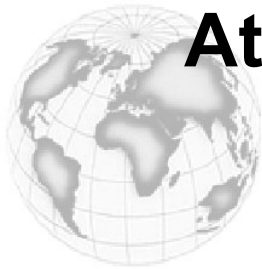
- The IEEAF’s OC-192c (10-Gbps) and STM-1 (622 Mbps) circuits between NYC and the Netherlands are homed at MAN LAN
- The 10 Gbps circuit:
 - Supports direct SURFnet↔Abilene connectivity through optical TDM
 - Circuit is partitioned between production and experimental use
 - One OC-48c devoted to direct, production Surfnet/Abilene IP peering (through an OC-192 interface on the Abilene NYC router)
 - Remaining bandwidth is devoted to experimentation – e.g., recent Pasadena-Geneva (Caltech-CERN) *lightpath* demonstration

Internet Educational Equal Access Foundation

The Strategic Picture...

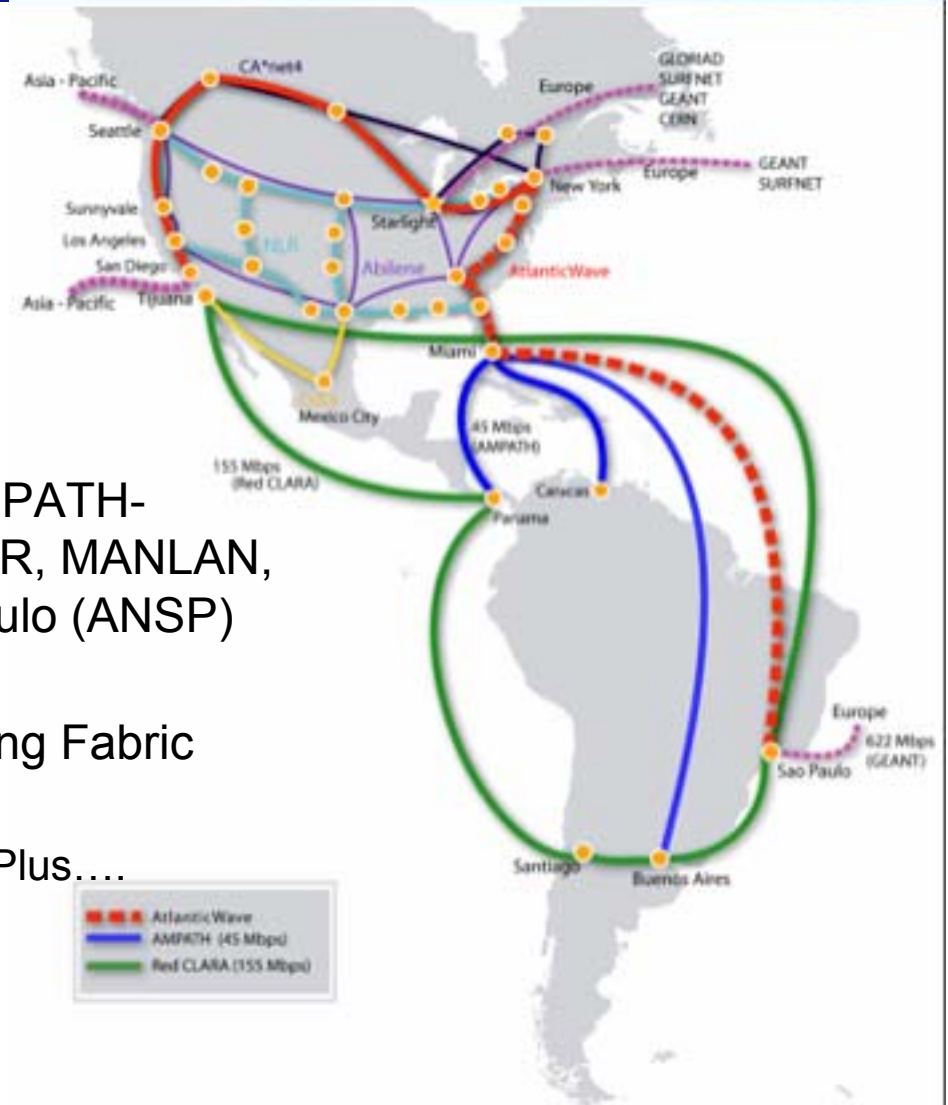


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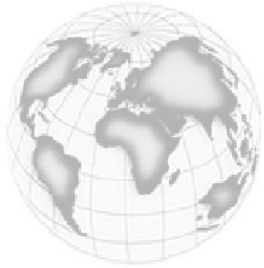


AtlanticWave

- IEEAF partnering with SURA, FIU-AMPATH-CHEPREO, the IEEAF, MAX, SoX/SLR, MANLAN, and the Academic Network of Sao Paulo (ANSP) to establish AtlanticWave
- AtlanticWave is an International Peering Fabric along the East Coast
 - US, Canada, Europe, South America Plus....
 - Distributed IP peering points:
 - NYC, WDC, ATL, MIA, SPB



Internet Educational Equal Access Foundation



Global Opportunities: The Global Quilt

The Global quilt





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“Significant Broadband Access”

Leads To

“Empowerment and Economic Development”





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“Significant Broadband Access”

Leads To

“Empowerment and Economic Development”

The Issues:

- **In-Country “PTT Protectionist” Issues**
- **Local Domestic Politics**
- **Consortium Submarine Cable Operators “Seasoned Monopoly”**
- **Missing International Business Drivers**
- **Sustainability**



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“Significant Broadband Access”

Leads To

“Empowerment and Economic Development”

The Plan:

- **“Establish the beach head – Set-up Hub and Spoke Design”**
- **Team together “International Telecom Knowledge” and their Relationships with “global multinational telecom opportunities and barter.”**
- **Add a foundation with “17 time zones of critical mass success in bandwidth donations”.**
- **Add a team with “historical knowledge of projects, participants and government relationships”**



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“Significant Broadband Access”

Leads To

“Empowerment and Economic Development”

The Invitation:

- Invite the R&E community **starting from today** to stand with us for a **“FINAL PUSH”**

The End Result..... Broadband for Research Project Collaborations equals **“Empowerment and Economic Development”**



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Why are we here, what's different this time...?

1. Each R&E African initiative participant has significant experience with their initiatives. Those initiatives require affordable broadband solutions to enable great change.
2. NSF funding opportunity for IRNC link to Africa.
3. John Mack – George Sadowski Gov't. relationships and experiences opened the doors...
4. GEO and IEEAF have a significant success record of achieving donations over 17 time zones... more on the way.
5. Significant National and International business opportunities, other than R&E community, becomes the “Dangled Carrot” negotiation tool.

This time.... **“Alignment”** ...

Experience – Relationships – Persistence - and a “Sustainability” legacy



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ThaiREN

Atlantic Wave

STARLIGHTSM
The Optical STAR TAP™



WHREN



NORDUnet



IEEAF Donations – 10 Gig and STM-4 – 17 Time Zones

Tokyo

Hamburg

African Collaboration Initiative





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THE GLOBAL QUILT: A Network of Networks, “stitched together” to create a common single fabric, and shared equally by all. This will be achieved through collaboration and community effort, until it covers the globe.



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**In this Global Quilt network infrastructure,
the seeds of socially responsible
donations and support grow into new
history setting commercial opportunities
for economic prosperity and
“sustainability”.**



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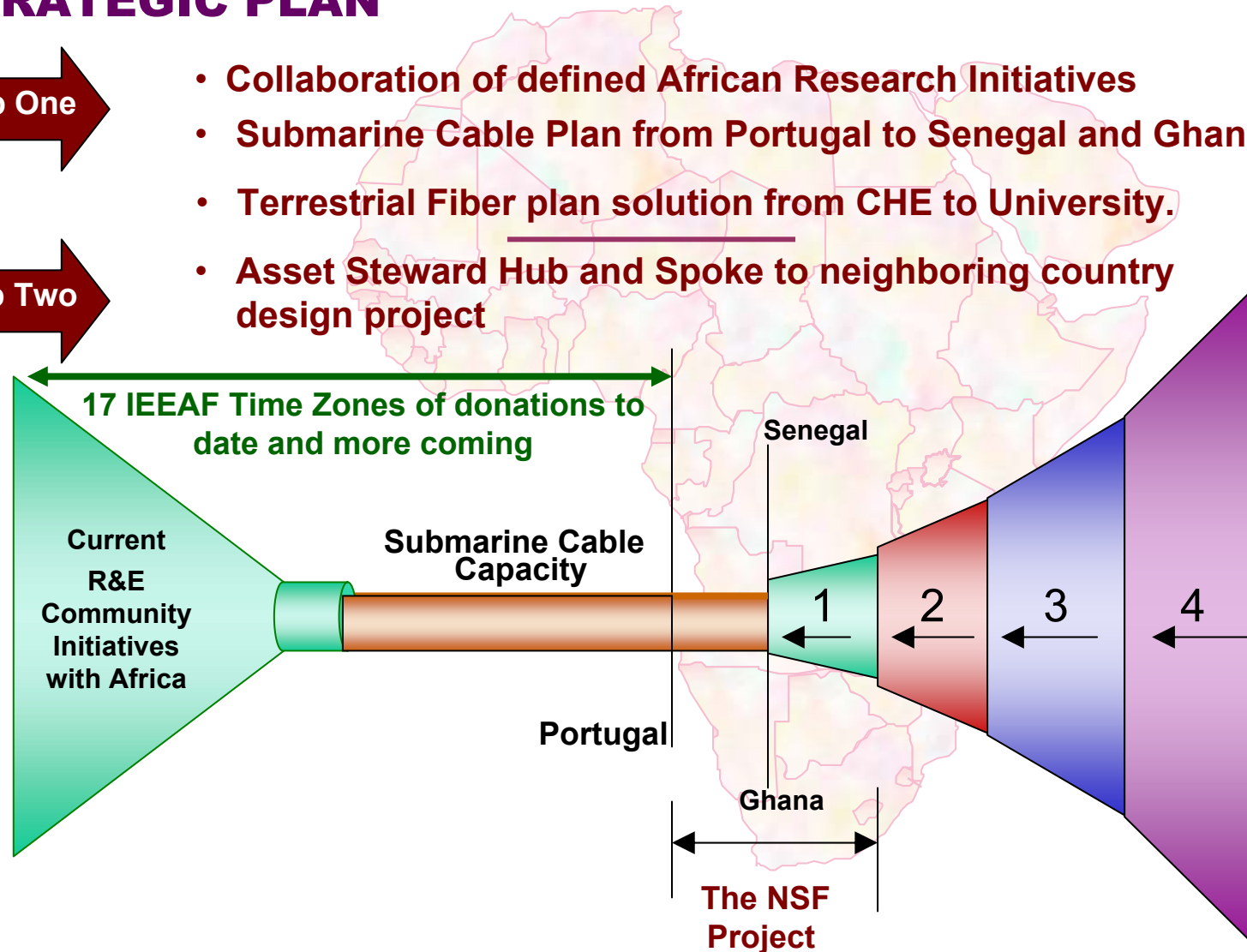
STRATEGIC PLAN

Step One

- Collaboration of defined African Research Initiatives
- Submarine Cable Plan from Portugal to Senegal and Ghana
- Terrestrial Fiber plan solution from CHE to University.

Step Two

- Asset Steward Hub and Spoke to neighboring country design project





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STEP ONE:

Submarine Cable Landing Site

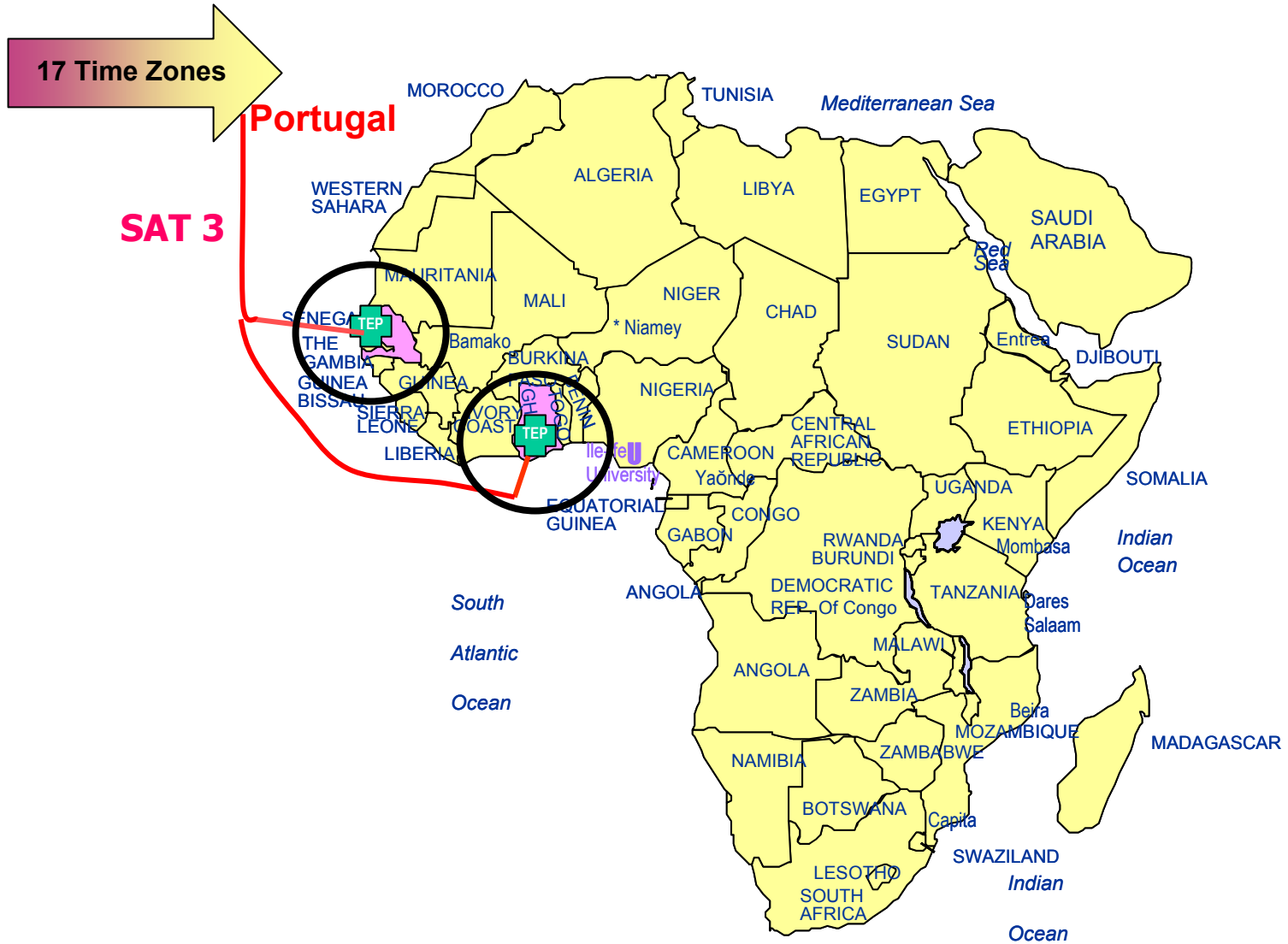
To

**First University Asset Steward
Exchange Point**



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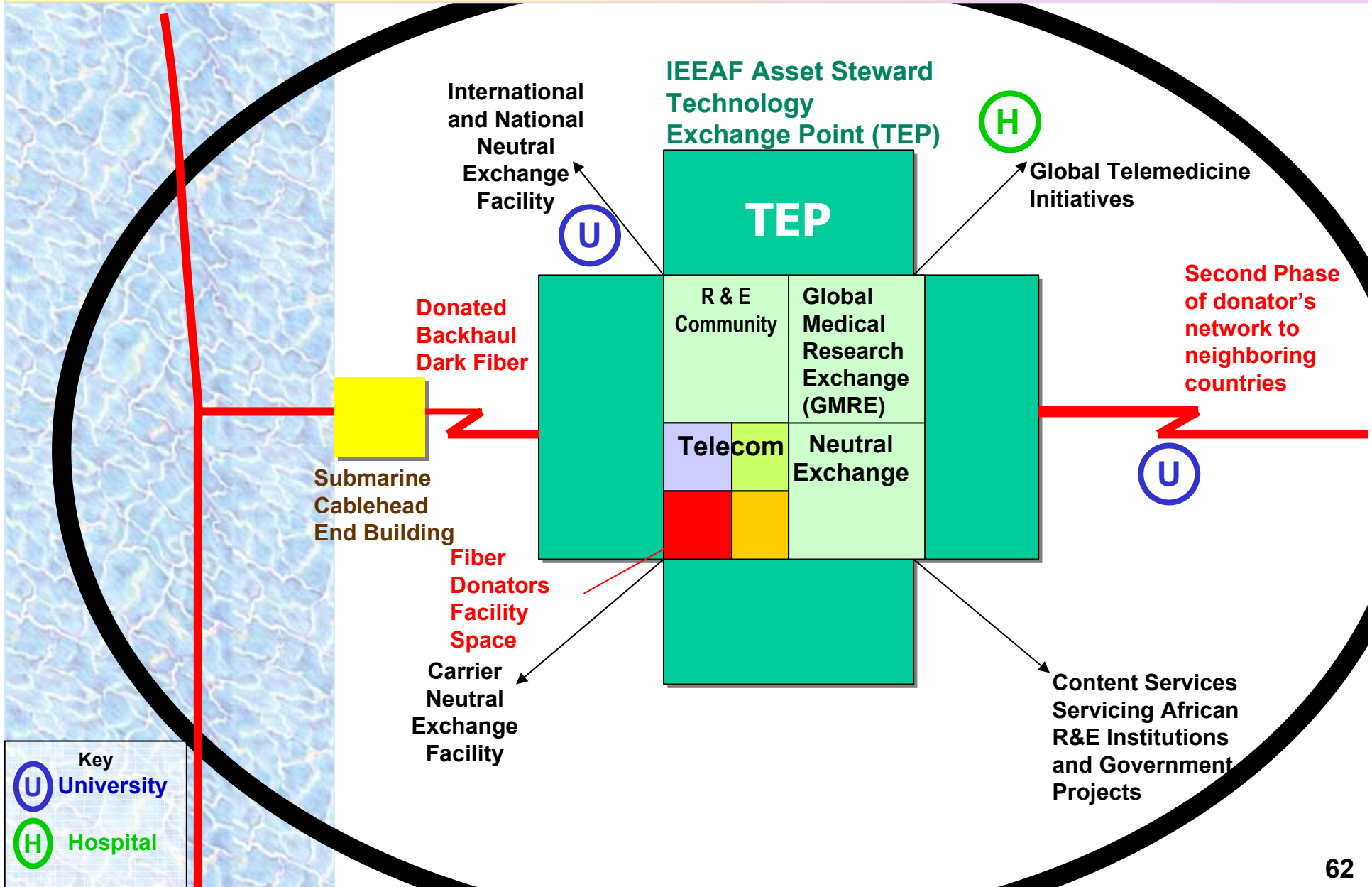
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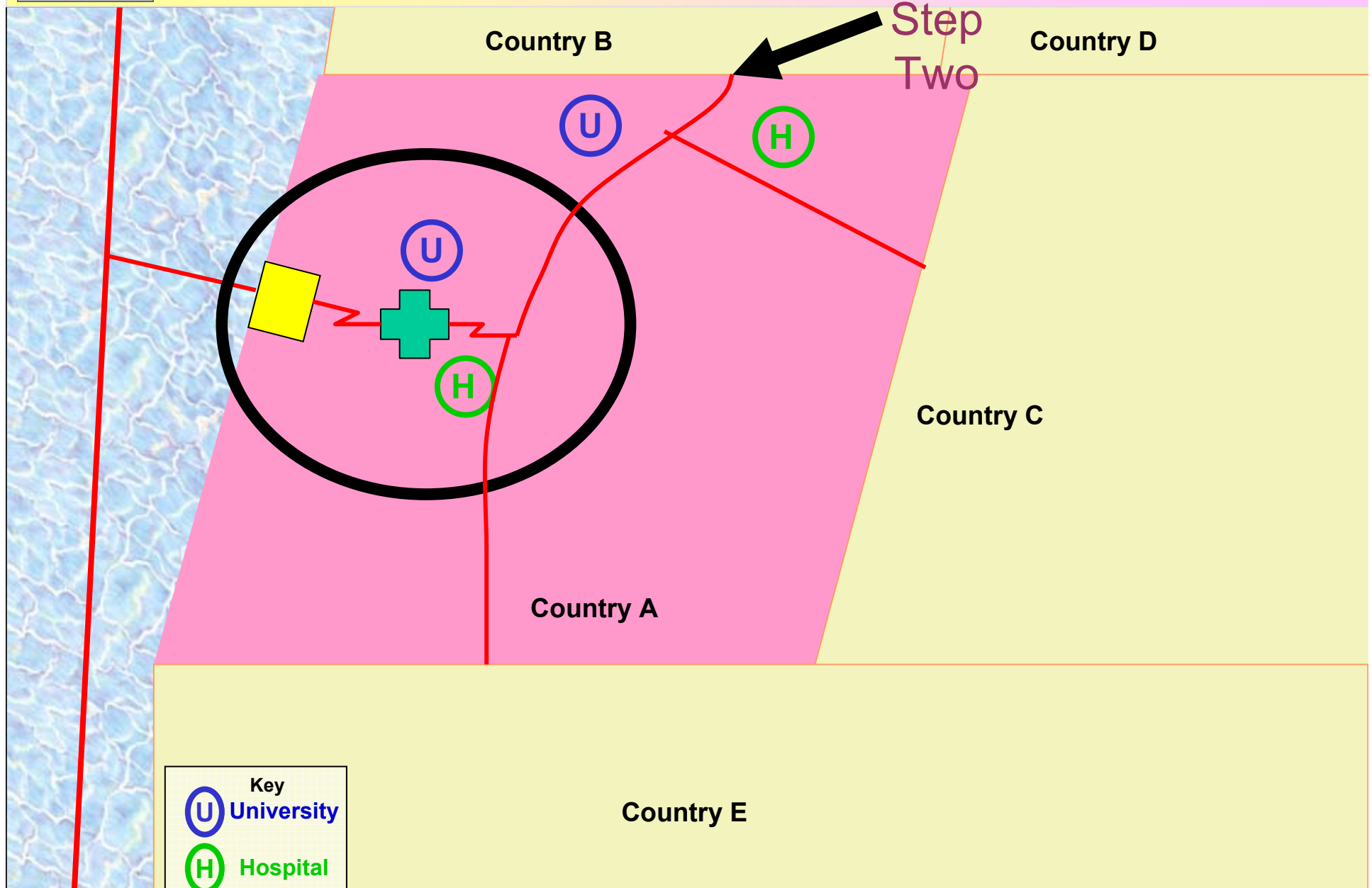
INTERNET EDUCATIONAL EQUAL ACCESS FOUNDATION (IEEAF)





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STEP TWO:

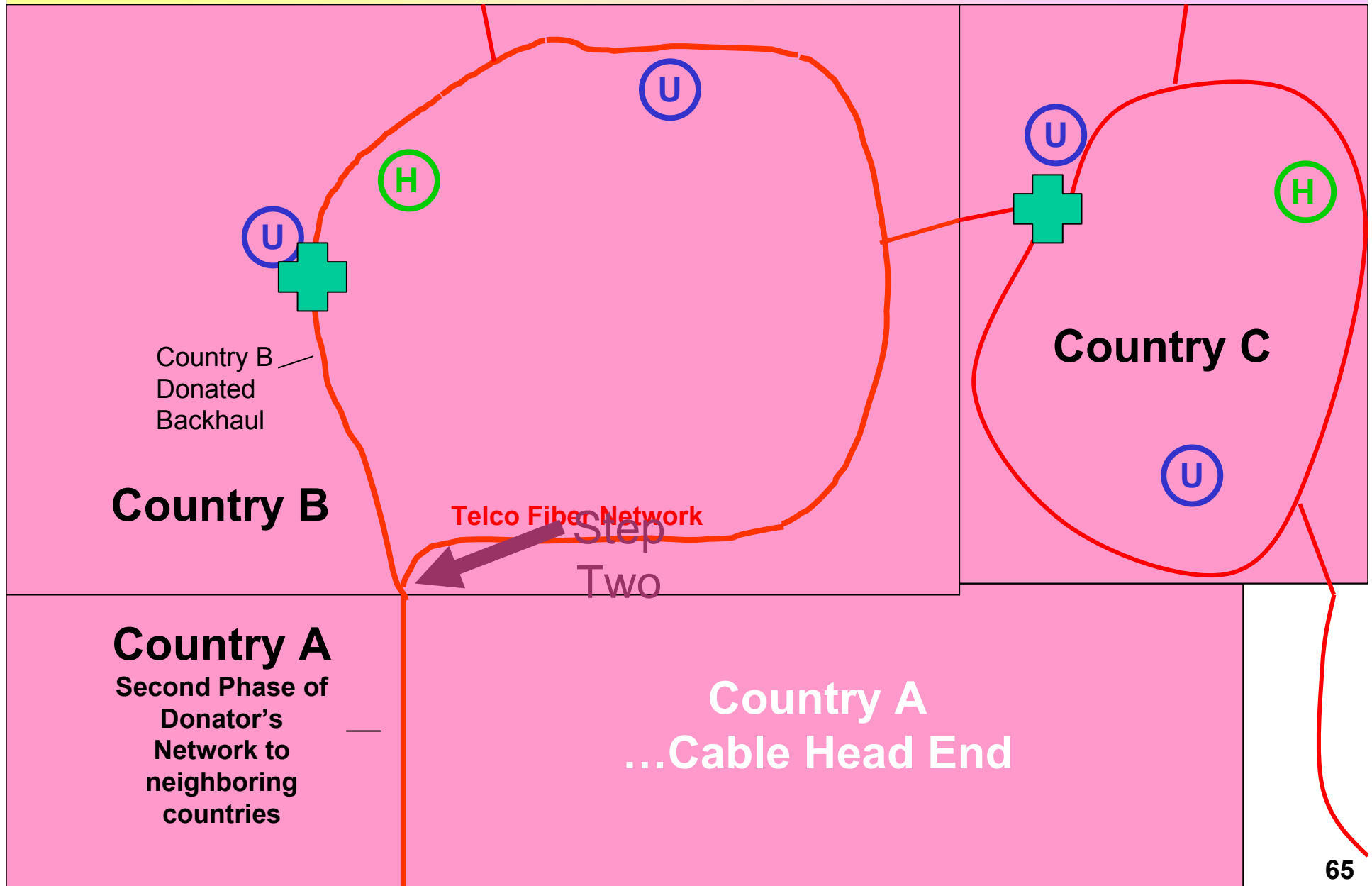
HUB AND SPOKE EXPANSIONS:

**Border country telecom donations “linking”
back to the newly established international
exchange point with IEEAF “University
Asset Steward” at sub-cable landing**



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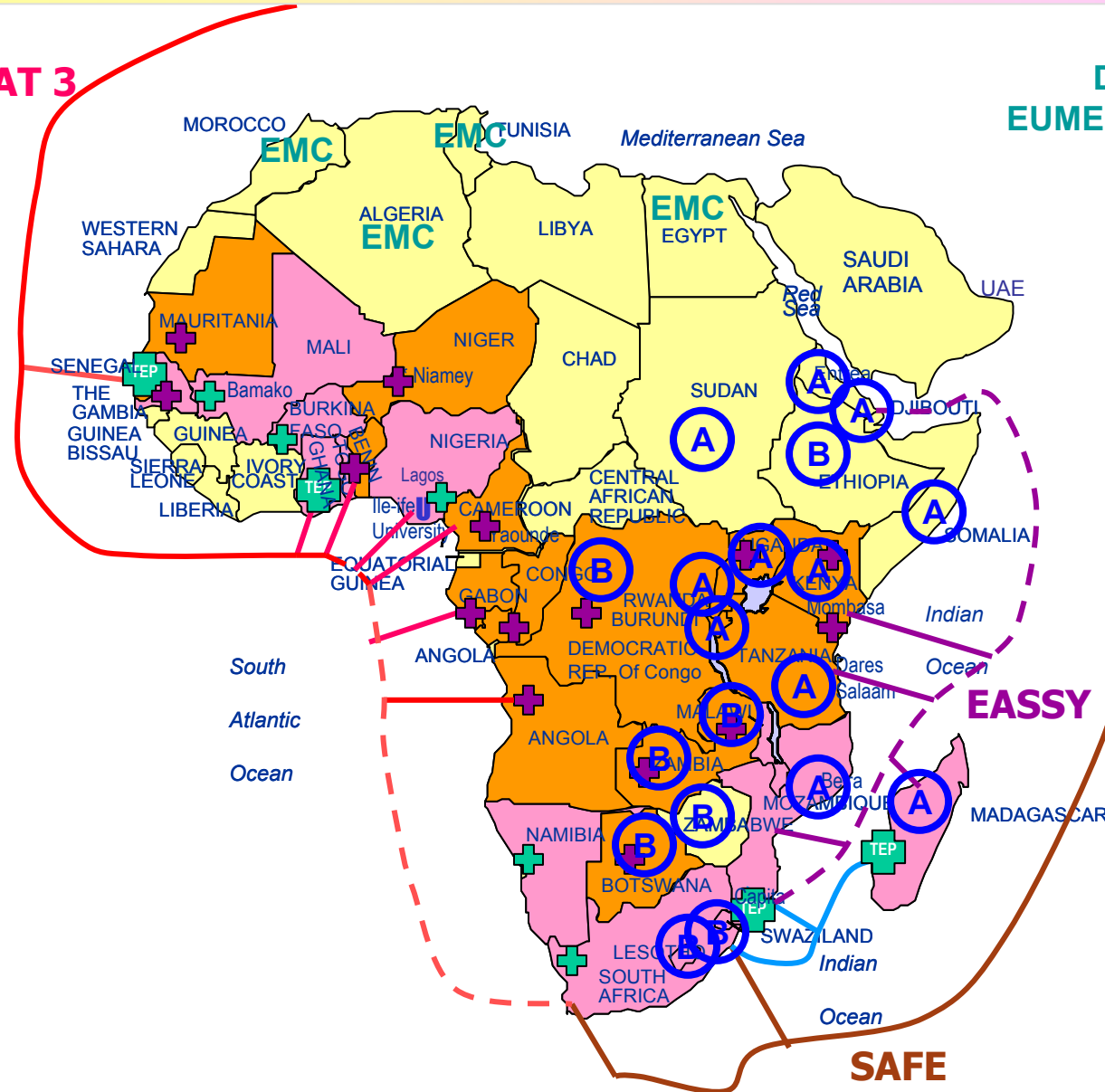


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SAT 3

**DANTE
EUMEDCONNECT
EMC**



**World Bank
Regional
Communications
Infrastructure
Program ("RCIP")**

Countries **(A)**

Countries **(B)**

SAFE



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Before our first step:

FROM ARTWORK TO ENGINEERING:

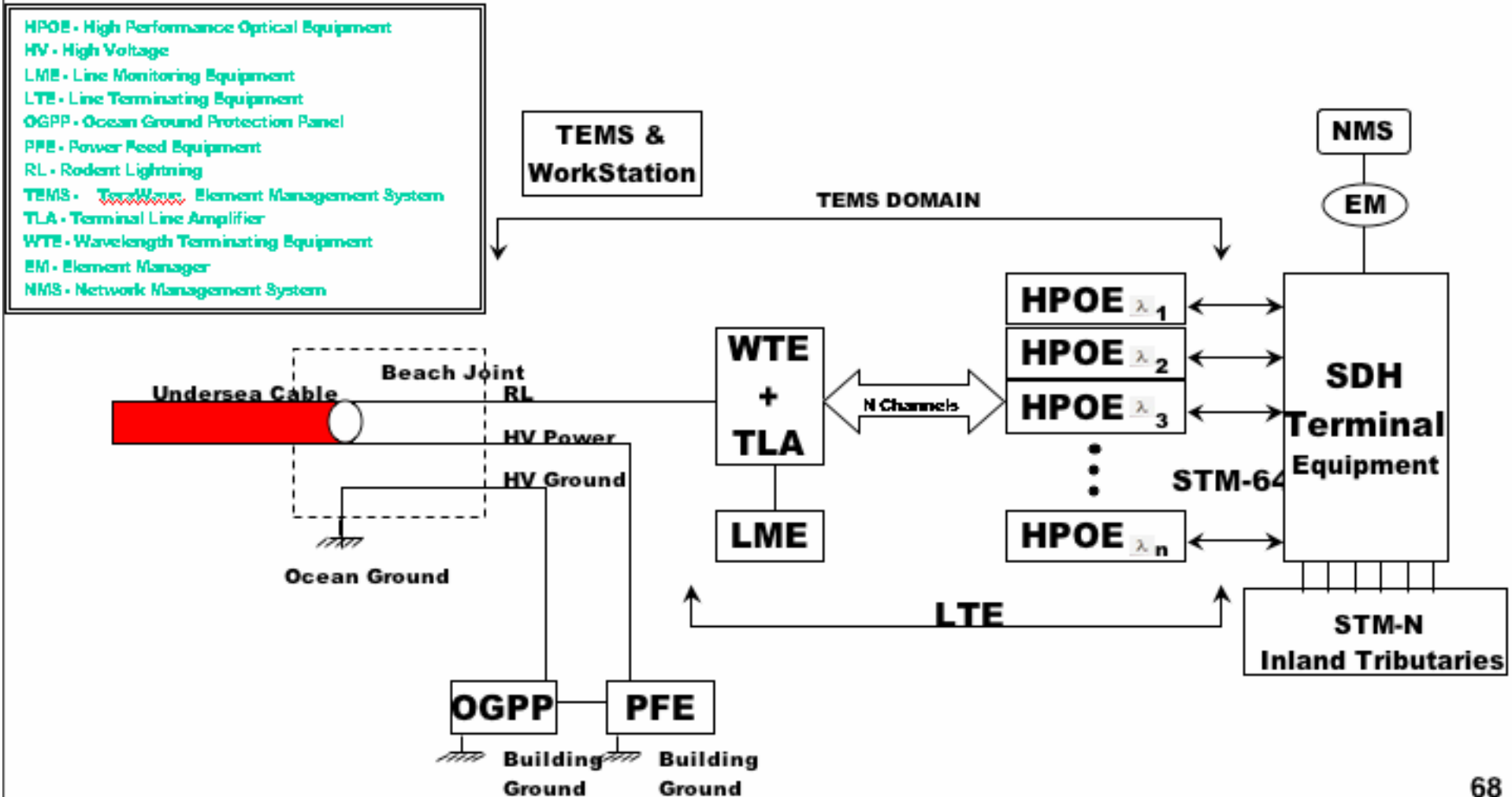
- Current int'l Collaborating research project locations accurately mapped out.
- Set location criteria for “*collaborating university asset steward*” candidates.
- Develop “*chess game*” with Fiber or wireless providers near collaborating institutions.
- “*Friendly*” in-country telco relationships



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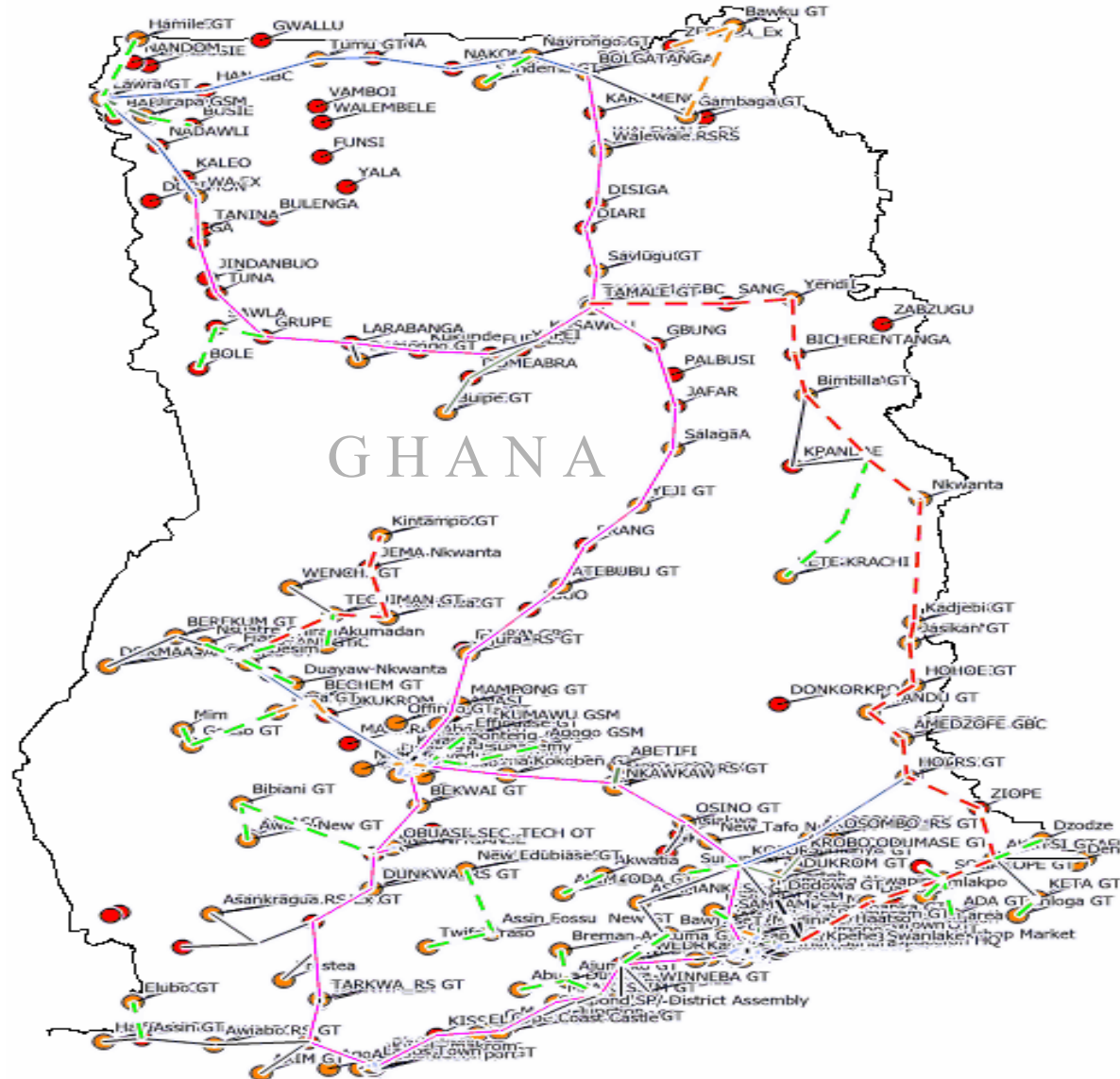
Typical cable Station Equipment





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Come Join the Pushing, Starting from Today...

If you would like your research project initiative to be able to utilize this new broadband capacity, please provide us a letter of support:

- ★ **Please talk with us over the next few weeks about details of where your current project connectivity starts from and goes to, as well as what's missing in achieving your goals. Share your experiences with the current regional conditions.**
- ★ **Please include your Research Project or initiative description in the letter.**
- ★ **Please give us your email address so that you will be on the “team correspondence list” for design updates and developments.**

... Our combined weight, pushing in a single direction, will burst open the “Access Doorways” for our African Colleagues



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THE GLOBAL QUILT INITIATIVE



Thank You

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