

TNC 2018

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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

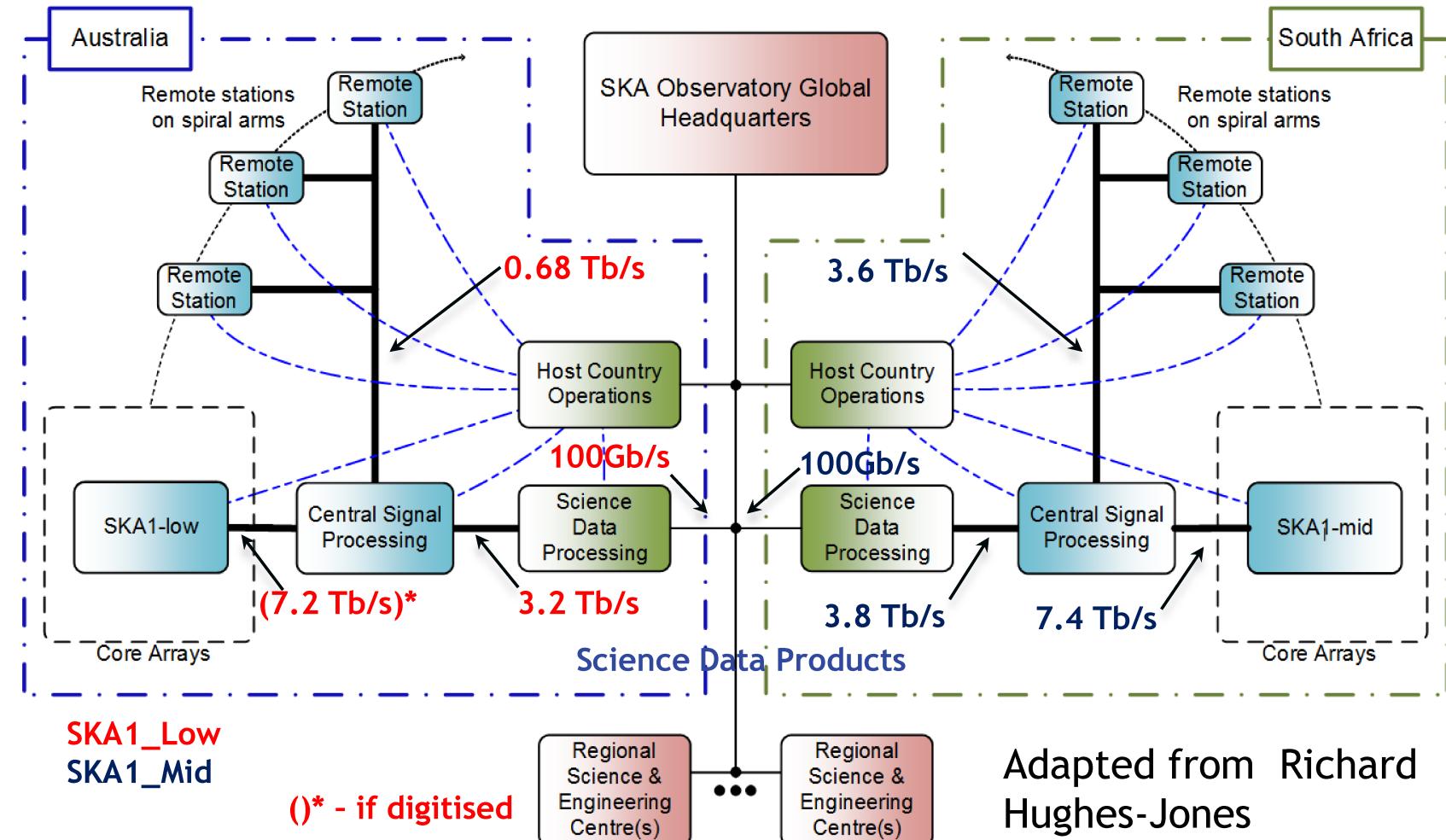
MeerKAT Radio Telescope

- 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



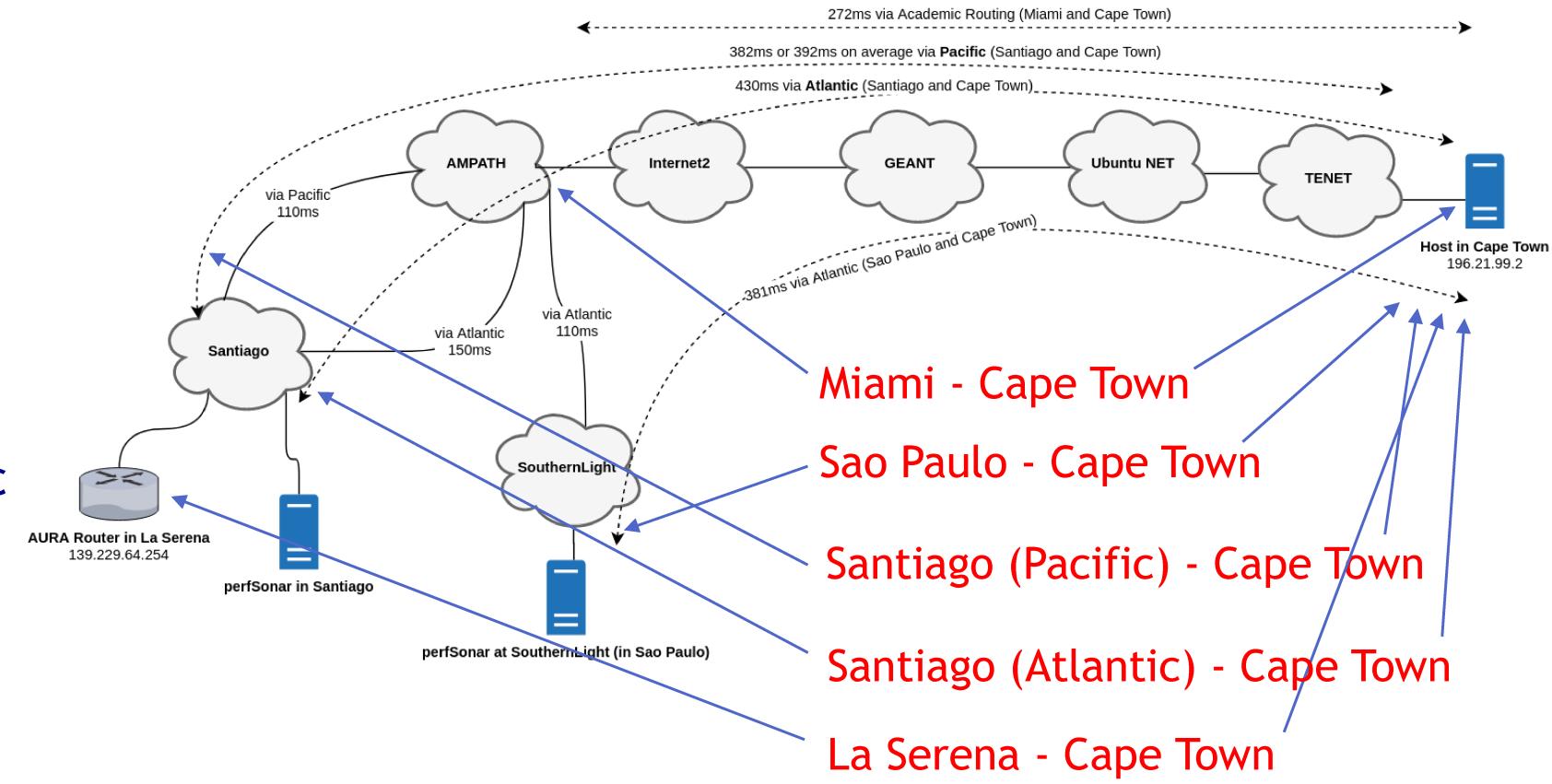
SKA Data Transport Requirements

- 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



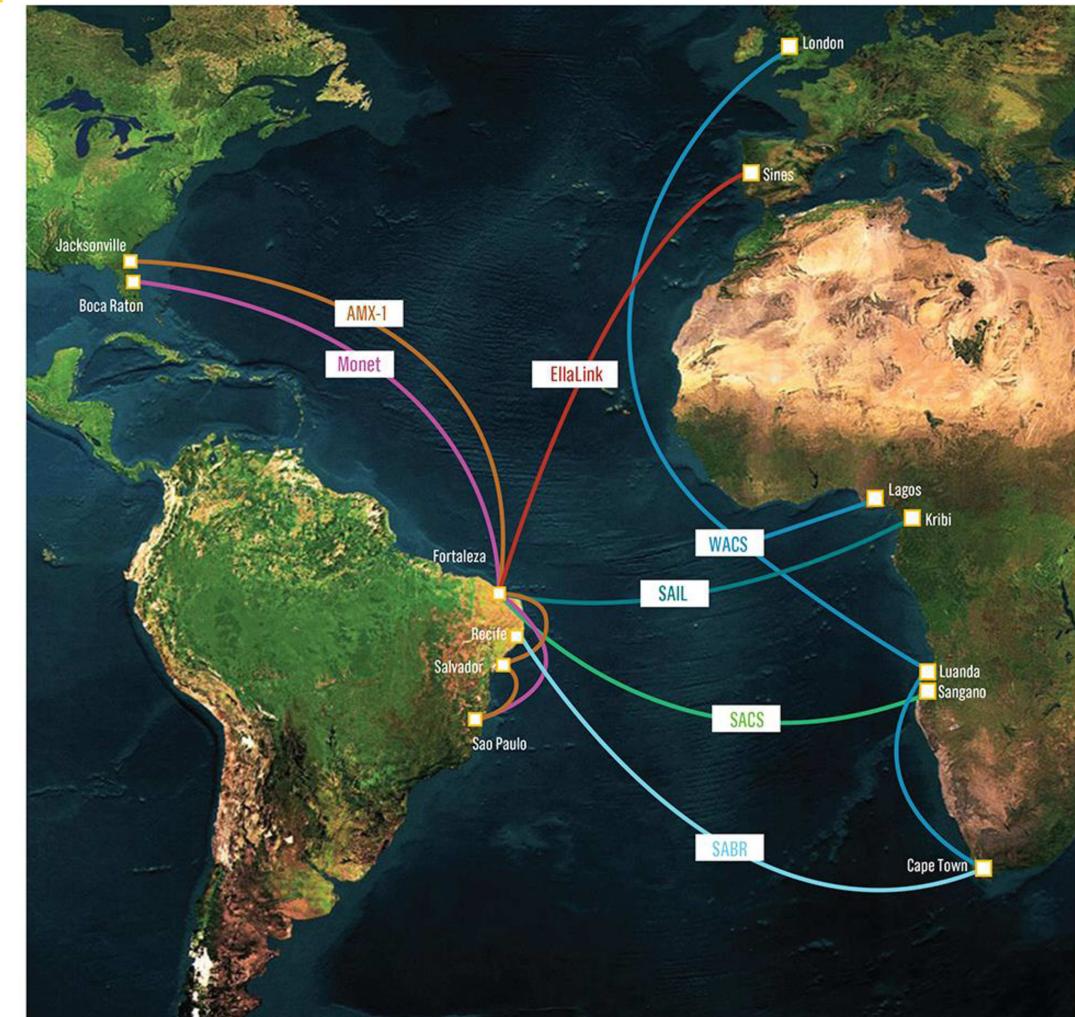
Network performance to Latin America

- 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



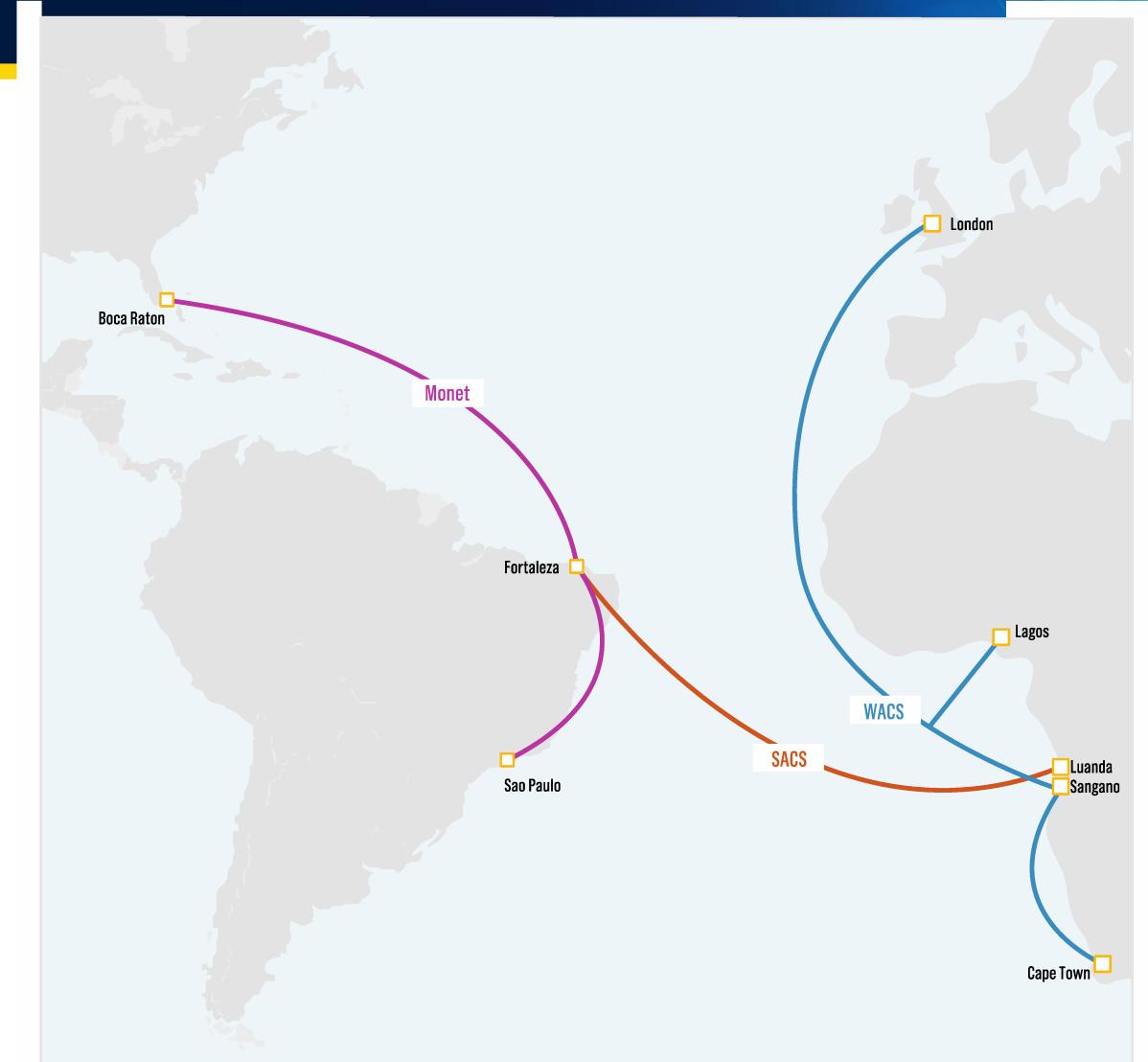
New submarine cables in the South Atlantic

- **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



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THANK YOU!

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