ADVANCES IN COLLABORATION TO LEVERAGE R&E NETWORK INFRASTRUCTURE BETWEEN AFRICA, LATIN AMERICA AND THE U.S.

UbuntuNet CONNECT 2020

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Outline

- South Africa NREN Connectivity(TENET/SANReN)

- Updates on AmLight ExP & AtlanticWave SDX (FIU CIARA)

- New connection over AmLight-SACS (RedCLARA)

- Updates by RNP, the Brazilian National Education and Research Network
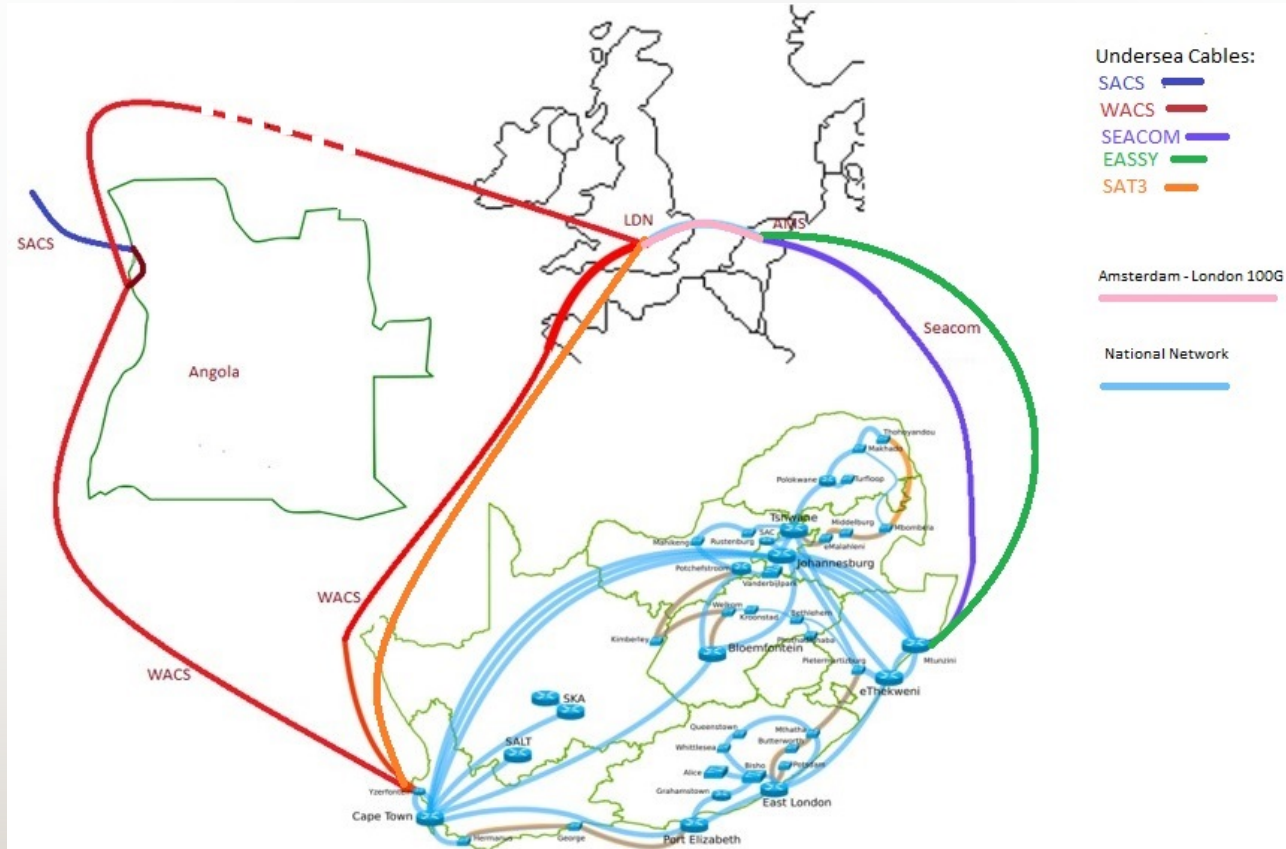
The SA NREN = TENET & SANReN

TENET

- Created in 2000 as a non-profit company. Membership is primarily universities (all 26) and research institutions, but serves a much wider constituency (TVET Colleges and School Networks)

- Funded through cost recovery from beneficiary Institutions.

- Operates the network deployed by SANReN, but also deploys some network functions and components

- Delivers services

SANReN

- Created in 2006 as a business unit in the Council for Scientific and Industrial Research

- Funded through a State grant (Department of Science and Technology)

- Designs, acquires and implements networks and network components, from metro to international level

- Develops and incubates services

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SA NREN Connectivity ....

UbuntuNet peering at the Exchange Point in Cape Town

- SA NREN (TENET and SANReN) operates an exchange point in Cape Town – ZAOXI.

- SA NREN has ownership of 7.4% of the WACS cable allowing it to light capacity between any landing stations on the route from Cape Town to London.

- AARCLight and AmLight have a collaborative partnership with SA NREN.

- UbuntuNet is now connected to ZAOXI. SA NREN carries UbuntuNet Member traffic from their South African POPs to the Exchange Point and thereby opens the path to Fortaleza and Miami.

- Once an exchange point is established in Luanda, SA NREN can light capacity between ZAOXI and the new exchange point using WACS capacity.

- Collaborative partners can utilize capacity as needed on the SACS cable, WACS cable, AARCLight etc. to connect to AmLight in Fortaleza, ZAOXI in Cape Town or any other connected Exchange point.

- SA NREN's WACS connectivity may be extended to reach other landing stations to add new collaborative partners to the project. This opportunity is being discussed among interested parties and Angola-Lagos-London could be a possible starting point.

Americas-Africa Lightpaths Express and Protect (AmLight-ExP)

The goal of the newly funded NSF project (Award #2029283) is to operate and continuously improve the suite of production and experimental network connections between the USA, Latin America and Africa:
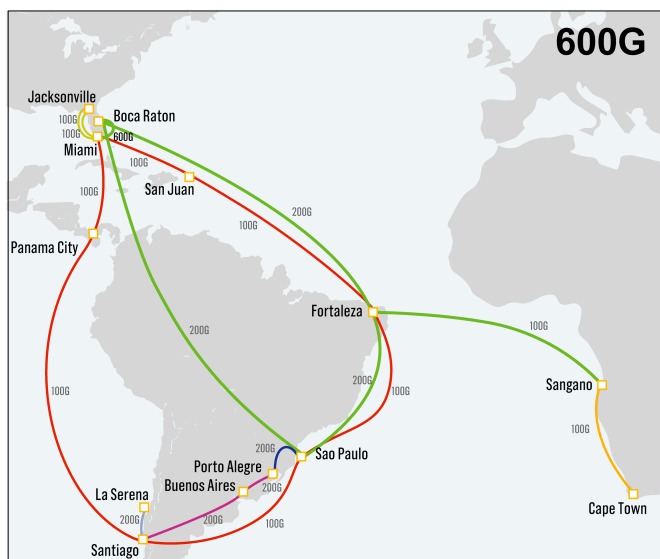
- **Evolving the AmLight-ExP SDN Controller**: With the existing infrastructure, AmLight has presence in 5 countries, 10 data centers, photonics, and a forwarding layer that includes 25+ 100Gbps links. On top of this complex infrastructure, many services are provided, such as L2VPNs, L3VPNs, cloud services, R&E IP Transit, including dynamic services and testbeds. AmLight will operate through multiple SDN controllers using many southbound protocols.

- **Evolving the AmLight-ExP physical infrastructure:** The upgraded network infrastructure will support new high-demand SLA-based science drivers.
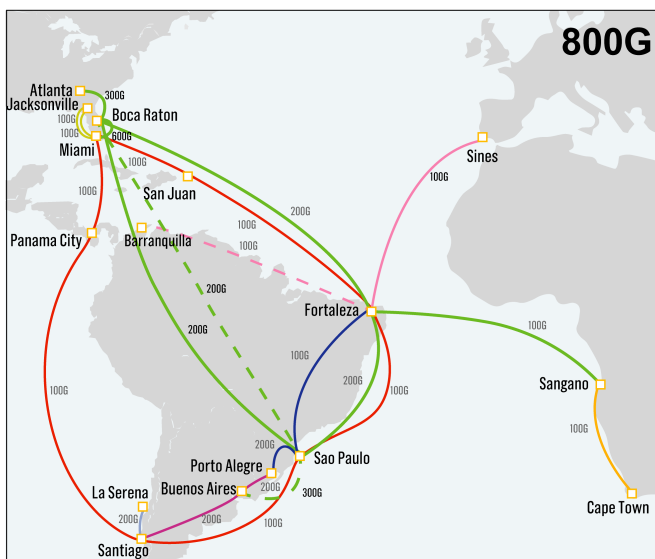
(NSF Award # ACI-1451018 & Award # ACI-2029283)

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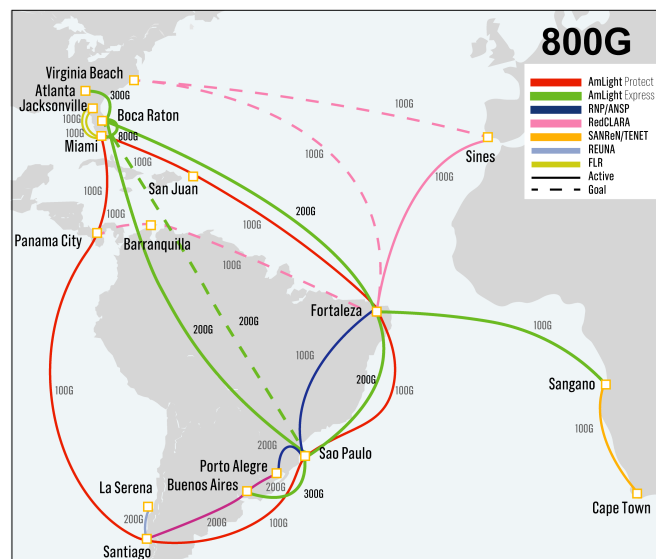# Americas-Africa Lightpaths Express and Protect (AmLight-ExP)

Backbone: Americas Lightpaths Express and Protect (AmLight-ExP)

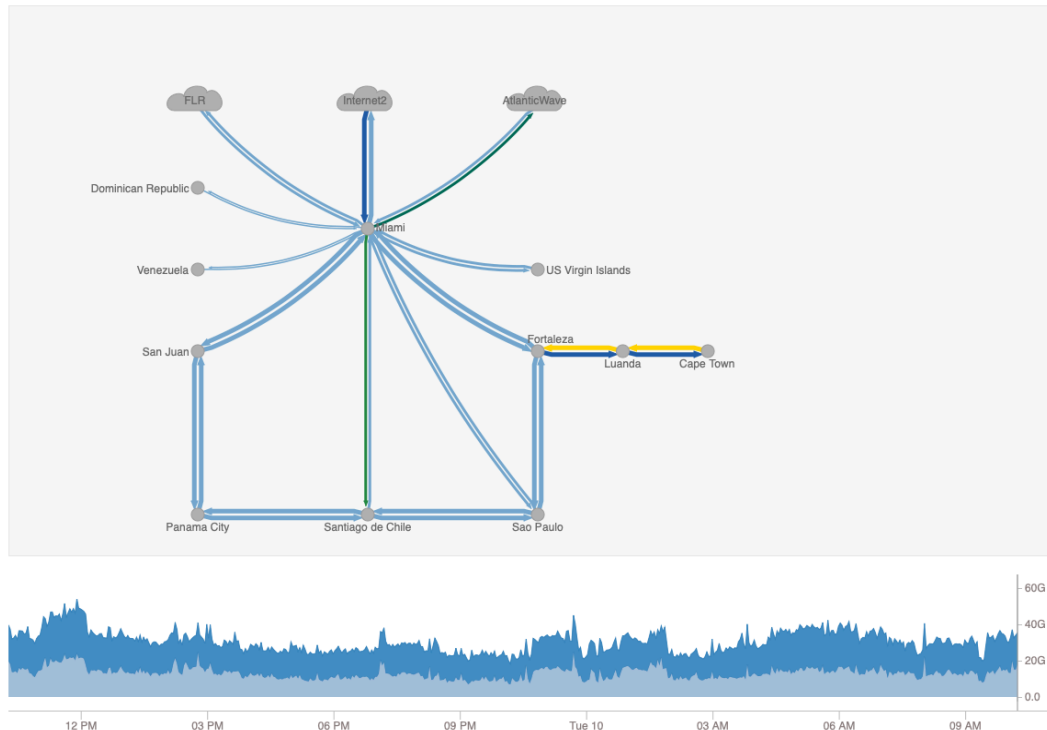Map is available to the community to highlight the locations AmLight serves, the network topology, and the per link traffic utilization

AtlanticWave-SDX

A Distributed Experimental SDX Supporting Research, Experimental Deployments, and Interoperability Testing at Global Scale

GOALS:

To build a distributed SDX between the U.S. and S. America

- To support a dramatic increase in south-north science flows
- To integrate the SDN infrastructures at AMPATH, SoX, SouthernLight, and AndesLight open exchange points

To enable domain scientists to reserve network resources through a multi-domain SDX by

- Simplifying the interface for domain scientists to request network resources
- Providing interfaces to program the forwarding plane to respond to application requirements
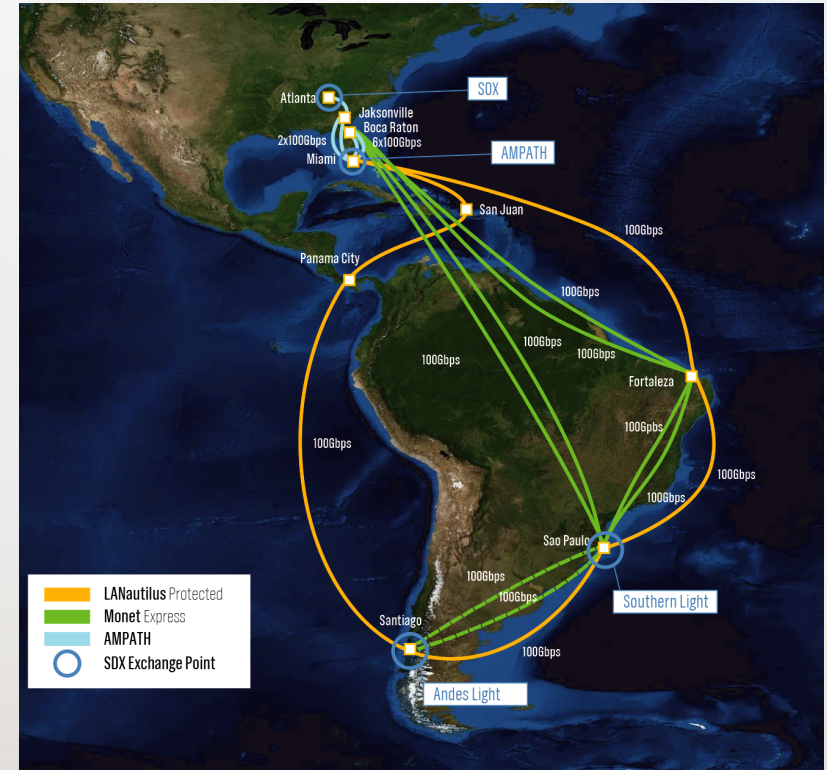
(NSF Award #1451024 & Award #2029278)
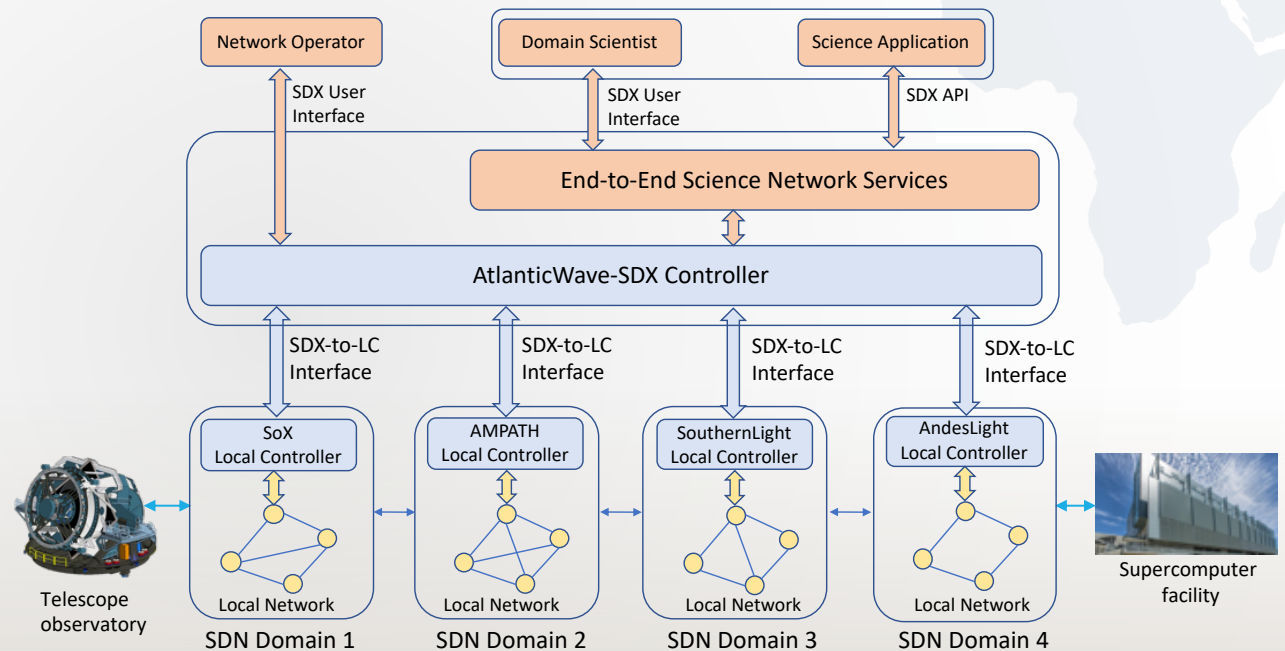
AtlanticWave-SDX

A Distributed Experimental SDX Supporting Research, Experimental Deployments, and Interoperability Testing on Global Scale

AtlanticWave-SDX Features

- In-band Management Plane
- Authentication via CILogon
- Point-to-Point Connections
- Point-to-Multipoint Connections
- Bandwidth Reservation
- Failure Handling

Users (network operators and domain scientists), and applications can

- Request end-to-end science network services from the AW-SDX controller
- Consume end-to-end services composed by the AW-SDX controller

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RedCLARA

- RedCLARA is the regional research and education network in Latin America.

- It connects eleven national research and education networks.

- Cooperation with this project has strengthened the connectivity south to north increasing the infrastructure available for Latin American Research Communities.

- The investments made by the project increase efficiency and effectivity of the network.
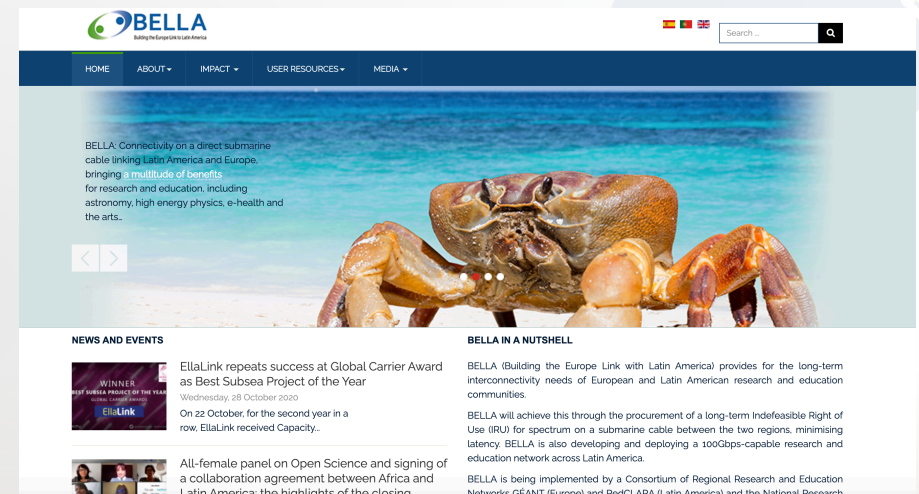
RedCLARA

- As part of the global research and education network community, the new link to Africa increase cooperation opportunities with the African scientist.

- RedCLARA signed a cooperation agreement with Ubuntunet Alliance to explore and expand collaboration opportunities.

- It provides, altogether with the Bella Project, a significant network, augmenting cooperation opportunities between Europe, USA, Latin America, and Africa.
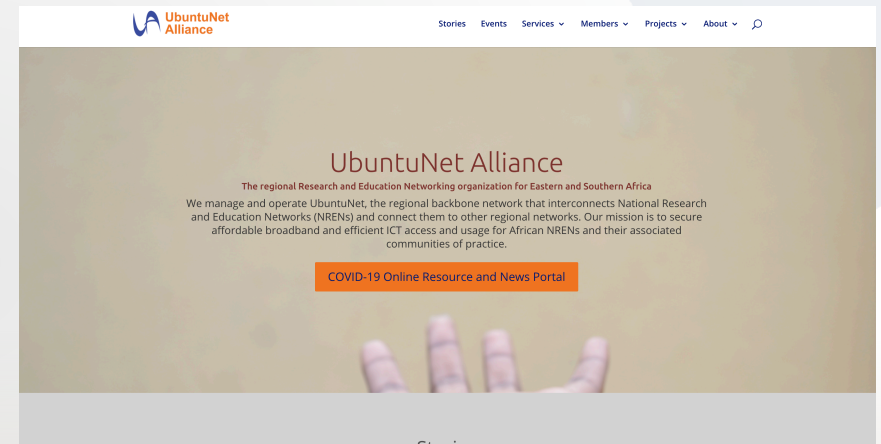
RedCLARA and BELLA

- The new link with Africa provides a backup route to the Bella subsea cable that will connect in a direct link Europe with Latin America.

- Bella terrestrial project increases the connectivity inside Latin America, to make available and resilient the connections of the NRENs to the international links.

# RedCLARA: Intercontinental access for Latin American NRENs (Project BELLA)

- The delivery of Nx100G connectivity using the new EllaLink cable (Brazil-Portugal) in 2021 also provides Nx100G connectivity between Europe and several NRENs in South America

- GXPs (Global Exchange Points) in Fortaleza and São Paulo provide support for traffic to Africa via SACS, as well as to the US via Amlight Exp.
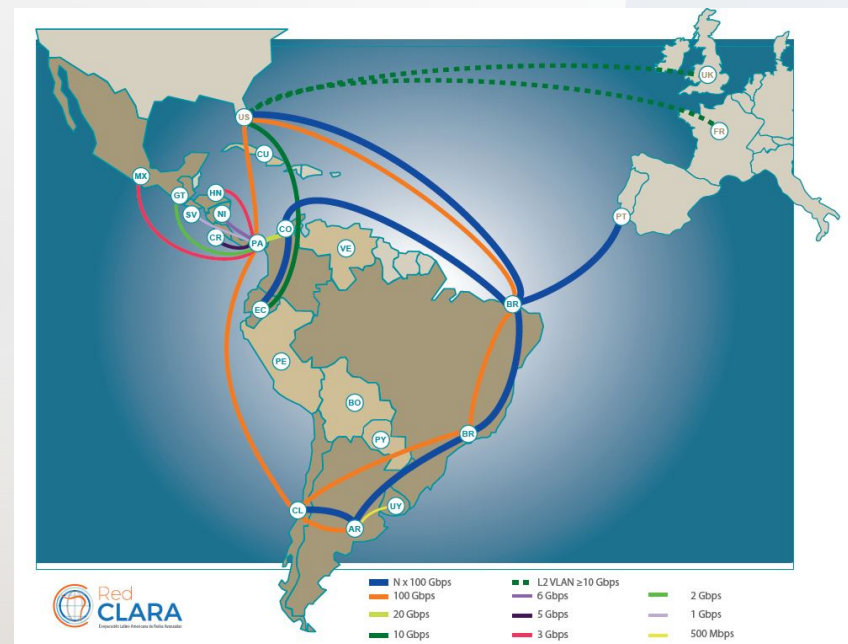
RNP backbone network and connections in 2021
(https://www.rnp.br/en)

- Brazil is the World's 5th largest country, and 6th most populous at 209M in 2018. The capital is Brasília and the official language is Portuguese. Straddling the Equator, the climate is tropical and subtropical.

- RNP, the Brazilian NREN, has operated an R&E backbone network with government support since 1992.

- Each state and the national capital has a point of presence (PoP) on the backbone network, known as the Ipê network (Rede Ipe), which is currently being upgraded to 100G by 2021. More than 1500 sites are connected, and, in more than 40 cities, by means of RNP's own metro networks.

- Terrestrial links to Argentina and Paraguay; other external traffic via RedClara and throufg Global Exchange Points (GXP) in São Paulo (SoL) and Fortaleza (SAX), in collaborations with FIU CIARA, Tenet/Sanren, Géant)
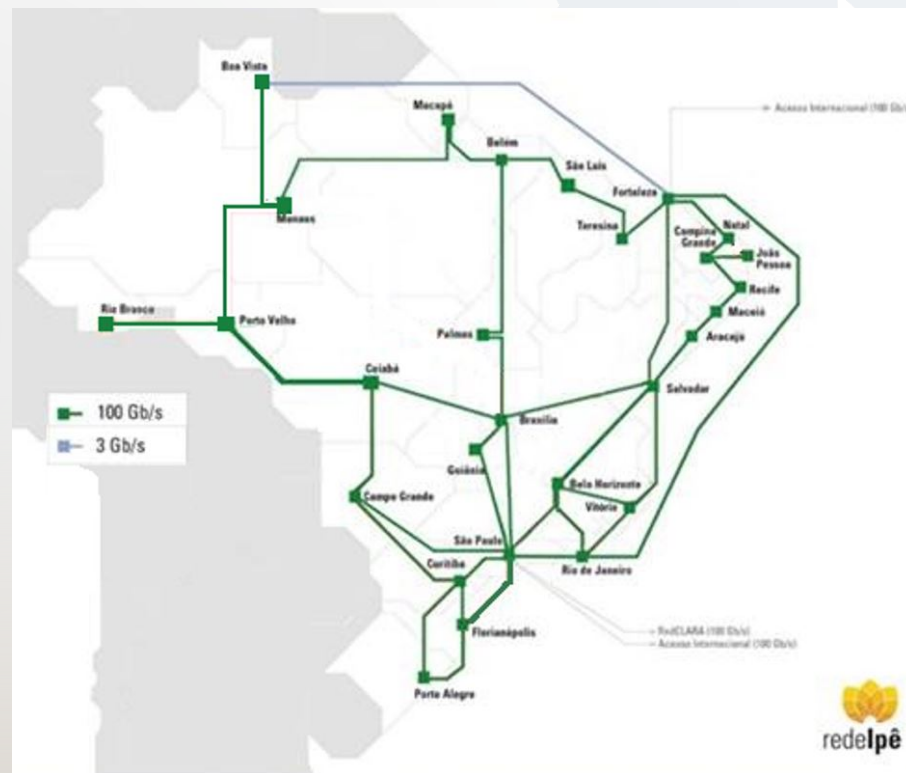
# RNP's Global Exchange Points (GXPs) SAX and SoL in 2021

SAX (South America eXchange) – Fortaleza

- Interconnection of the Amlight-Exp (200G Monet) and Amlight-Protect (100G SAC/LAN) with the establishment of a 100G ring between the sites.
- perfSONAR node with 100G capability
- Reconfiguration of the nodes into a single domain, and adoption of EVPN VPWS* in order to simplify the setup of virtual circuits.

SoL (SouthernLight) – São Paulo – jointly with ANSP

- Integration of the Juniper node with the Fortaleza equipment to create a single MPLS domain
- Acquisition of the new generation of Amlight SDN switches to manage part of the international connections.

* EVPN VPWS: Ethernet Virtual Private Networks – Virtual Private Wire Services
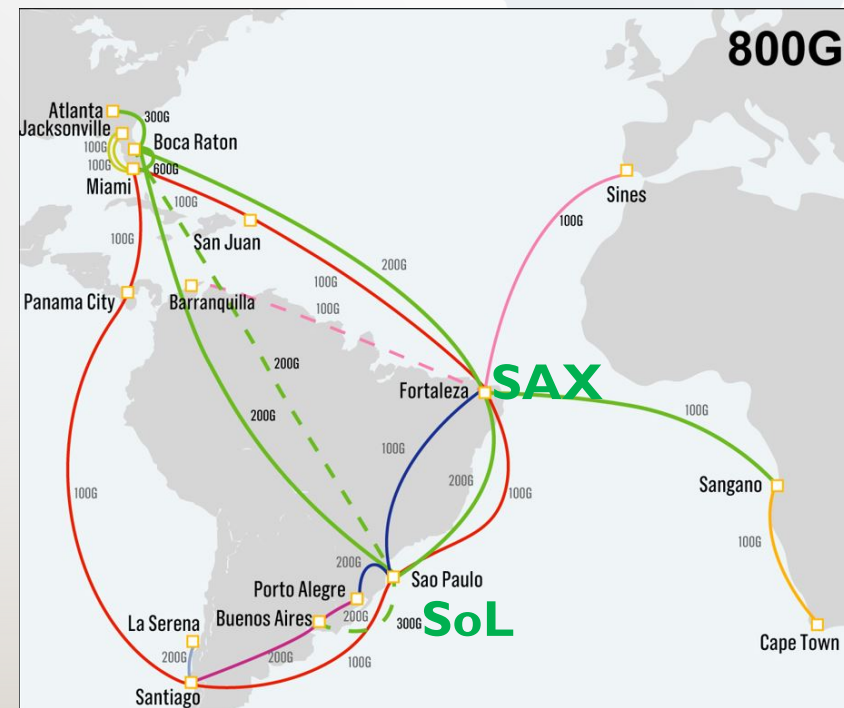
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THANK YOU!

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