AmLight ExP

Americas Lightpaths Express & Protect

AmLight Express and Protect (AmLight-ExP):

Enabling Research and Education in the Americas via cooperation and collaboration

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Global 100G: ANA-100G, GÉANT, RedCLARA/RNP, SINET Push for Greater Connectivity Around the Globe

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Outline

- Overview
- Current Status
- Planned activities for 2019
- Science Drivers
- Conclusion

Overview: AmLight Express & Protect Vision

- Community-operated network infrastructure
- Leased capacity on two submarine cable systems, evolving to a hybrid model that includes spectrum from Boca Raton to Sao Paulo
- Express (spectrum) capacity will provide up to 6 optical channels, which will be lit with 100G transponders today
- Protect (leased) capacity 100G ring will back up the Express capacity

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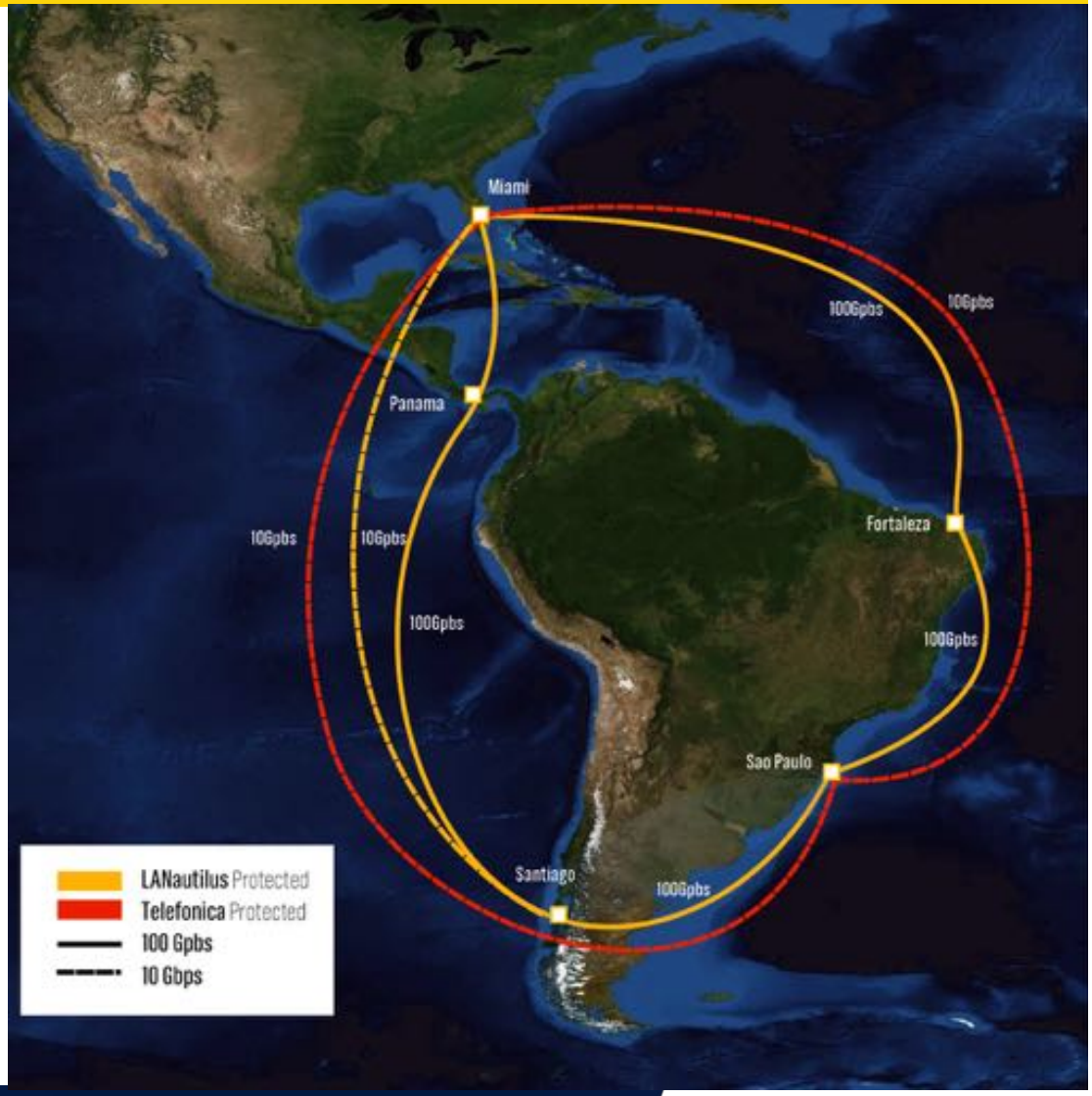
Partners and Goals

- AmLight-ExP interconnects the U.S. to key aggregation points in South and Central America (Brazil, Chile, Panama)
- 5-year Cooperative Agreement with the U.S. National Science Foundation
- Cooperative and collaborative partnerships with ANSP, RNP, CLARA, REUNA, AURA, FLR, and Internet2
- Continue evolving a rational network infrastructure using both optical spectrum and leased capacity

Current Status: Regional Network Infrastructure

- 100G ring Miami-Fortaleza, Fortaleza-Sao Paulo, Sao Paulo-Santiago, Santiago-Panama City, Panama City-Miami
- 10G ring from Miami-Sao Paulo-Miami for protection (red)
- 10G Miami-Santiago for protection
- 100G and 10G rings are diverse, operating on multiple submarine cables
- Total upstream capacity presently at 230Gbps



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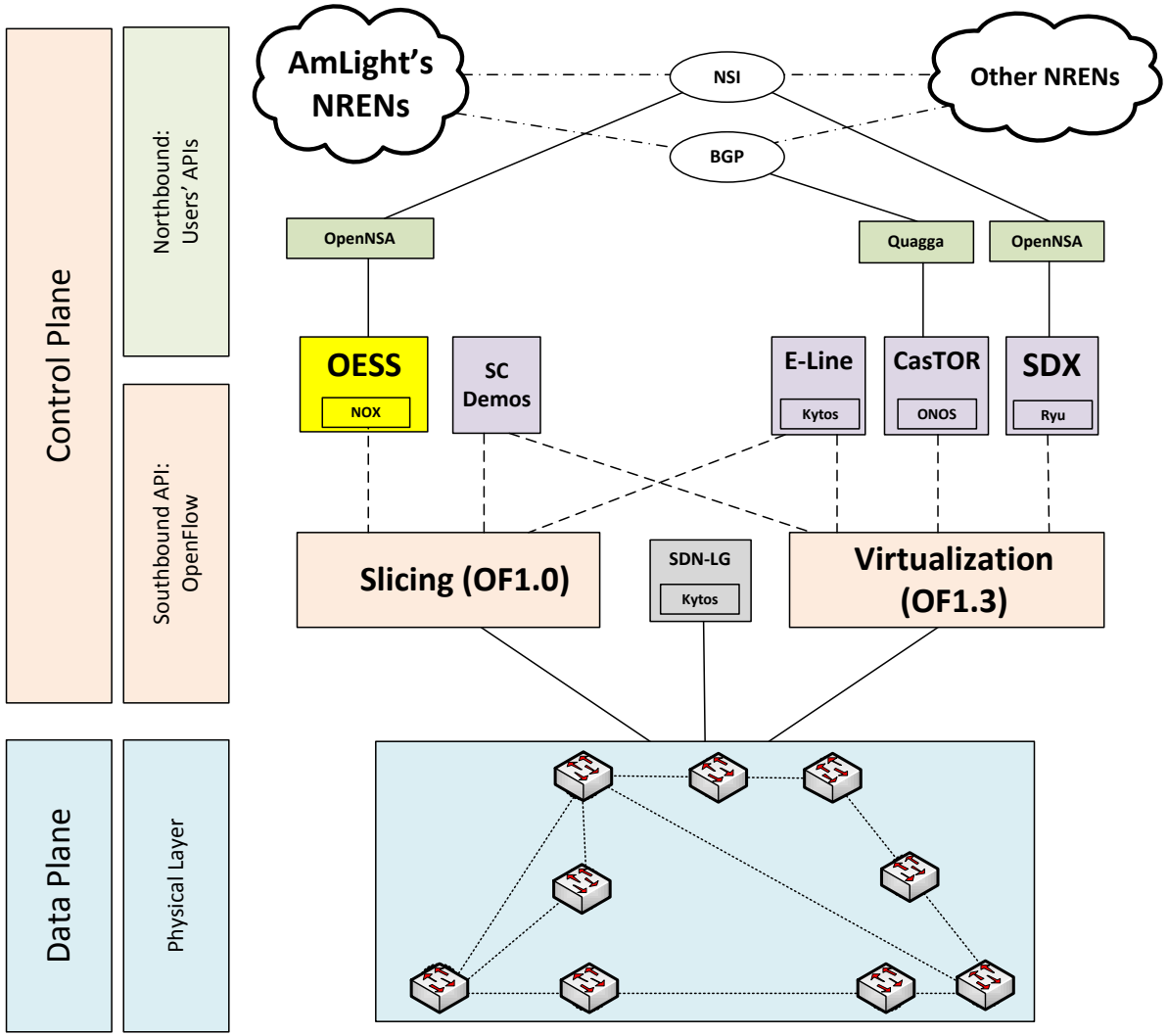
Network virtualization and programmability

- Supporting SDN in production since 2014
- Researchers use slicing/virtualization to prototype network-aware applications
  - Can implement testbeds with real network devices
  - Can validate research in a production environment, and at scale
  - E.g., Existing testbed for bandwidth prioritization and reservation to support big-data and real-time applications (LSST use case)
- SDN Looking Glass for integration of both optical and packet domains for a complete network troubleshooting and visualization



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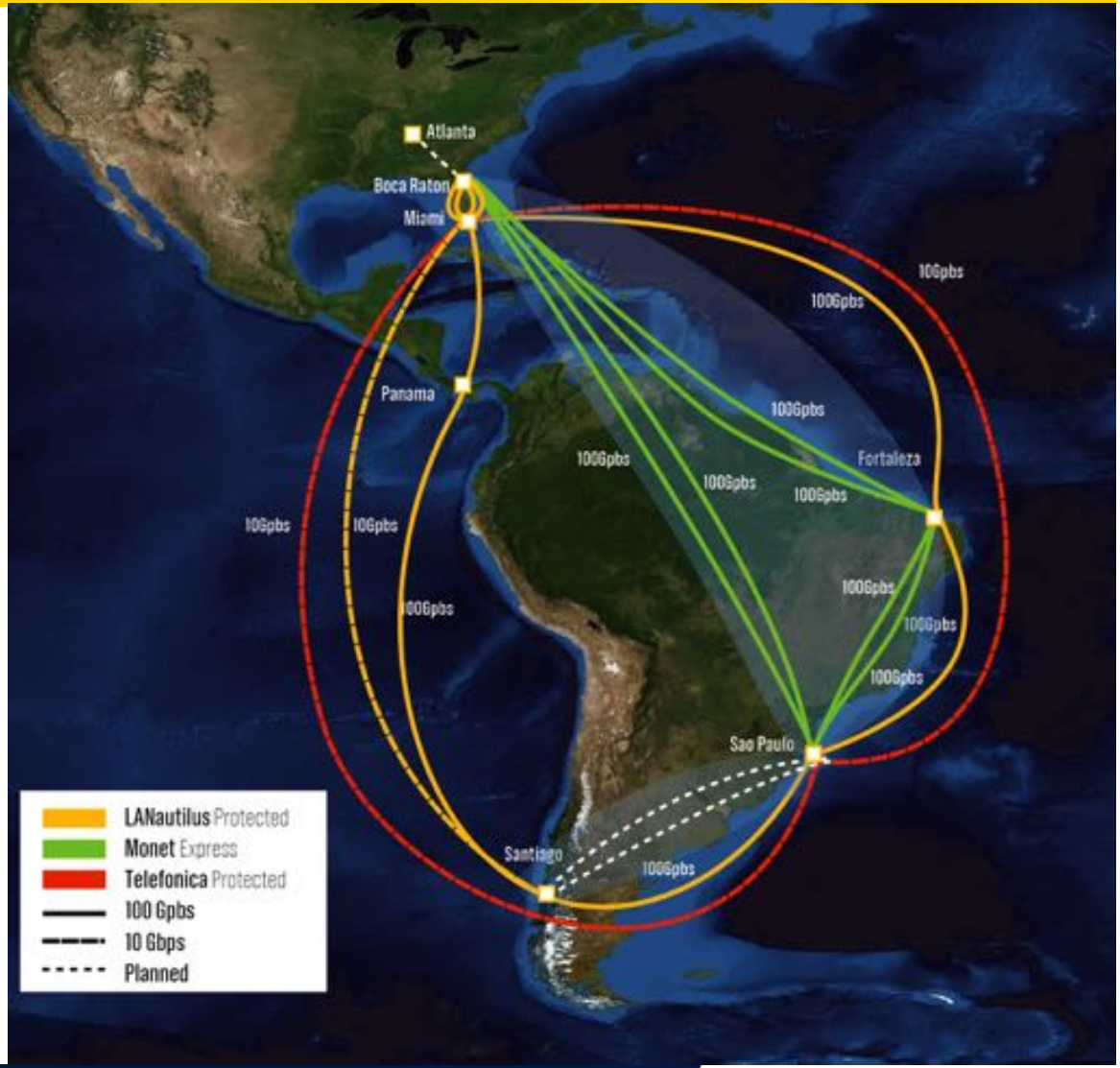
Planned Activities: Building Express backbone, and enhancing resilience on AmLight

- Increasing AmLight network resilience and capacity
  - Activate Express:
    - Boca Raton, Fortaleza, Sao Paulo
    - 6 (green lines) x 100G links
      - 4 managed by RNP
      - 2 managed by FIU/ANSP/LSST
- Expanding AmLight network
  - Add PoPs in Jacksonville and Boca Raton
- Enhancing monitoring capabilities
  - Enhance SDN Looking Glass
  - Activate INT capabilities
  - Add P4+INT NICs to perfSonar nodes



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Science Driver: Large Synoptic Survey Telescope (LSST)

- LSST will be a large-aperture, wide-field, ground-based optical telescope under construction in northern Chile
- The 8.4 meter telescope will take a picture of the southern sky every 27 seconds
  - producing a 13 Gigabyte data set
- Each image must be transferred to the archive site at NCSA in Champaign, Illinois, within 5 seconds
  - Reason: for processing to be completed in time to generate “transient alert” notifications to the worldwide astronomical community within 60 seconds
- In response to LSST’s transient alert requirements, the network must be scalable, highly available, reliable, and provide high-throughput and guaranteed bandwidth

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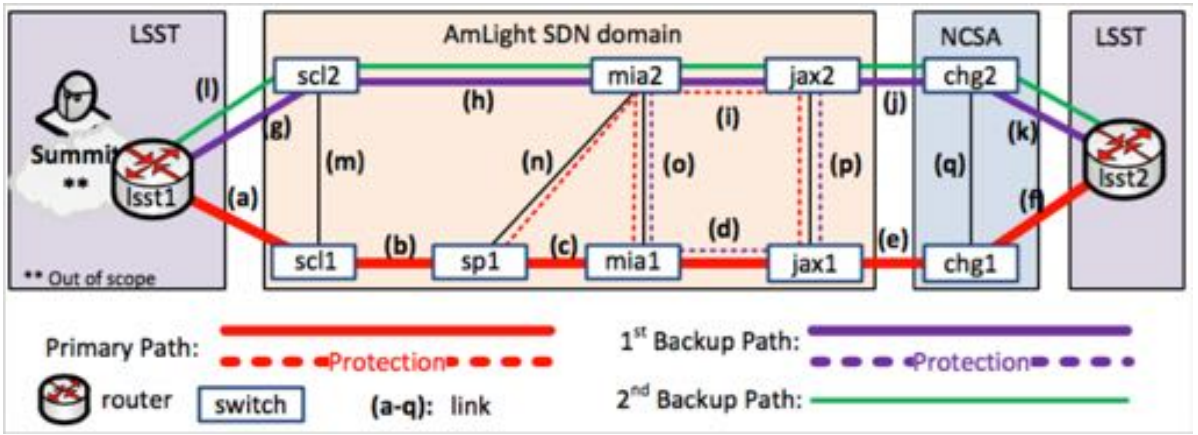
Challenge: LSST Use Case

- LSST will be remotely operated from Tucson, Arizona
- Every 27 seconds throughout the night, LSST will take a 6.4GB picture of the sky, process it, generate transient alerts (6.3GB) from this picture, and then send a 13GB data set to NCSA, at Urbana-Champaign, Illinois
  - From the 27-seconds window, only 5 seconds are available for data transmission
  - Multi-traffic types with different priorities (db sync, control, general Internet traffic) must be supported

- A 0.001% of packet loss will compromise the LSST application
- Packet loss isolation will have to be handled in real-time
- Strict SLA:
  - MTBF (180 days in a year)
  - MTTR (48 hours)



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Conclusion

- AmLight continues to
  - Develop a network infrastructure that interconnects North America with key aggregation points in South and Central America (Brazil, Chile, Panama)
  - Evolve as a rational R&E network infrastructure that is scalable, effective and efficient
  - Facilitate effective peering among academic networks and communities of interest
  - Respond to the network requirements from research communities
  - Achieve success in its goals through cooperation and collaboration

Thank You!

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  - Association of Universities for Research in Astronomy (AURA)
  - Florida International University
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