AtlanticWave + Americas Lightpaths: Enhancing Research Connectivity between North and South America with Open Lightpath Exchanges and 100G Waves

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Outline

• Americas Path (AMPATH)
• Western Hemisphere Research and Education Networks – Links Interconnecting Latin America (WHREN-LILA)
• AtlanticWave
About AMPATH

- AMPATH was launched in March 2000 with support from FIU, Global Crossing, Cisco Systems, Lucent Technologies, Juniper Networks and Terremark Worldwide
- Science research and education exchange between the U.S., Latin America and the Caribbean was augmented
- International connectivity provided by point-to-point 45Mbps links (2001-2005)
- U.S. – Brazil link increased to 622Mbps to support LHC-CMS collaborative research in 2004
- Coordination and collaboration between R&E networks was improved
- AMPATH received support from the NSF Advanced Networking Infrastructure & Research (ANIR) Division
Western Hemisphere Research and Education Networks – Links Interconnecting Latin America (WHREN-LILA)

- NSF International Research Network Connections (IRNC) program in 2004
- IRNC funded connections linking U.S. research networks with peer networks in other parts of the world
- FIU proposal awarded for U.S. connectivity to Latin America via RedCLARA
  - 1.2 Gbps Miami – São Paulo
  - 1Gbps San Diego – Tijuana
- 5-year cooperative agreement (2005-2009)
• Connectivity to Brazil and Latin American was supported by a coalition effort through the WHREN-LILA project
  – Florida International University (award #0441095)
  – Corporation for Education Network Initiatives in California (CENIC)
  – Project support from the Academic Network of Sao Paulo (award #2003/13708-0)
  – CLARA, Latin America
  – CUDI, Mexico
  – RNP, Brazil
  – REUNA, Chile
AtlanticWave

- Established in 2006 a 10GigE wave to provide a distributed international exchange and peering fabric along the Atlantic coast of North and South America
- Connected key exchange points on the Atlantic rim:
  - MANLAN in NYC and AMPATH in Miami
  - MAX gigapop and NGIX-East in Washington, DC
  - SoX gigapop in Atlanta
  - Southern Light, São Paulo
- Extended the reach of the NSF IRNC WHREN-LILA project
- Partners included SURA, FIU, IEEAF, FLR, MAX, SLR/SoX, Internet2/MANLAN, the Academic Network of Sao Paulo (ANSP) and RNP
WHREN-LILA 2009

- 2.5Gbps circuit (Miami – São Paulo) + two 1Gbps circuits (Los Angeles - Tijuana)
- 10GigE distributed international peering service from MIA to NYC via AtlanticWave
- Layer2 services extended to StarLight, then Europe using IRNC Translight/Startlight
- Interconnections with RedCLARA in São Paulo, Tijuana and Miami
Thank You!

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  - Rede Nacional de Ensino e Pesquisa (RNP)
  - Florida International University
  - Latin American Research and Education community
  - The many national and international collaborators who support our efforts
Americas Lightpaths (AmLight): (2010-2015)

- AmLight is an NSF IRNC Production Network (ProNet) award for USA-Latin America science and engineering research and education, ACI-0963053
- AmLight aims to enhance science research and education in the Americas
- International Collaborating Organizations:
  - Florida International University (AMPATH @ FIU)
  - Corporation for Education Network Initiatives in California (CENIC)
  - Lonestar Education and Research Network (LEARN) Texas
  - Academic Network of Sao Paulo (ANSP-FAPESP)
  - Corporación Universitaria para el Desarrollo de Internet (CUDI)
  - Red Universitaria Nacional (REUNA)
  - Rede Nacional de Ensino e Pesquisa (RNP)
  - Cooperación Latino Americana de Redes Avanzadas (CLARA)
  - Internet2
AmLight Links (2010)

- **AmLight East:**
  - Miami (AMPATH)-Sao Paulo (SouthernLight):
    - 5G protected
    - 5+10G unprotected
  
- **AmLight West:**
  - Tijuana-Los Angeles (PacificWave):
    - dark fiber
    - 2x1G waves, increasing to 10G
  
- **AmLight Andes:**
  - Sao Paulo-Santiago:
    - 1G protected capacity
    - collaboration with RedClara
  
- **AmLight Central:**
  - San Antonio – Mexico City:
    - dark fiber
    - 1G wave
AmLight Network Topology

- **ANSP**: 2x 10G links S Paulo – Miami
  - (W) via Santiago (LAN)
  - (E) direct (Telefonica)
- **RNP**: 2x 10G links S Paulo – Miami
  - (W) direct (Telefonica)
  - (E) via Rio de Janeiro & Fortaleza (LAN)
    (+ redundant terrestrial links)
- **CENIC**: 1 x 10G LA – San Diego – Tijuana
- **CUDI**: 1x10G Tijuana - Ensenada
- **LEARN**: 1 x 1G San Antonio – Mexico City