AmLight: An International R&E Network to support a Long-haul Fiber-Sensing Network Testbed

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Outline

- About the AmLight International R&E Network
- Cyberinfrastructure to support a Long-Haul Fiber-Sensing Network Testbed
- Integration with FABRIC
- Roadmap for 2025

About the AmLight International R&E Network

AmLight Express and Protect Project

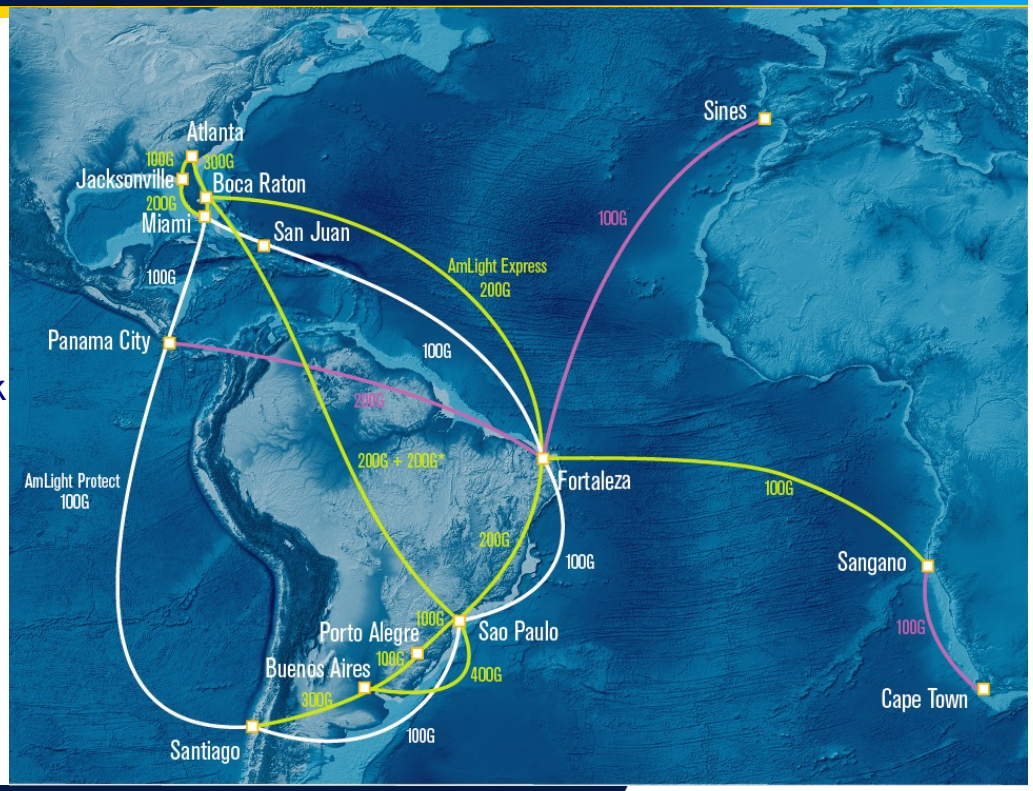
- AmLight-ExP is an international R&E network purpose-built to enable collaboration among Latin America, Africa, the Caribbean and the U.S.
- Supported by NSF and the IRNC program under award #OAC-2029283
- Partnerships with R&E networks in the U.S., Latin America, Caribbean and Africa, built upon layers of trust and openness by sharing:
  - Infrastructure resources
  - Human resources

AmLight ExP
Americas Lightpaths Express & Protect
(NSF Award # OAC-2029283)

AmLight ExP
Americas Lightpaths Express & Protect

AmLight-ExP Network Infrastructure (Physical)

- 600G of upstream capacity between the U.S., Latin America, Caribbean and 100G to Africa
- OXPs: Florida(3), Georgia, Brazil(2), Chile, Argentina, Puerto Rico, Panama, and South Africa
- Production SDN Infrastructure since 2014
- Deeply programmable across the network stack
  - Programmable P4 Data Plane
  - Open Source SDN Controller (kytos-ng)
  - Fine-grained telemetry
- Highly instrumented
  - PerfSonar, sFlow, Juniper Telemetry Interface (JTI), In-band Network Telemetry (INT)



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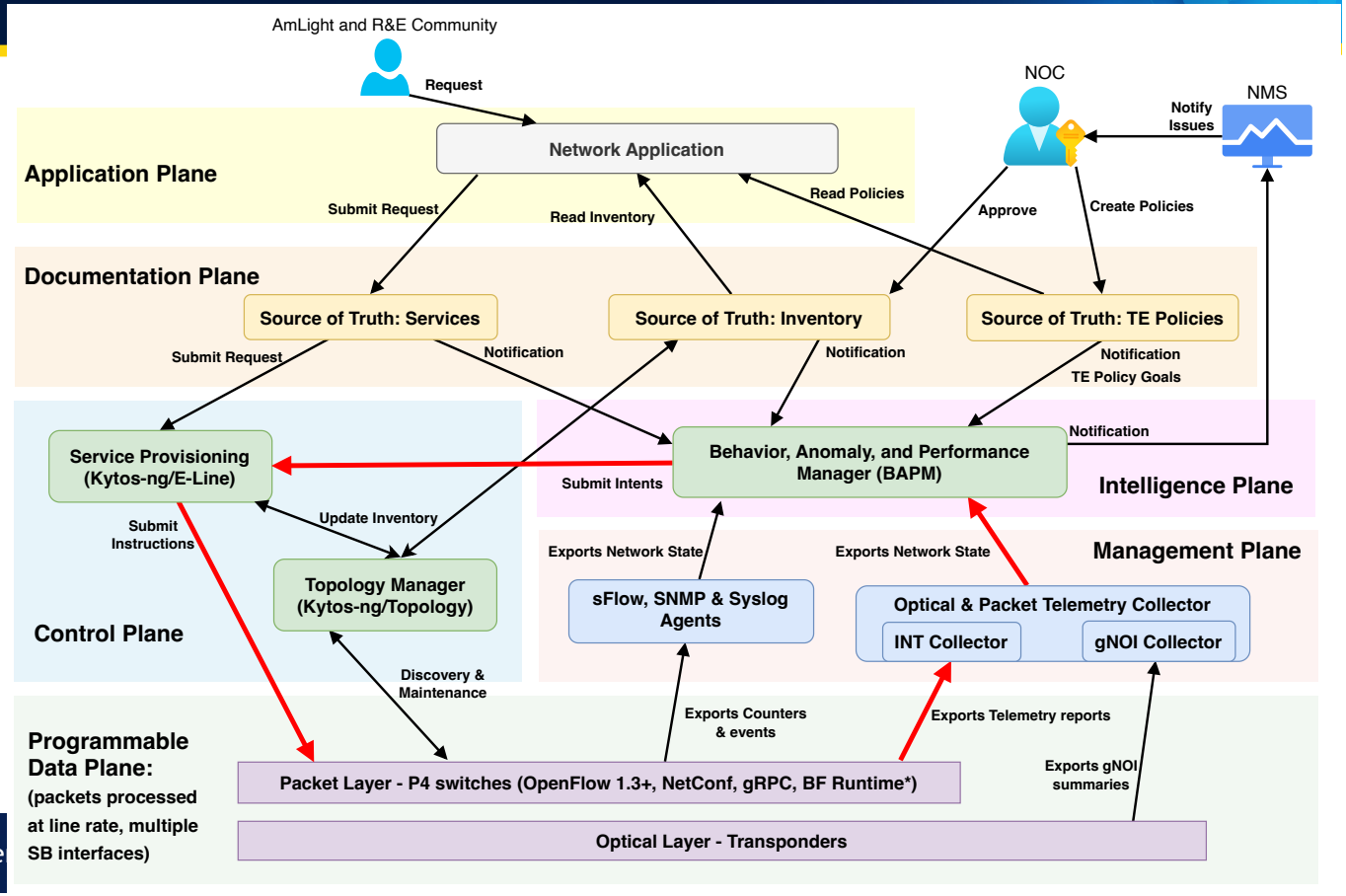
AmLight's Deeply Programmable Network Stack (Software)

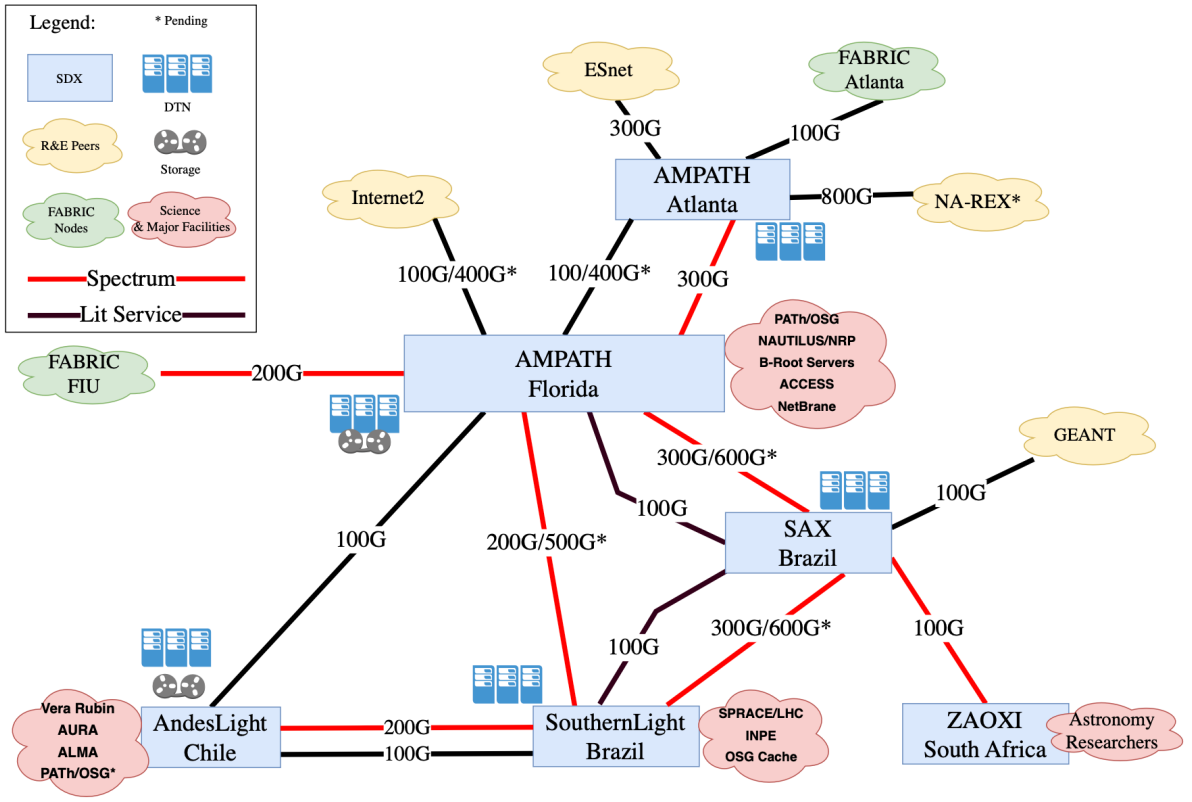
- Purpose-built Multi-layer Programmable Network Stack
- Network State
  - Network Verification
  - Packet Provenance
- Closed-Loop Orchestration
  - Reduces the need for operator intervention



Cyberinfrastructure to support a Long-Haul Fiber-Sensing Network Testbed

AmLight's Multi-Layer Infrastructure

- SDXs: AMPATH, SouthernLight, AndesLight, SAX, and ZAOXI
- 100G+ to FABRIC, RENs, clusters, testbeds, and scientific instruments
- Telemetry deployed per site (Optical and Packet)
- Spectrum added between FL and Brazil:
  - Final bandwidth: **1.1 Tbps**
- 100G DTNs added to each SDX/OXP



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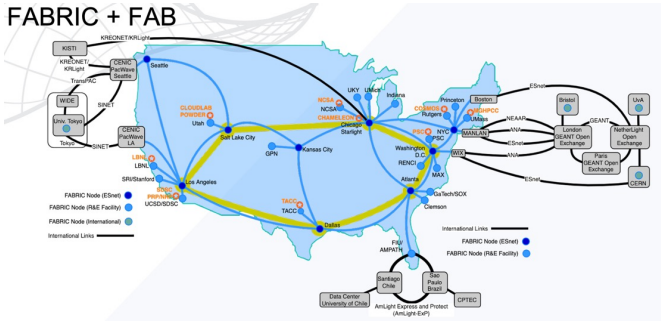
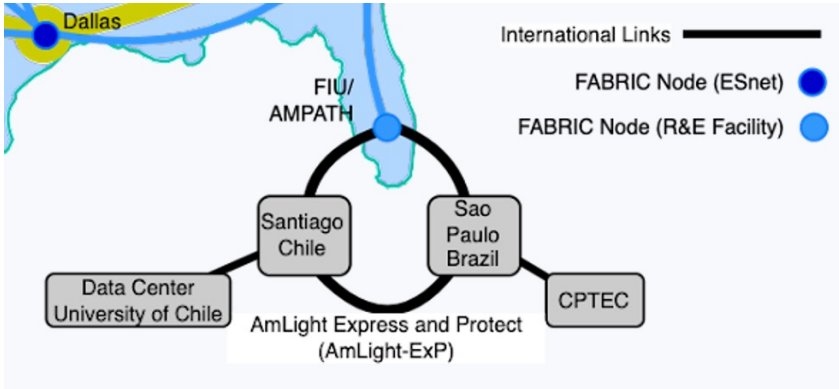
Integration with FABRIC

AmLight is Integrated with FABRIC

- AmLight is connected to FABRIC via a dedicated 100G facility port
- SDXlib was developed to integrate AmLight with FABRIC
- Launched at SC24, SDXlib demonstrated how
  - Optical telemetry was captured from AmLight's optical equipment and forwarded to FABRIC's facility port
  - Captured optical telemetry was forwarded to a FABRIC node with disk and GPU
  - Processing leveraged FABRIC and Chameleon resources
  - Resulting datasets were exported to AmLight and hosted for the community to download, all instantiated by SDXlib
  - All of it from just ONE FABRIC notebook and no NOC interaction
- *Experimenters on FABRIC and network operators can now use SDXlib to automate network provisioning over multiple network domains*





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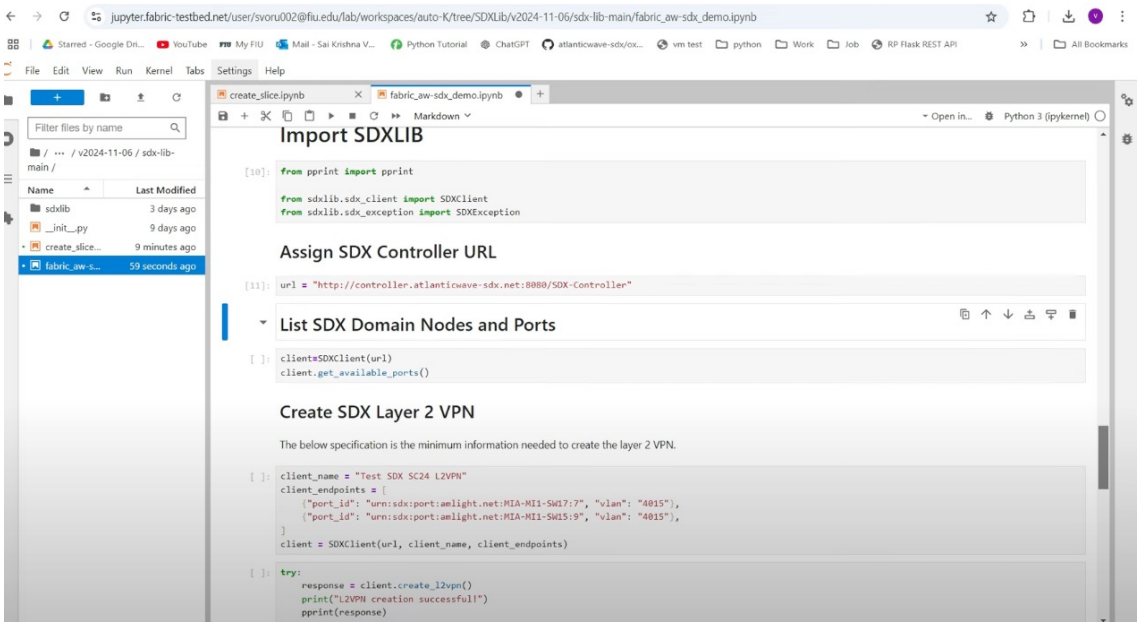
About SDXlib

- SDXlib is a Python library to allow FABRIC experimenters to create services directly from Jupyter Notebooks
- Similar methods as FABlib
- Abstracts manual complexity to enable quick deployment
- Currently, experimenters can create L2VPNs from FABRIC facility port to an endpoint on AmLight



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Roadmap for 2025

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- Deploy a Ciena Waveserver 6E at Sao Paulo, Fortaleza, and Boca Raton to activate a total of 1.1Tbps (currently we have 400G using Waveserver Ai)
- Upgrade 1x100G from Miami to Jacksonville to 1x400G
- Upgrade 1x100G from Jacksonville to Atlanta to 1x400G
- Activate the NA-REX connectivity: 1x400G to StarLight and 1x400G to PacificWave
- Add more functionality to the Intelligence Plane of the SDN framework architecture

THANK YOU

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AmLight ExP
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AtlanticWave SDX
INTERNATIONAL DISTRIBUTED SOFTWARE-DEFINED EXCHANGE

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