

**TNC 2018**

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**Regional Networks, Communities and Ecosystems**  
***Americas Africa Research and eduCation Lightpaths***  
***(AARCLight) Study: Year 1 findings***

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# AARCLight: Americas Africa Research and eduCation Lightpaths, NSF Award #OAC-1638990

- Planning activity that aims to
  - Define a strategy for research and education network connectivity between the US and West Africa along the South Atlantic
  - Coordinate planning efforts among stakeholders in the U.S., Africa, and Brazil
  - Understand the potential impact
    - From the use of the offered spectrum
    - To create economies of scale
    - Towards serving the broadest communities of interest in research and education



# Collaborative Partners

- UbuntuNet Alliance
- WACREN: West and Central African Research and Education Network
- TENET: The Tertiary Education and Research Network of South Africa
- SANReN: The South African National Research Network
- SABEN: South African Broadband Education Networks
- ANSP: Academic Network of São Paulo
- RNP: Rede Nacional de Ensino e Pesquisa
- CLARA: Cooperation of Advanced Research and Education Networks in Latin America
- Internet2
- Florida LambdaRail





# Indicators to guide the study

- New Data-Intensive, Network-Dependent science instruments in the southern hemisphere:
  - Large Synoptic Survey Telescope (LSST) in Chile
  - SKA in South Africa and Australia
- New submarine cables in South Atlantic
- Network aggregation emerging in the southern hemisphere
- Potential to leverage network infrastructure linking the U.S., South America, and Africa



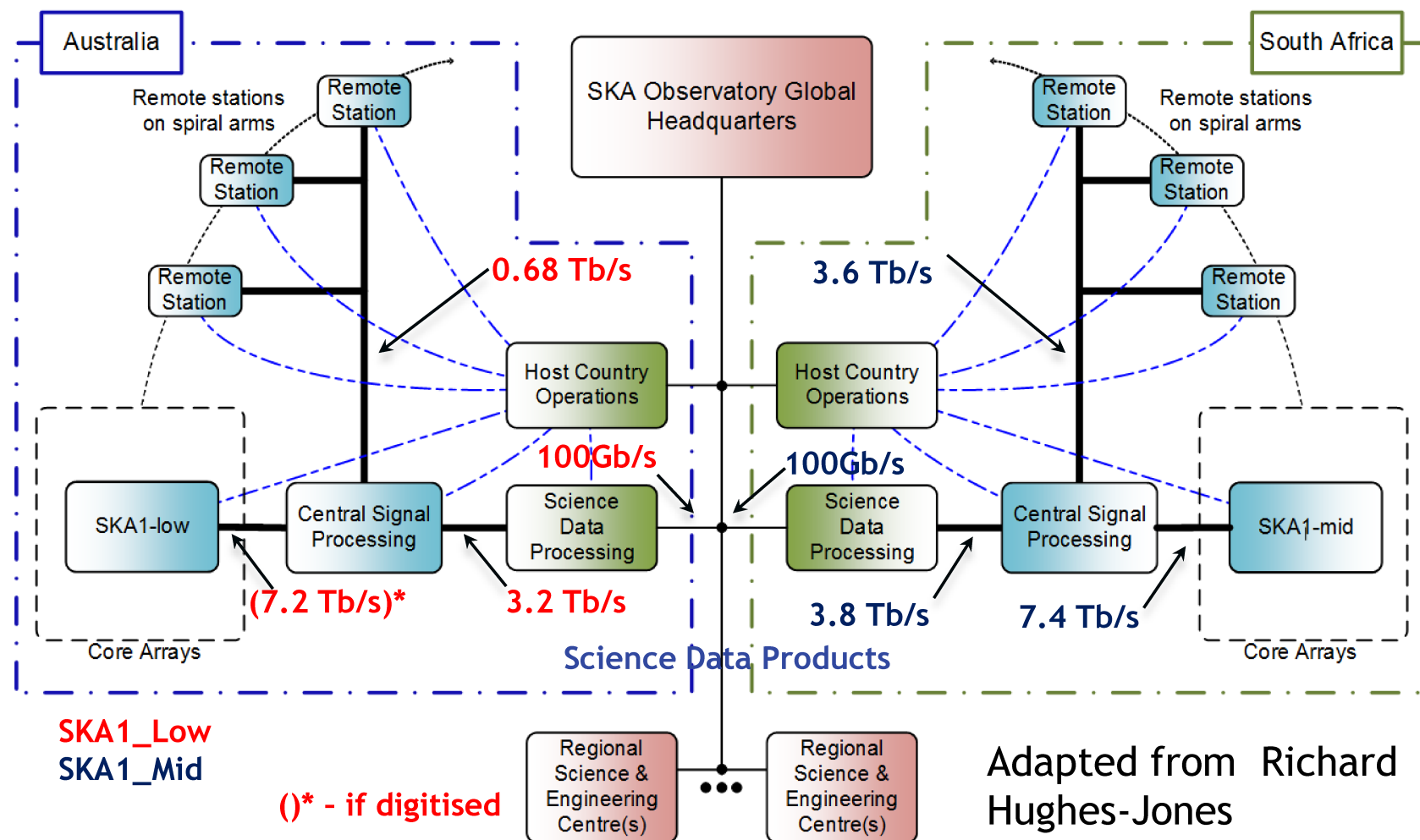
# MeerKAT Radio Telescope

- MeerKAT is a 64-dish system
- MeerKAT will be integrated into the mid-frequency component of SKA
- Generates data at a rate of 4.7Gbps
- Data is transported either by tapes, or scientists travel to South Africa
- Data is collected and digitized at each antenna and then streamed via optical link to the Karoo Array Processor Building (KAPB) for science processing
- Clock signal is distributed from a central point to remote dishes



# SKA Data Transport Requirements

- SKA will be the world's largest radio telescope
- Australia and South Africa are the host countries
- SKA Regional Science and Engineering Centers (SRC) will provide access to
  - SKA data products
  - Computational resources for processing and analysis
  - A long-term archive for SKA science data products
- NRENs will be critical to support data movement to SRCs and users

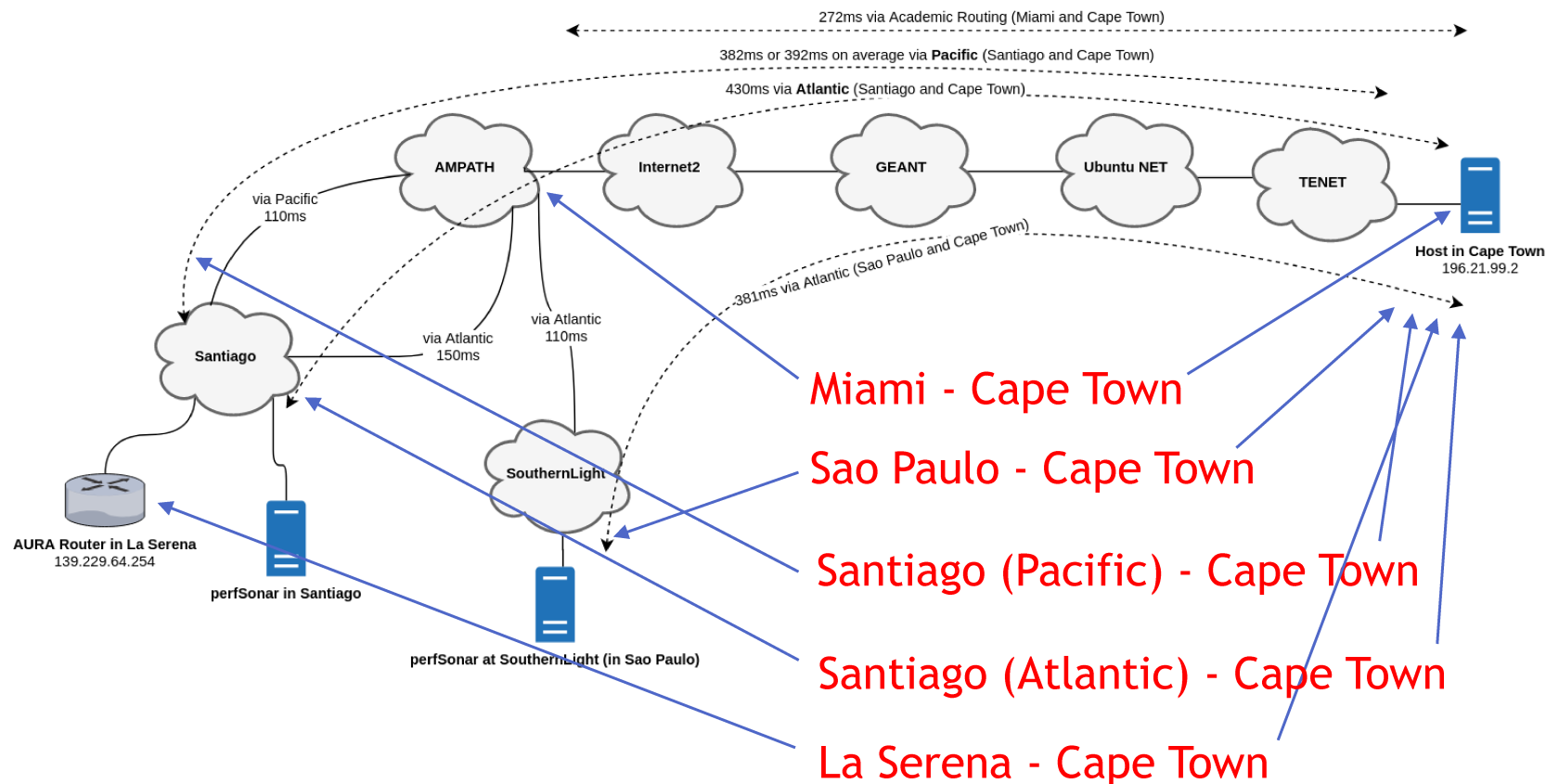


# Network performance to Latin America

- Latency was measured from Cape Town to the following sites:

- Miami 272ms
- Sao Paulo 381ms
- Santiago 382ms via Pacific
- Santiago 430ms via Atlantic
- La Serena 392ms

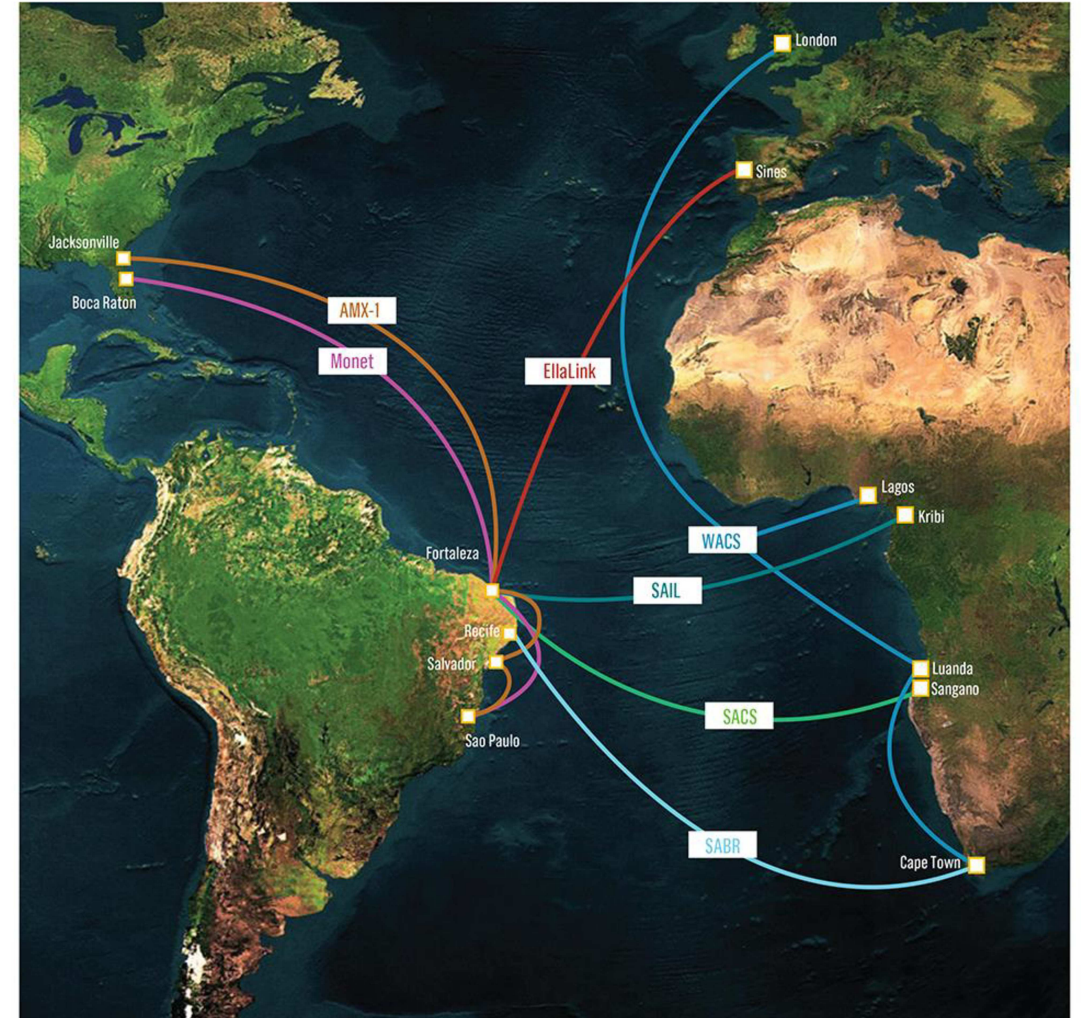
- Academic networks transited were TENET, UbuntuNet, GEANT, Internet2, AmLight, REUNA, RNP and ANSP





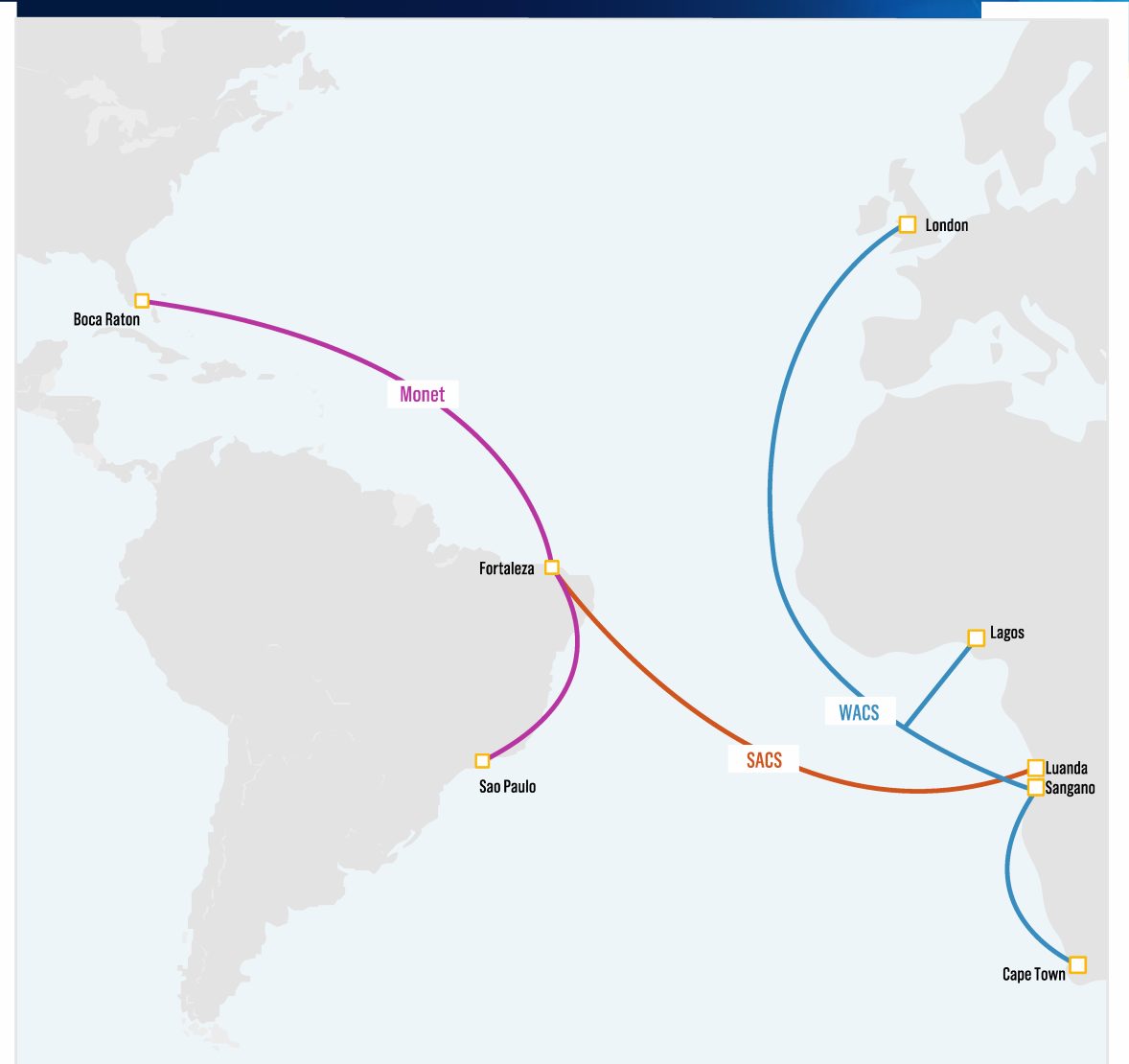
# New submarine cables in the South Atlantic

- **Monet:** Boca Raton, FL-Fortaleza, BR. Operational
- **South Atlantic Cable System (SACS):** Fortaleza, BR- Sangano, Angola. Q3 2018
- **South Atlantic Inter Link (SAIL):** Fortaleza, BR - Kribi, Cameroon. Q3 2018 (TBD)
- **EllaLink:** Fortaleza, BR - Sines, Portugal. RFS 2020
- **America Movil (AMX-1):** Fortaleza, BR - Jacksonville and Hollywood, FL. Operational
- **SABR:** Cape Town, SA - Recife, BR. RFS 2019
- Fortaleza is a landing point for all cables, except for SABR



# Network infrastructure resources in the Southern Hemisphere (potential leveraging)

- 225GHz linear spectrum of Monet committed in AmLight-ExP project
- 40GHz of spectrum on SACS is available to the R&E community
- TENET operates 220G of capacity on WACS
- South Atlantic eXchange point (SAX) is under development in Fortaleza, led by RNP
- R&E exchange point in Cape Town operated by SANREN and TENET
- R&E exchange point in Lagos, operated by WACREN



# Findings in Year 1

- Data volume will be increasing from science drivers in Sub-Saharan Africa (SSA)
- Network infrastructure capacity is increasing in the Southern Hemisphere
- Linking the R&E communities in the US, Africa and Brazil is realizable via Monet and SACS submarine cable systems
- Reducing latency and improving infrastructure diversity is realizable
- Human resource development in several science, engineering and technology areas is lacking





# Year 2 Goals

- Develop a plan for the activation of the offered spectrum on SACS
- Study locations for interconnections with partners' R&E networks in Africa
- Develop a network design with AARCLight collaborators
- Develop an assessment plan to measure the level of engagement by communities of interest with the potential new network infrastructure



# Acknowledgment

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- Academic Networks of Sao Paulo, RNP, SANREN/TENET, UbuntuNet and WACREN for their participation and support
- The many national and international collaborators who support our efforts



A world map with a blue background, showing flight paths connecting major cities. The cities labeled are Los Angeles, New York, Miami, Panama, Santiago, Sao Paulo, Rio de Janeiro, and Luanda. The text "THANK YOU!" and "julio@fiu.edu" is overlaid in white.

THANK YOU!  
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