AMPATH: Pathway of the Americas

UNIVERSITY TECHNOLOGY SERVICES GENERAL MEETING

APRIL 26, 2002

http://www.ampath.fiu.edu

Heidi L. Alvarez
Heidi.Alvarez@fiu.edu

What is AMPATH?

- AMPATH is a project led by FIU, with partial support from the National Science Foundation to interconnect the R&E networks in South and Central America, the Caribbean and Mexico to US and non-US R&E networks via Internet2's Abilene network

FIU Florida International University
Hope, Knowledge, and Opportunity

What is AMPATH?

- The AMPATH Network is built upon Global Crossing's terrestrial and submarine optical-fiber networks

- **But AMPATH is more than a Network for the Americas…**

- Fifth Tier-1 NAP
- Strategically located to serve Latin America, the Caribbean, Southern Europe and Africa
- Close to major carrier POPs and 7 worldwide undersea cable landings

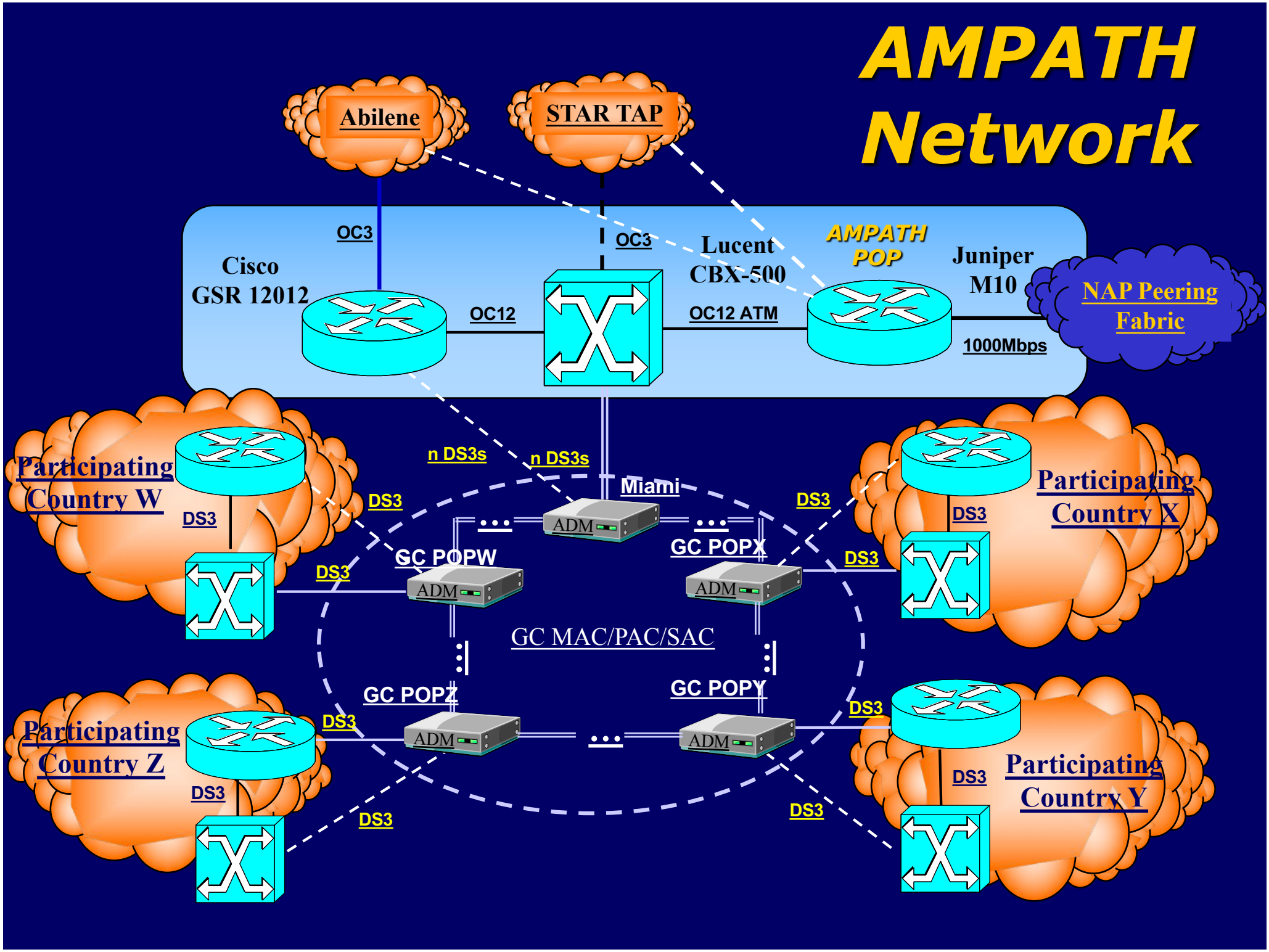
International Cable Landings

What is AMPATH?

- 10 DS3s from Global Crossing
- Cisco GSR 12012
- Lucent CBX 500 ATM switch
- Juniper M10 router
- Collocation in the NAP of the Americas
- Shared OC3 to Abilene with the South Florida GigaPOP

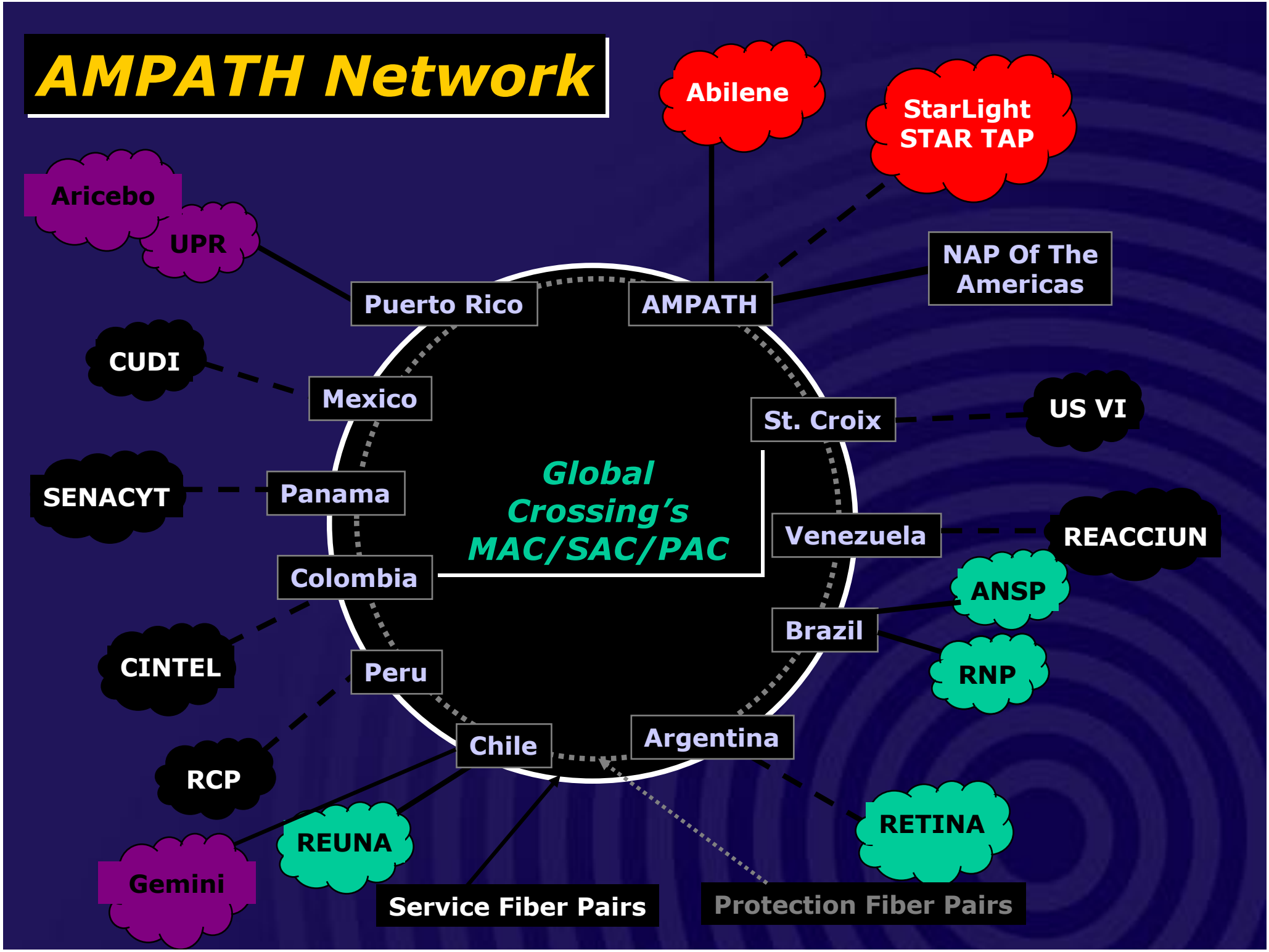
AMPATH Service Area

- Argentina
- Brazil
- Chile
- Colombia
- Costa Rica
- Mexico
- Panama
- Peru
- Puerto Rico
- US Virgin Islands
- Venezuela


AMPATH Network
Abilene
STAR TAP
OC3
OC3
Cisco GSR 12012
OC12
Lucent CBX-500
OC12 ATM
AMPATH POP
Juniper M10
1000Mbps
NAP Peering Fabric
n DS3s
n DS3s
Miami
ADM
GC POPW
GC POPX
GC POPZ
GC POPY
GC MAC/PAC/SAC
DS3
Participating Country W
Participating Country X
Participating Country Z
Participating Country Y

AMPATH Network

- Flexible and Scaleable
- SDH Infrastructure:
  - ✓ Avoids ATM overhead
  - ✓ Benefits Participant NRNs not using ATM
- ATM infrastructure:
  - ✓ PVCs, PVPs
  - ✓ Direct peering between Participants
- Optical infrastructure supporting wavelenghts
- Direct layer 2 or layer 3 connectivity to other countries connected to the AMPATH network.


AMPATH Network
Abilene
StarLight
STAR TAP
Aricebo
UPR
NAP Of The
Americas
Puerto Rico
AMPATH
CUDI
Mexico
St. Croix
US VI
SENACYT
Panama
Global
Crossing's
MAC/SAC/PAC
Venezuela
REACCIUN
Colombia
ANSP
Brazil
CINTEL
Peru
RNP
RCP
Chile
Argentina
RETINA
REUNA
Gemini
Service Fiber Pairs
Protection Fiber Pairs

AMPATH Engineering Support

- FIU Network Engineers
- Global NOC

Maria Rose Drake (Camera Shy)

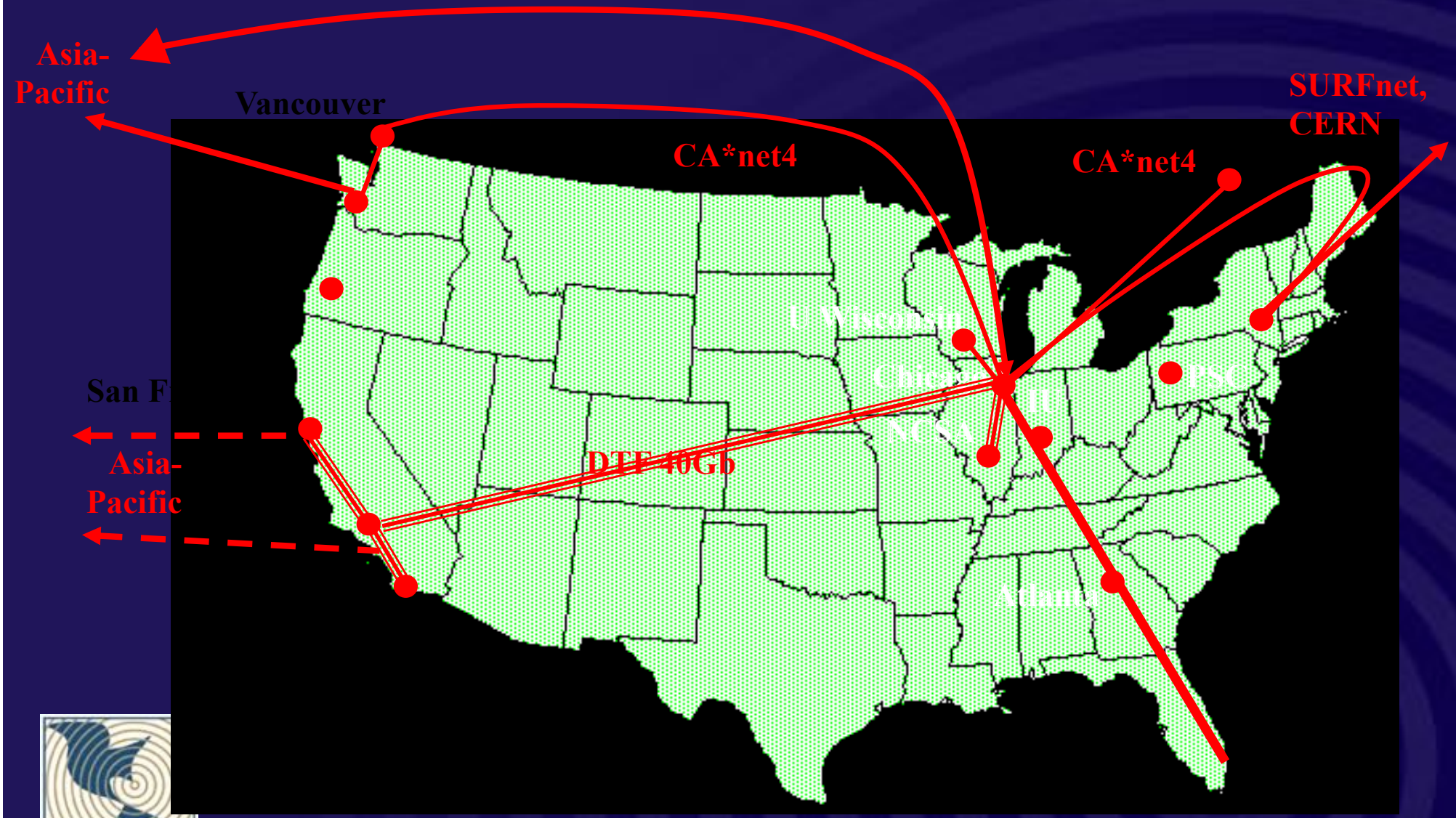
noc@ampath.net

AMPATH Management Support

- John McGowan, Executive Sponsor
- Julio Ibarra, Principal Investigator and Director of AMPATH
- Melyssa Fratkin, AMPATH Int'l Coordinator (Based in Washington D.C.)

- Fiorella Salinas, Administrative Assistant for International Relations
- Heidi Alvarez, AMPATH Co-PI and Grant & Acquisitions Assoc. Director

StarLight Optical Network Connections



Networks reachable via AMPATH – by country

Europe-Middle East

Austria
Belgium
Bulgaria
Croatia
Czech Republic
Cyprus
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Latvia
Lithuania
Luxembourg
Netherlands
Norway
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
Switzerland
United Kingdom
***CERN**

Asia-Pacific

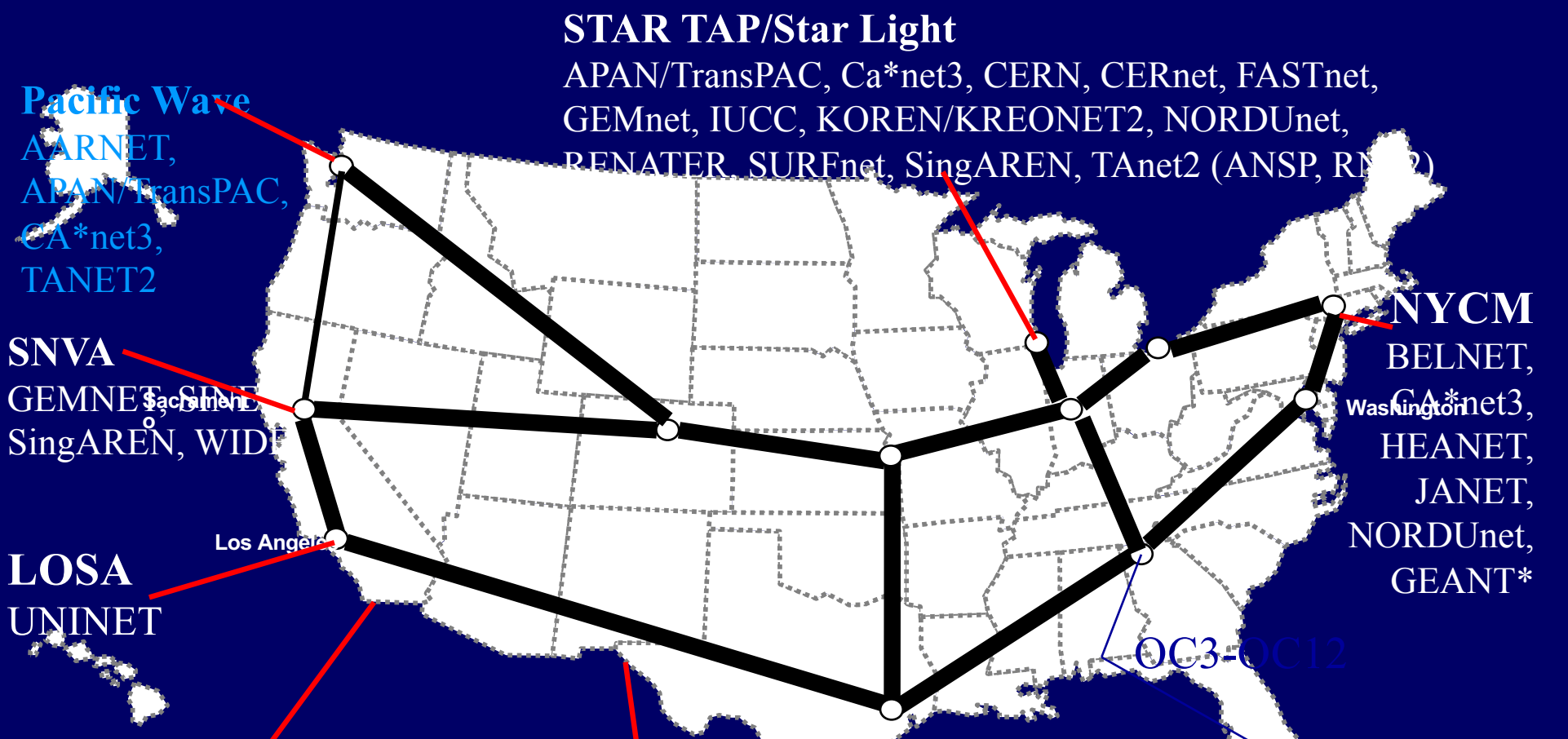
Australia
China
Hong Kong
Japan
Korea
Singapore
Taiwan
Thailand

Americas

Argentina
Brazil
Canada
Chile
Mexico
United States

How?
STAR TAP, Abilene, CA*net ITN

16 November 2001



* ARNES, CARNET, CESnet, DFN, GRNET, RESTENA, SWITCH, HUNGARNET, GARR-B, POL-34, RCCN, RedIRIS

Asia to US connectivity (April 2002)

Country	Network	BW(mbps)	Interconnect
APAN/US	TransPAC	622	Tokyo to P. Wave
		622	Tokyo to Star Light
Australia	AARNET	310	Pacific Wave
China	CERNET	10	STAR TAP
Korea	KOREN/KREONET2	45	STAR TAP
Japan	SINET	155	Abilene, Sunnyvale
Japan	WIDE (ipv6 only)	45	Abilene, Sunnyvale
Japan	GEMNET	33	Abilene, Sunnyvale
Singapore	SingAREN	27	STAR TAP, Sunnyv.
Taiwan	TANET2	90	Pacific Wave
Thailand	UNINET	10	Abilene, LA

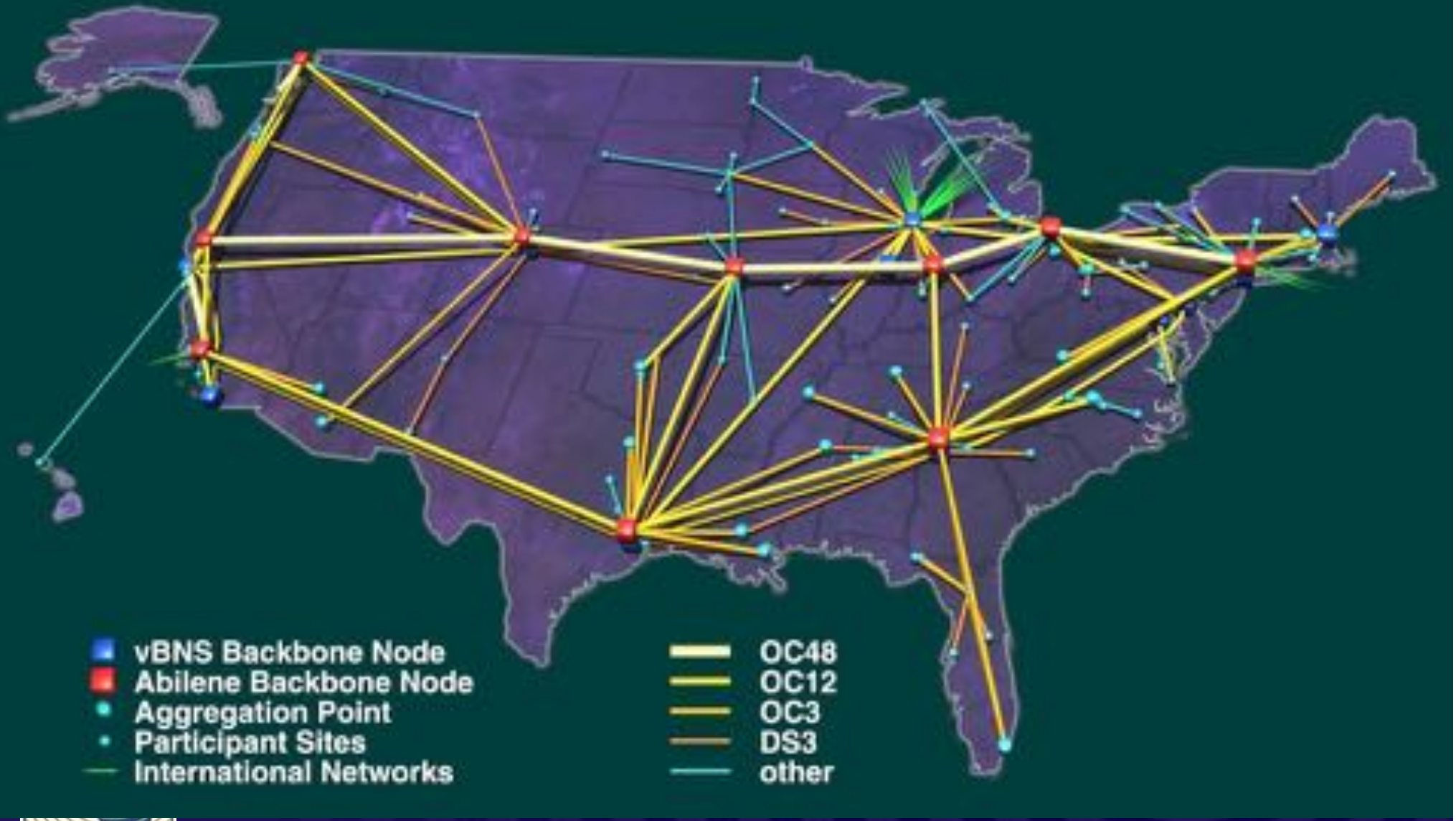
Europe to US connectivity (April 2002)

Country	Network	BW(mbps)	Interconnect
Belgium	BELNET	155	NYC
CERN	CERN	622	STAR TAP
Ireland	HEANET	310	NYC/STAR TAP
Israel	IUCC	45	STAR TAP
Netherlands	SURFnet	1244+	Star Light
Nordic Countries	NORDUnet	622	NYC/Star Light
U.K.	JANET	2400	NYC
Russia	FASTnet	45	STAR TAP
Europe	GEANT	5000	NYC

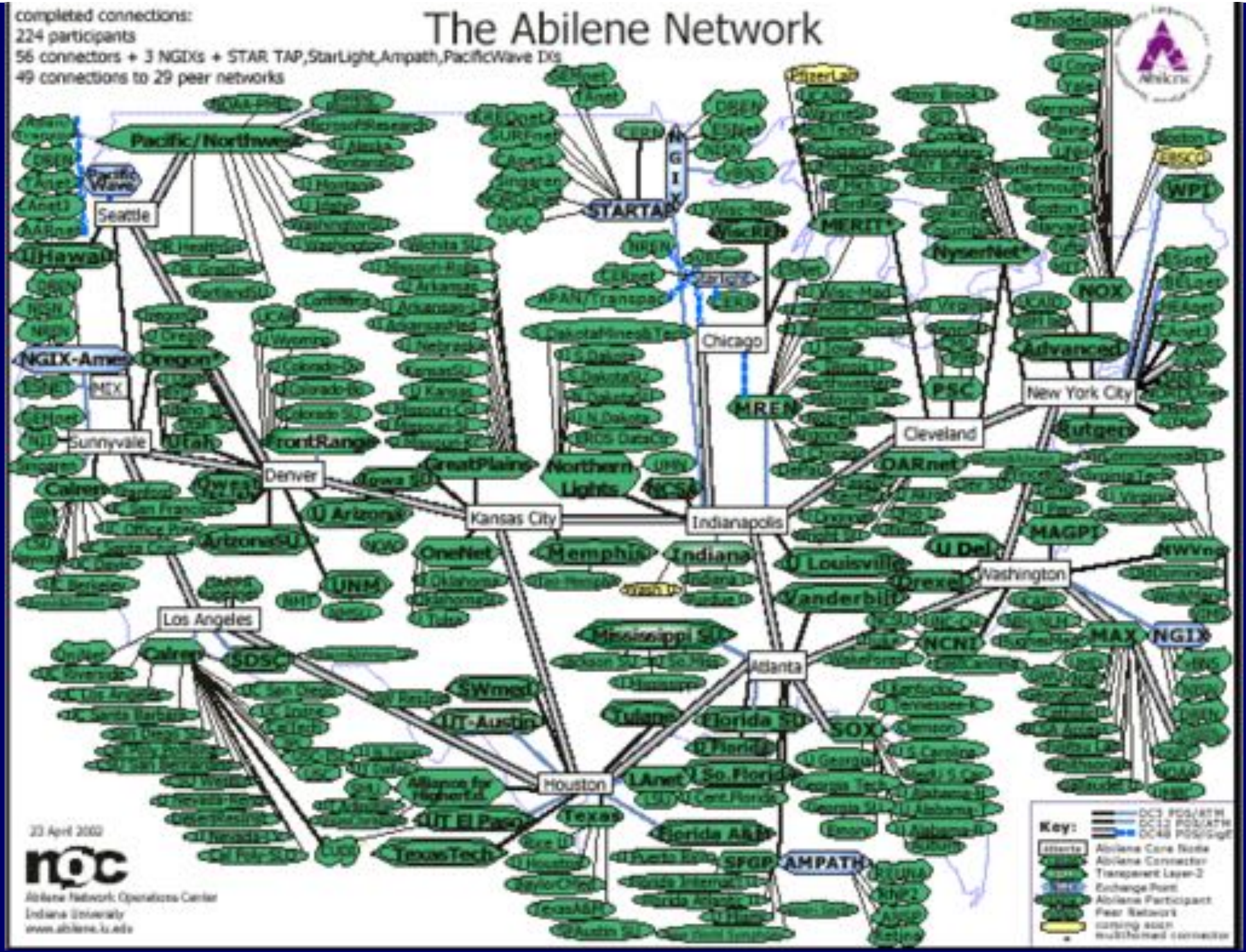
Why University Leadership?

- The Internet came from the academic community
  - Stanford -- the Internet protocols
  - NSFNet -- the scaled-up Internet
  - CERN -- The WWW protocols
  - University of Illinois -- The Web browser
- Universities' research and education mission require an advanced Internet and have demonstrated they can develop it

Internet2 Backbone Networks



Donna Cox,
Robert Patterson, NCSA



completed connections:
224 participants
56 connectors + 3 NGIXs + STAR TAP,StarLight,Ampath,PacificWave IXs
49 connections to 29 peer networks
The Abilene Network
Pacific/Northwest
Seattle
Sunnyvale
Denver
Kansas City
Chicago
Indianapolis
Cleveland
New York City
Washington
Los Angeles
Atlanta
Houston
STARTAP
MERIT
NyserNet
NOX
WPI
Advanced
PSC
MREN
Rutgers
DARnet
MAGPI
U Del
NWVng
Drexel
Vanderbilt
U Louisville
Indiana
Memphis
OneNet
Northern Lights
GreatPlains
FrontRange
Utah
Oregon
NGIX-Ames
MIX
Calren
U Arizona
ArizonaSU
UNM
SDSC
SWmed
UT-Austin
Tulane
Florida SU
SOX
NCNI
MAX
NGIX
LAnet
Texas
Florida A&M
SFGP
AMPATH
TexasTech
UT El Paso
Mississippi SU
Key:
Abilene Core Node
Abilene Connector
Transparent Layer-2
Exchange Point
Abilene Participant
Peer Network
coming soon
multihomed connector
23 April 2002
Abilene Network Operations Center
Indiana University
www.abilene.iu.edu

Project Time Line

Aug 2001

- Connect Brazil and Puerto Rico
- Conduct workshop at FIU to identify science applications for collaboration in AMPATH Service Area
- Participate in HPIIS measurement workshop

Sept 2001

- Connect Argentina
- Complete AMPATH Workshop Report

Dec 2001

- Connect AMPATH to StarLight
- NSF StarLight Support Proposal for the LISHEP Grid Workshop

Feb 2002

- Connect ANSP Sao Paulo – DONE!
- Connect Gemini South Observatory, Chile "We're Testing Now!"
- Move AMPATH to NAP Of The Americas – Some active equipment installed

March 2002

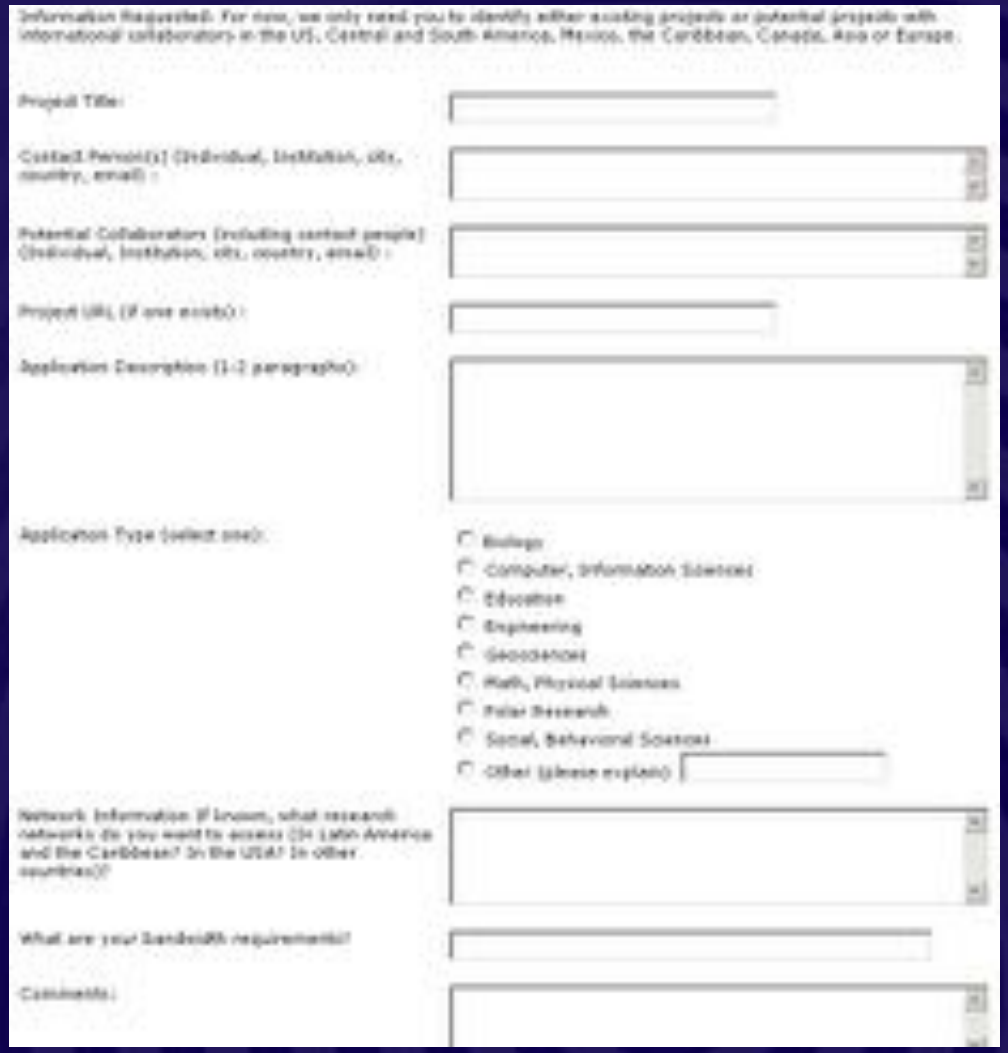
- Connect Venezuela. Identify funding a consortium activities to make the AMPATH / StarLight connection persistent in support of e-science

Project Time Line

April 2002	First Int'l AMPATH Conference: Valdivia Chile April 10 – 12 with sponsorship from the US National Science Foundation. Please join us!
July 2002	Connect Peru, Colombia, USVI
September 2002	Participate in iGrid 2002 in Amsterdam with an AMPATH Service Area country application demonstration – BRAZIL?
December 2002	Connect remaining countries in the AMPATH Service Area
Ongoing Activity	Work with Project Participants to exceed bandwidth utilization Develop value added services to support next generation networks and research (e-science, global distributed systems, data grids)

Request for Application Information

- Request first issued April 2001
- Workshop proposal submitted to the NSF's CISE/ANIR Division awarded proposal for the AMPATH Workshop in August, 2001



AMPATH NSF Funded Meetings

- ***FIU AMPATH Workshop to Identify Areas of Scientific Collaboration between the US and the AMPATH Service Area* August 16, 2001 NSF Award #0123388**
- ***Grid Workshop February 7-8, 2002 Rio de Janeiro, Brazil NSF Award #0215434***
- ***First International AMPATH Conference, April 10 -12 , 2002 Valdivia Chile NSF Award #0220176***

Application Information Results

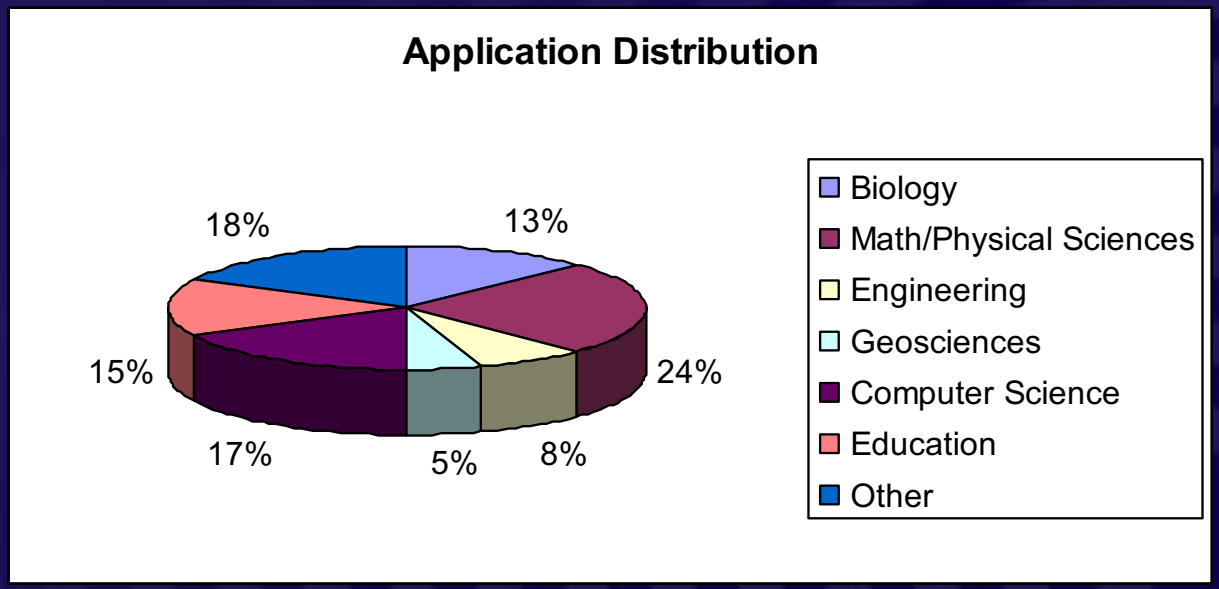
- Having an advanced networking infrastructure for research & education would benefit research institutions in:

- Argentina	-Australia	- Austria	- Brazil
- Canada	- Chile	- Colombia	- Korea
- Mexico	- Panama	- Puerto Rico	- Peru
- Singapore	- Spain	- US	- Venezuela
- West Indies			

And the list goes on…

e-Science Applications

- August, 2001 AMPATH Workshop in Miami to identify scientific research applications
- ~ 40 applications identified



Application Information Results

- Bandwidth requirements range from 8 Mbps today to a projected 2.4 to 10 Gbps over the next 3 – 5 years.
- The average requirement today is between 45 and 155 Mbps.

NSF 0123388 Award
FIU AMPATH Workshop to Identify Areas of Scientific Collaboration between the US and the AMPATH Service Area, August 15 – 17, 2001

AmericasPATH (AMPATH)
Computational Science and Engineering Applications

http://www.ampath.fiu.edu/APPLICATIONS/Appendix A.htm

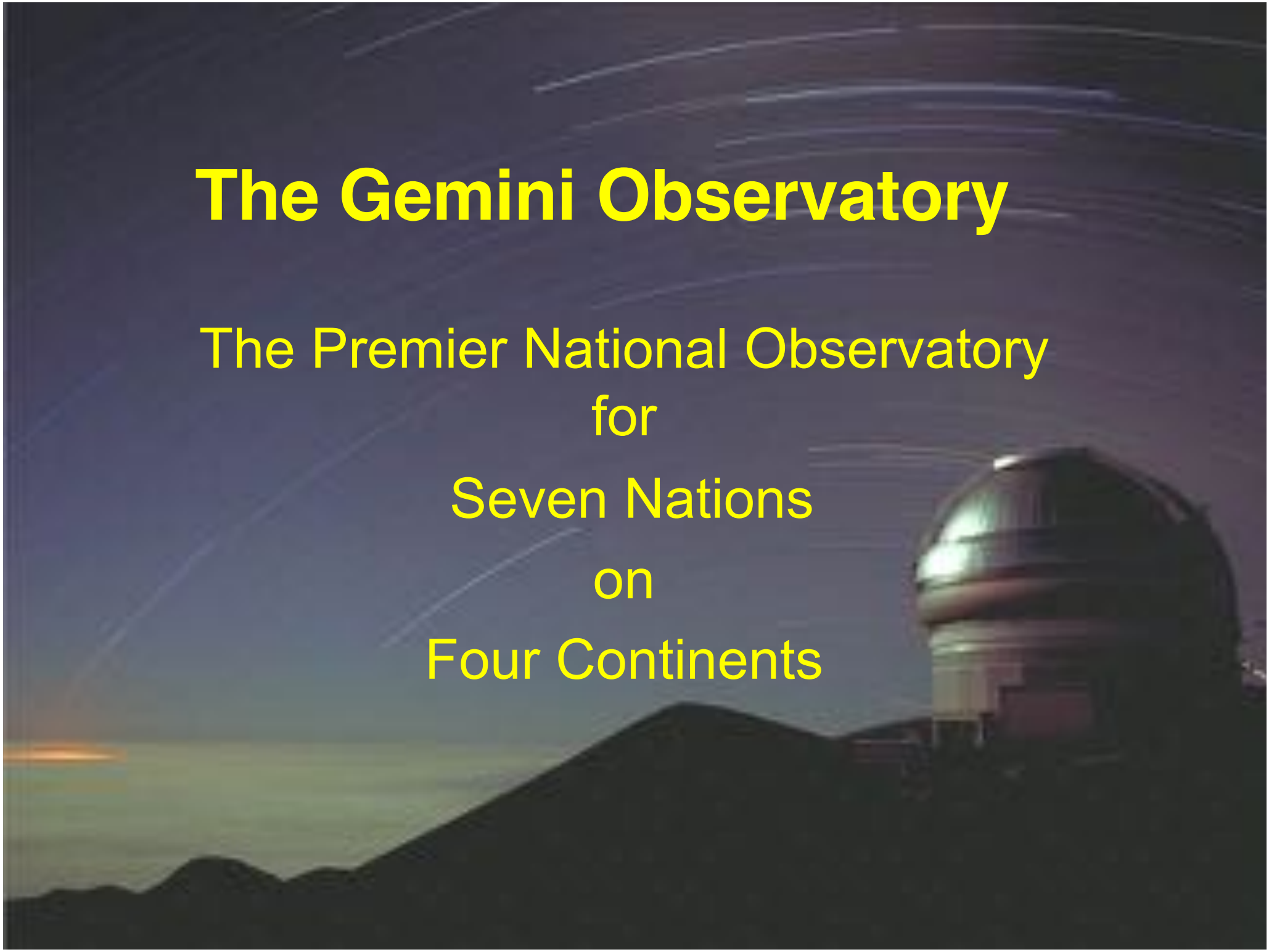
Tell us about your applications. Complete the *Request for Application Information at:*
http://www.ampath.fiu.edu/application_info_req.htm

Other AMPATH Related Meetings

- *Joint Techs (Internet2 / NLANR) Meetings*
- *Internet2 Members Meetings (Bi-Yearly) Next May 5-9, Washington D.C. 2002*
- *STAR TAP Annual Meeting INET 2001 June 5, 2001 Stockholm, Sweden*
- **SC2001 Denver, Colorado November 10-15, 2001**
- **Global Research Networking Summit Brussels, Belgium May 20-21, 2002**
- **iGRID2002 Amsterdam, Netherlands Sept. 26, 2002**
- **SC2002 Baltimore, Maryland November, 2002**
- **And so on…**

Scientists Using AMPATH

- US scientists conducting high-quality science in the AMPATH Service Area
- Latin American & Caribbean scientists who are recognized research leaders
- NRN professionals who develop and support high-performance network-dependent applications for science, research and education
- What's new →


The Gemini Observatory
The Premier National Observatory
for
Seven Nations
on
Four Continents

HEP Data Grids, the LHC and Global Networks

COJAC Application Results over AMPATH / Abilene and StarLight

Contact:

- Harvey B. Newman
- California Institute of Technology
- newman@hep.caltech.edu

International Virtual Data Grid Laboratory

Contact:

Paul Avery
University of Florida
avery@phys.ufl.edu
http://www.ivdgl.org/

National Virtual Observatory (NVO)

Alex Szalay

szalay@jhu.edu

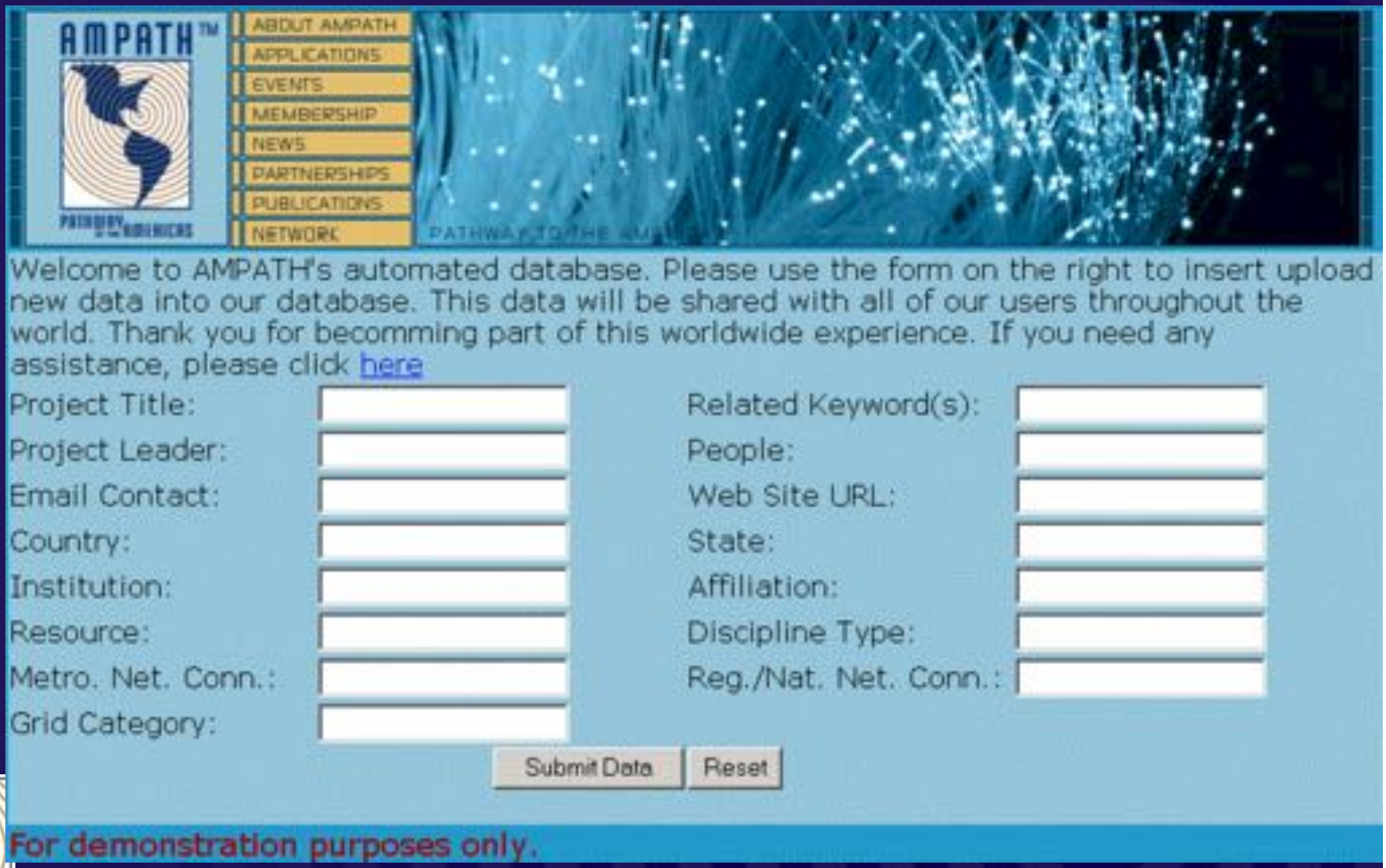
The Johns Hopkins University

http://www.srl.caltech.edu/nvo/

More e-Science Opportunities

- In addition to Gemini and Arecibo, AMPATH can provide connectivity for other US funded projects in the Service Area. For example:
  - Atacama Large Millimeter Array (ALMA) Project—Chile
  - Pierre Auger Observatory, Argentina
  - The Inter-American Institute for Global Change Research—Headquarters, Brazil
  - Yale Southern Observatory—Argentina

AMPATH Registry



AMPATH Working Groups

- Chairpersons Wanted
  - High-Energy Physics
  - Astronomy – Eduardo Vera Access*Nova, Chile
  - Biomedical Engineering
  - Nanotechnology
  - Geology
  - Environmental Studies
  - and the list goes on…
- Support on the AMPATH web site, mailing lists, and at AMPATH meetings – Next in Miami February 6-7, 2003

AMPATH & Internet2 – Common Goals

- International Partnerships
  - –Ensure global interoperability of advanced networking technologies and applications
  - –Enable collaborations between US researchers at Internet2 institutions and their non-US counterparts
- Inclusion, Collaboration, Community

Thank You!