

RNP/Southern Light

GLIF-Americas

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Rede Nacional de Ensino e Pesquisa
Brazil



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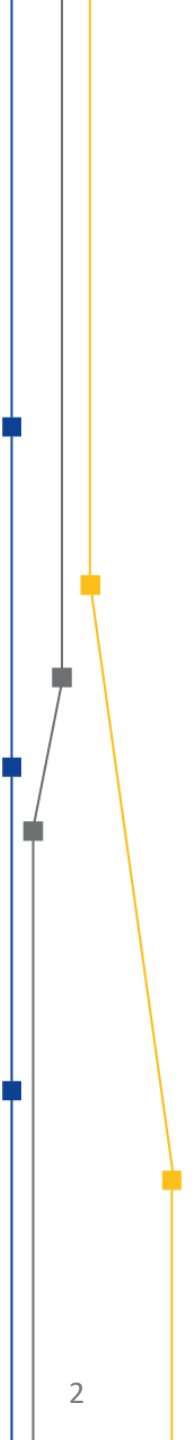
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Introduction

- This presentation summarizes current international connectivity in Brazil, and indicates how this is expected to evolve over the next few years



Current International Links

3 separate schemes for international traffic:

1. **RedCLARA:** a regional network within Latin America for exchanging traffic with national R&E networks in Argentina (AR), Chile (CL), Colombia (CO), Costa Rica (CR), Ecuador (EC), El Salvador (SV), Guatemala (GT), Mexico (MX), Panama (PA), Paraguay (PY), Peru (PE), Uruguay (UY), and Venezuela (VE). Supported by subscriptions.
2. **AmLight:** a project coordinated by Florida International U (FIU) in Miami, which provides high capacity connectivity between the USA and R&E networks in Brazil (RNP and ANSP) and Chile (REUNA).
3. **Scalable capacity optical links** between Brazil, Argentina and Chile, shared between R&E networks and owners of the fibre infrastructure. Implemented using DWDM on a shared optical fibre.

Rede Ipê and SouthernLight (2017)

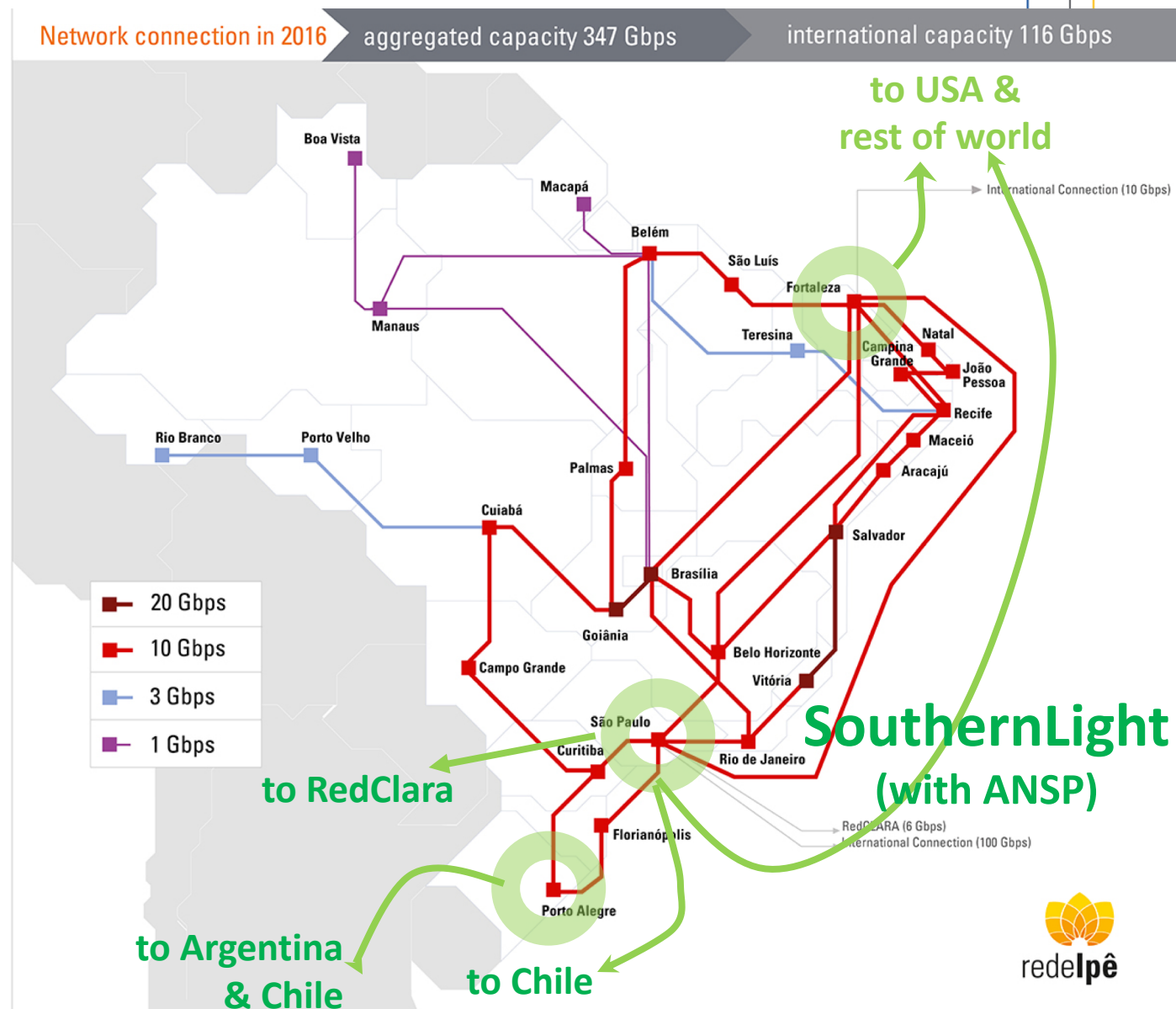
27 PoPs

interconnected by:

- 33x 10G links (some composed as 20G)
- 4x 3G links
- 4x 1G links

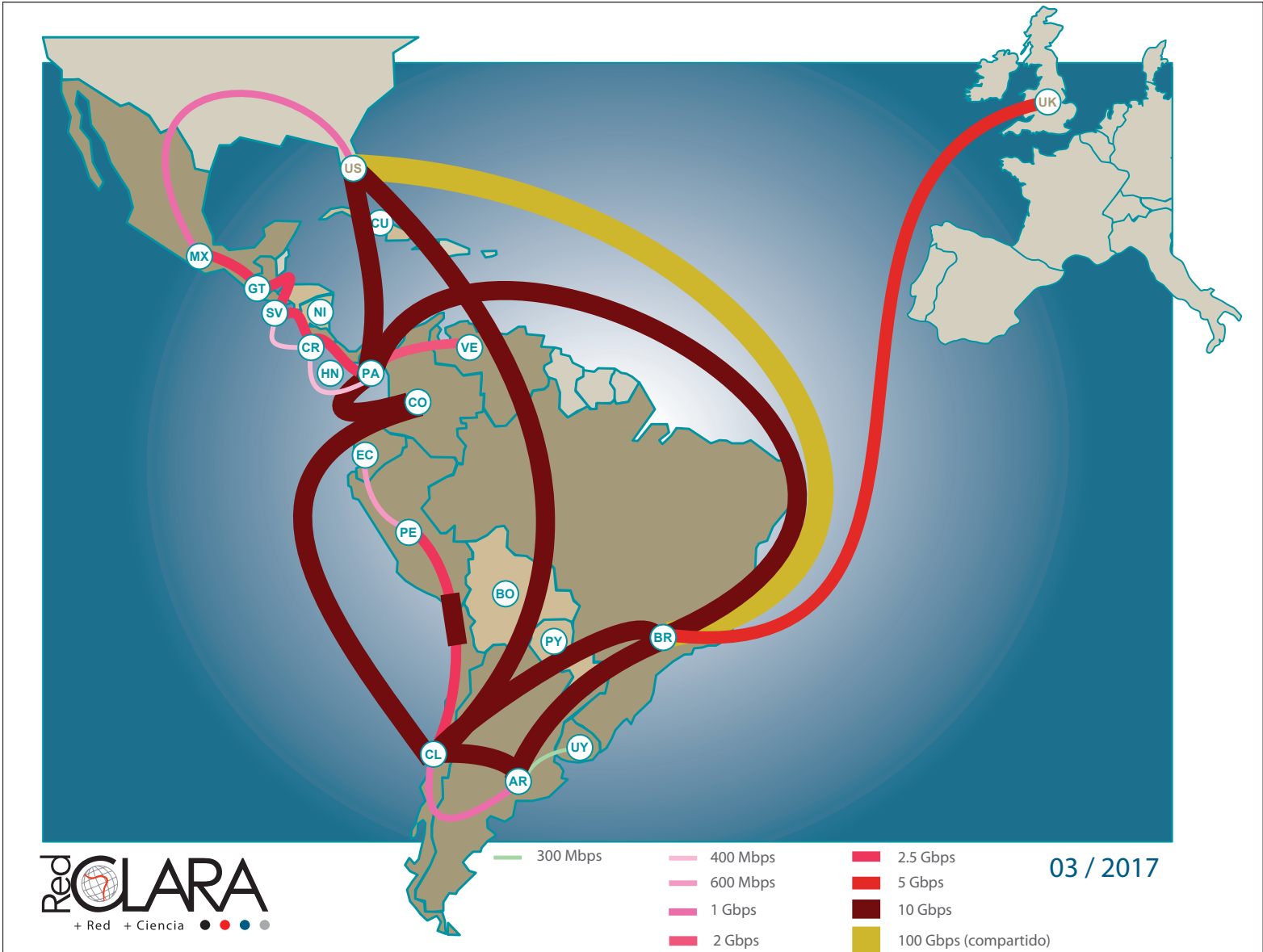
3 PoPs have international connections:

- Fortaleza to Miami (US)
- São Paulo (PoP of RedCLARA), to Santiago (CL) and Miami (US)
- Porto Alegre to Buenos Aires (AR) and Santiago (CL)



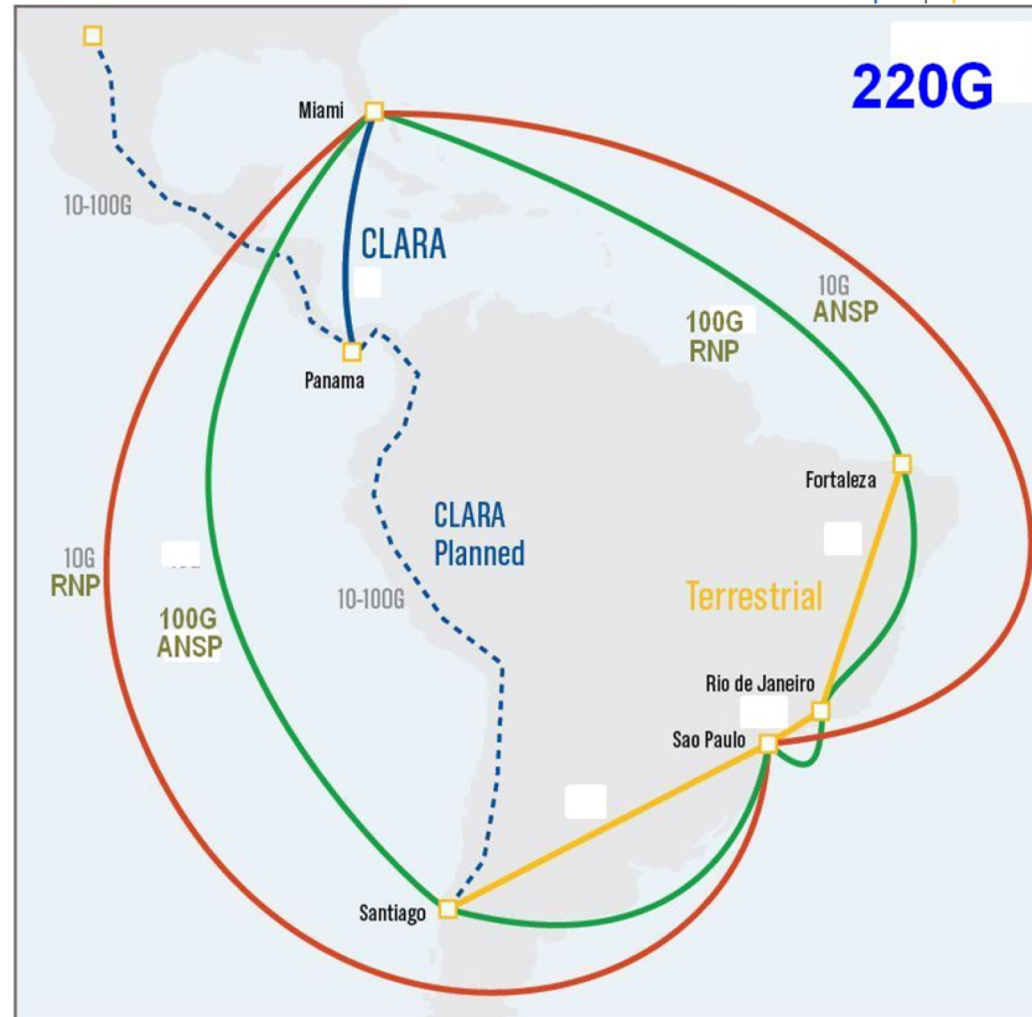
RedCLARA: Topology March 2017

(The link BR-EU has since been decommissioned)



Brazil – USA: AmLight Project (NSF/IRNC 2014)

- Alliance w/ FIU & ANSP (São Paulo Academic Network)
- 110G + 110G by Atlantic and Pacific Oceans
- All circuits leased
- Interconnection points:
 - São Paulo and Fortaleza (BR), Santiago (CL)
- Redundancy: 4 physically diverse submarine cable routes
 - $(100 + 10)\text{G} + (100 + 10)\text{G}$
= 110G + 110G = 220G
- Commodity traffic transported to IXP/Miami



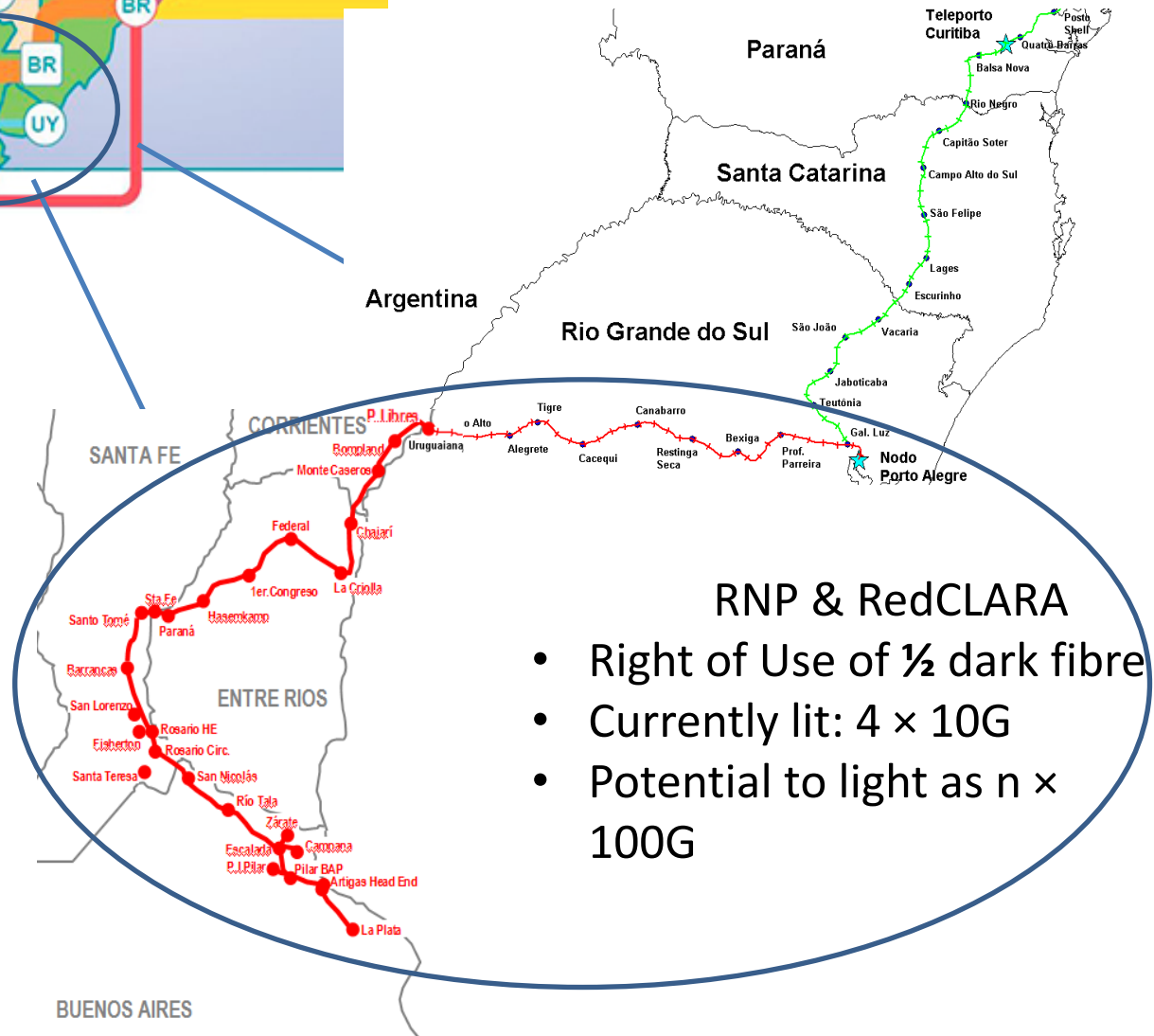
Scalable Optical Link: Brazil-Argentina (Level 3)



Business Model:

Fibre owner prepared to share the long-term use of the optical link, through use of a DWDM system. Capital costs usually paid for by non-owner.

The available spectrum is divided between the users in some fashion. Each user entity pays for their own transponders. Maintenance costs to be divided as agreed.



RNP & RedCLARA

- Right of Use of $\frac{1}{2}$ dark fibre
- Currently lit: $4 \times 10G$
- Potential to light as $n \times 100G$

New Big Science demands and solutions

- Current projects focus principally on astronomical observatories located in Chile, such as
 - LSST (Large Synoptic Survey Telescope)
 - ESO (European Southern Observatory)
 - ALMA (Atacama Atacama Large Millimeter Array)
- Some of these projects have large data demands, which involve transport to the US, Europe or Japan, and help is being offered by the countries involved to upgrade the R&E networks in the region and their international connections.
- Examples include the LSST project and the BELLA project, in large part financed by the EU.
- These projects take advantage of new 100G submarine cables

New submarine cables & RNP

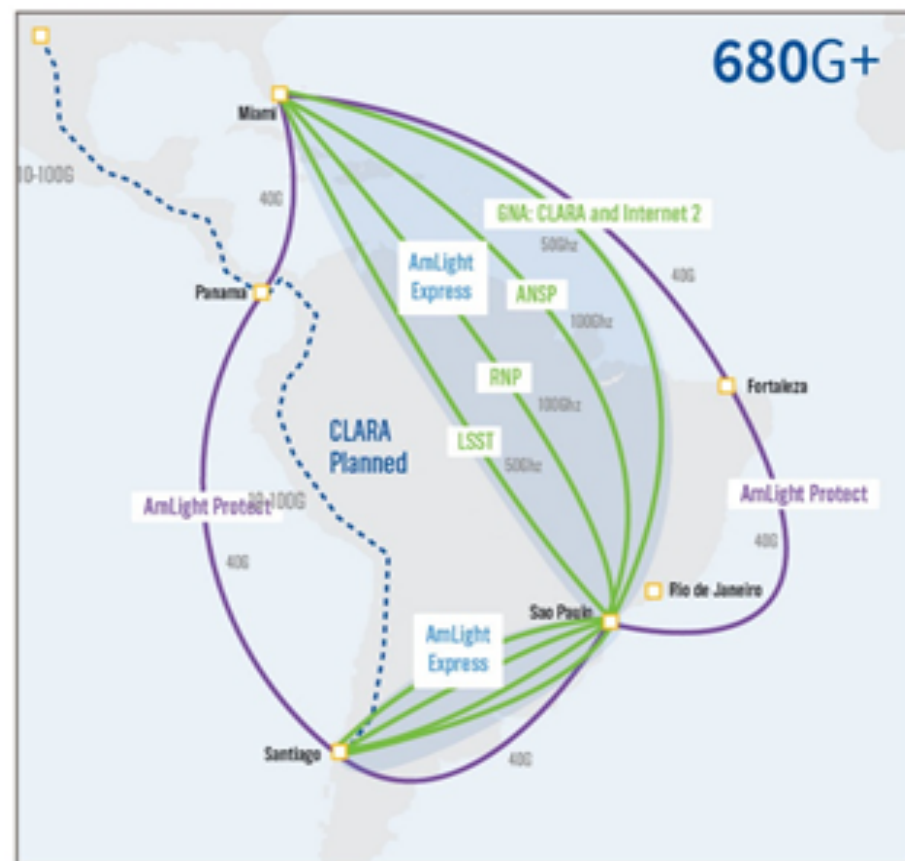
- Use of Monet Cable in LSST Project
- Use of Ellalink in BELLA Project
- Use of Monet + SACS in AARCLight Project (US-BR-Angola)



Note the future potential of Fortaleza as an IXP and GOLE (SAX – South Atlantic Crossing) with direct connections to 4 continents.

Brazil – EUA (2017) – LSST Project

- Project AmLight ExP (Express and Protect)
- Use of Monet Cable
 - MoA signed in 2015
 - Partners: Brazilian astronomy community, LSST, ANSP, RNP & FIU
 - Use of optical spectrum (GHz)
- 680G+ includes LSST, GNA, ANSP, RNP



LSST Project – RNP's viewpoint

- MoA signed in July - September 2015
- RNP is committed to provide connectivity between São Paulo and Santiago 2 x 100 G
 - 100 G starting September 30, 2019
 - Additional 100 G of burst traffic
 - Agreement lasts until September 2032.
- In exchange, RNP will be granted access to 100 GHz spectrum on the Monet cable, between Florida and São Paulo.
 - 100 GHz: 2 channels with current 100 G technology
 - Santos, SP, to Boca Raton, FL.
 - Available when the cable becomes operational
 - The 100 GHz operation will be the subject of a separate MoA
 - The Brazilian astronomy community will also gain right to participate actively in the LSST project

BELLA project (Building Europe Link to Latin America), with subprojects BELLA-S & BELLA-T

BELLA-S: project to acquire spectrum (45 slots) on a new 100G subsea cable between Portugal and Brazil for R&E network use during the cable lifetime (25 years)

EC and S. American governments to support this acquisition by GEANT and RedCLARA

1 slot for use by Copernicus.

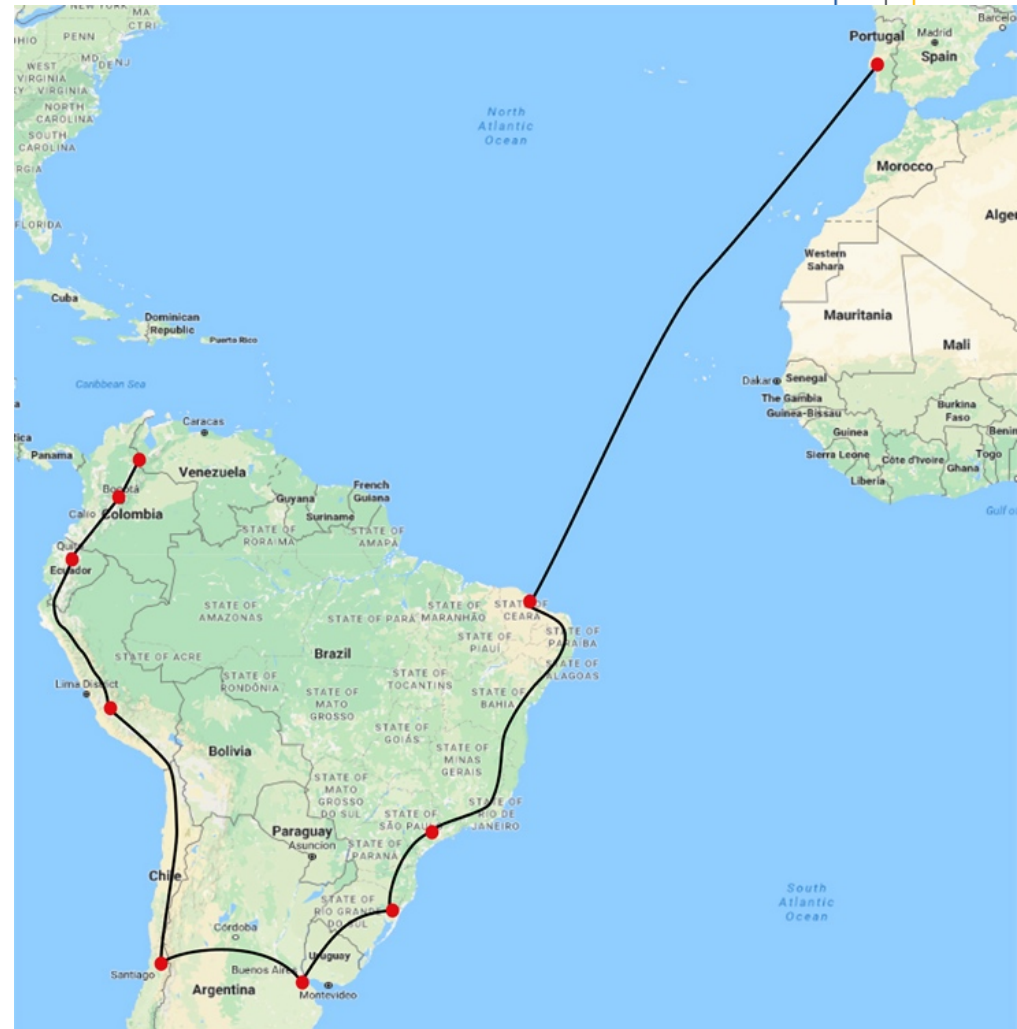


BELLA project (Building Europe Link to Latin America), with subprojects BELLA-S & BELLA-T

BELLA-T: project to build a scalable terrestrial DWDM capacity to provide access to:

- backhaul to the BELLA-S cable from NRENs in S. America
- Internal use for the NREN in each participating country
- Funding by EC and LA NRENS

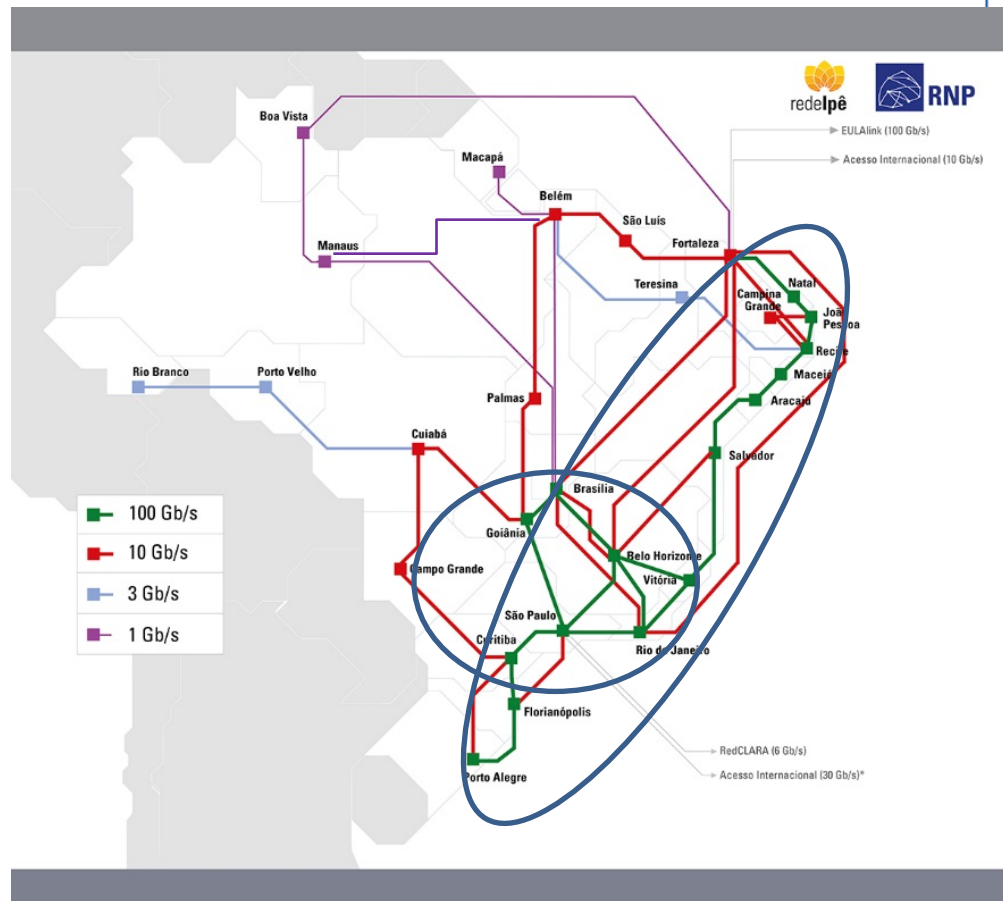
Each NREN will need to build out its national portion of this network.



RNP National Backbone 2018

To support the integration of the 3 PoPs supporting international links, we need to upgrade the national backbone to Nx100G (scalable)

- Fortaleza – Porto Alegre Route
- 100 G Southeast Ring

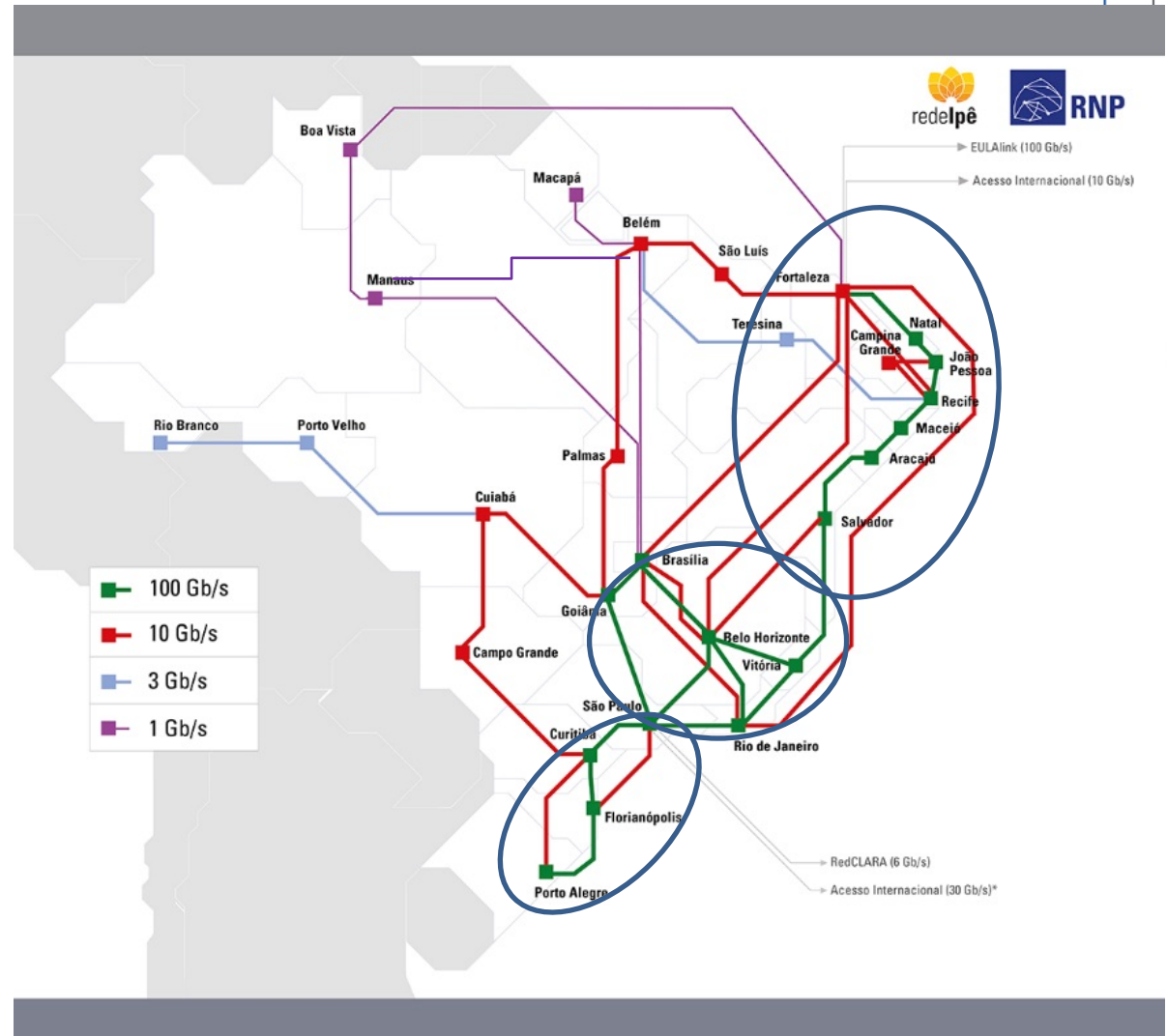


RNP National Backbone 2018

This will be carried out in 3 phases

- **3 phases:**

- Northeast region (NE)
- Southeast region (SE)
- Southern region (S)



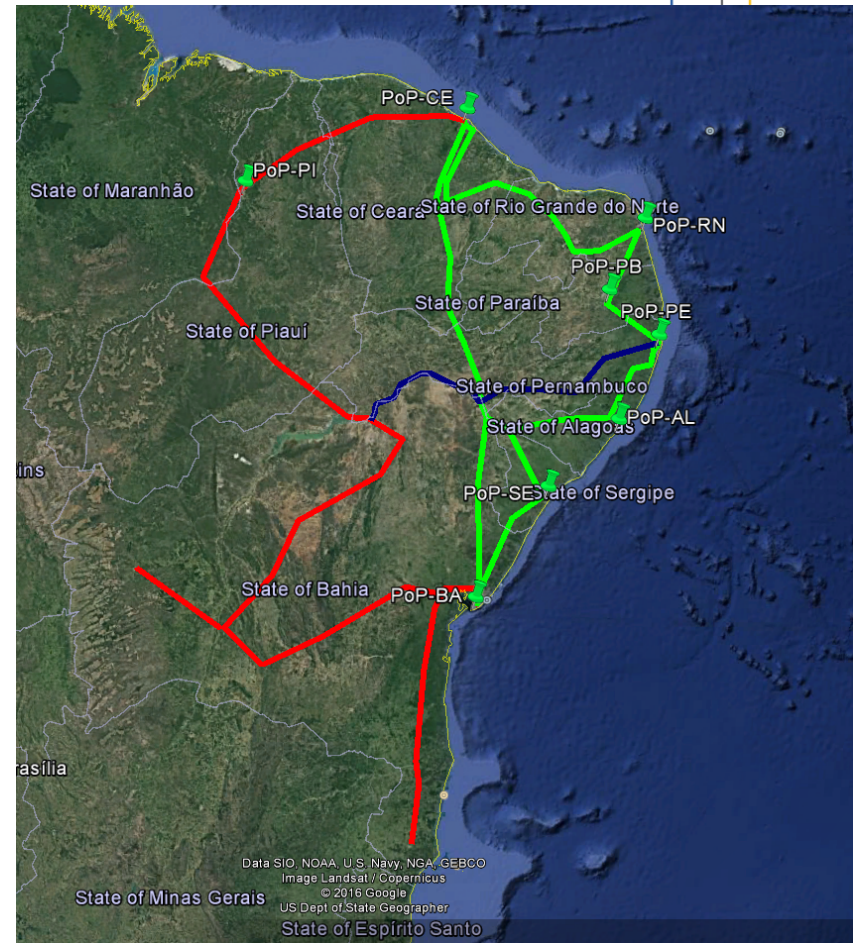
Northeast – Alliance with CHESF

- CHESF – Companhia Hidro Elétrica do São Francisco
- Right of Use of 50% of the optical spectrum
- Initially light up 3 × 100G waves
- Part of the Fortaleza - Porto Alegre route
 - Fortaleza - Recife – Salvador – South of Bahia
- Agreement signed on Sept 19, 2016, to last 20 years.
- DWDM equipment (Huawei) recently imported to light up the fibre between Fortaleza and Salvador by the end of 2017



The network

- 6900 km of **OPGW cables**
 - 8 states and their capitals
 - 10 backbone links
- **CHESF:**
 - Maintenance of optical fibre
 - Maintenance of SDH equipment
 - Network operation
 - **Guarantee of 99.98% SLA per PoP, and 99% per route**
- **RNP:**
 - Initial Investment
 - Repair of modules and other accessories of DWDM system
 - Maintenance of last mile of RNP nodes



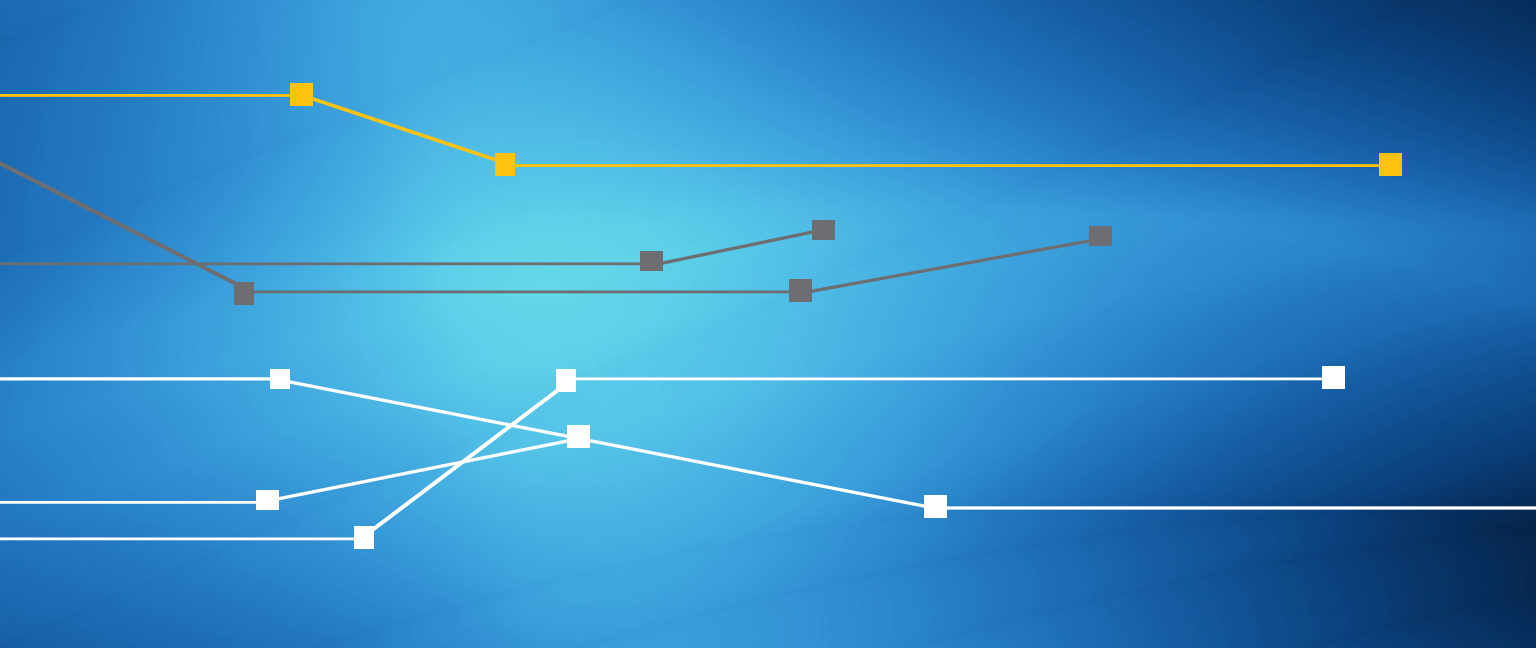
Final thoughts on BELLA

BELLA-S (submarine cable)

- It is hoped that the decision to build the Ellalink cable will be taken in 2017, and that it will become available for use 2 years later.
- This cable will make an important alteration in global connectivity, enabling alternative routes between Europe and S. America.

BELLA-T (terrestrial network)

- Currently tenders are in course for completing the new DWDM 100G network linking South American NRENs by 2020
- This network will be of great importance for providing access to the great observatories of Chile, and of transporting its data to the Northern Hemisphere.



Thank you!

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