Communication to remote observatories is a science enabler

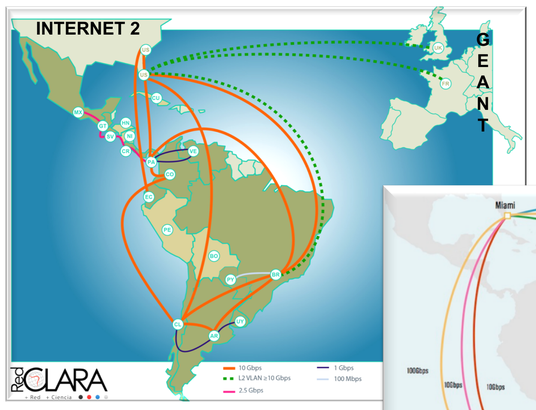
G. Filippi[a] , S. Jaque[b], R. Chini[c], S. Mieske[a], G. Hau[a], A. Astudillo[b], M. Zambrano[d], A. Schemrl[d], J.Parra[d], J. Ibsen[d]

INTRODUCTION

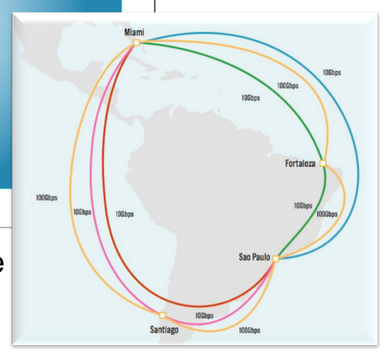
- Astronomical observations sites are far away from human settlements and of difficult access.
- Many nowadays and even more in the future are in the northern region of Chile.
- scientific user communities are distributed worldwide, mostly in the Northern Hemisphere.
- limited communications infrastructure available.

NETWORKS (as of 2018)

- the continental networks, like GEANT, RedCLARA , Internet2, each connecting the NRENs of a wide geographical area

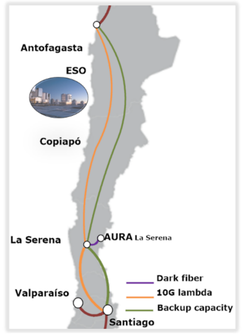


- ad hoc development like the Ampath/AmLight →



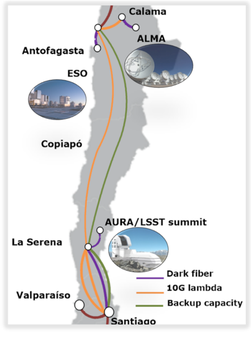
REUNA (Chile NREN): major projects:

- EVALSO, 10Gbps capable backbone between the ESO and OCA and Santiago
- extension of the network to ALMA installation
- Santiago to la Serena in dark fiber (x100Gbps) in collaboration with AURA/LSST



2011: EVALSO

2014: ALMA



2018: LSST

CASE STUDIES

The observation of the GW170817 required collaboration among Observatories in the North of Chile (ESO Paranal and La Silla, Las Campanas, Las Cumbres, CTIO, ALMA, …) and Home Institutes and other actors in the Northern hemisphere

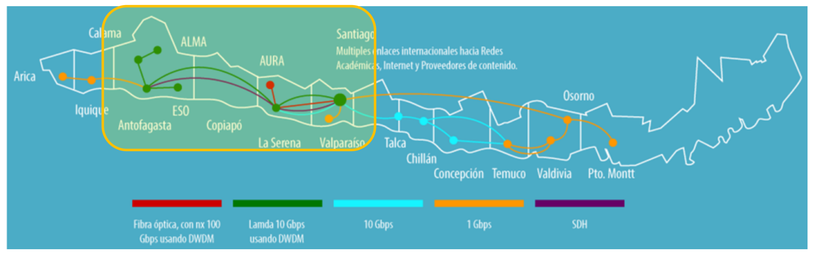
The use of virtual presence to bring the observer where things happen (ESO/PARANAL, Vitacura, HQ);

Remote operations for robotic installation (OCA):

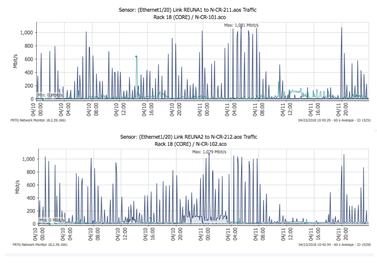
- Remote engineering and Monitoring
- Data transfer
- Lower operational costs (trips, people at the site)
- Integration of the telescope for teaching and training
- Lower access to installations for smaller institutes

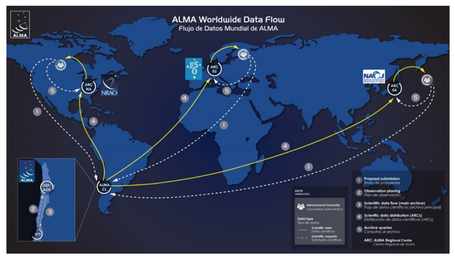
Contributing to develop the local environment (REUNA):

→ More capacity for other users/usages



Provide the "muscle" for the current and future data challenge (ALMA):

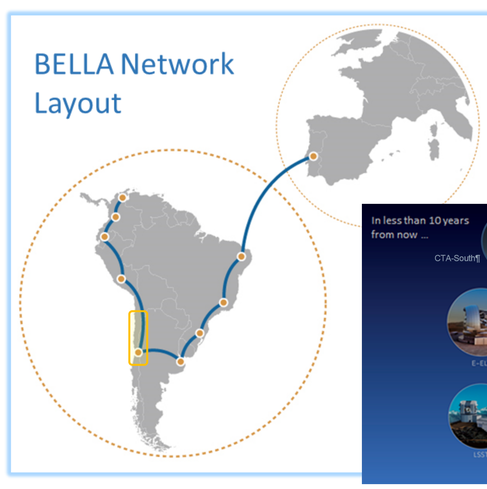




KEY ASPECTS

- communication may transform, or limit, the research and education.
- systems have to cope with current needs, but built thinking to the future and to be a step ahead.
- need to be sustainable in terms of investment and operational costs.
- connecting seamlessly communities in different places and with different focus, like astronomers, engineers, students, without limits imposed by location, travel means, conditions, etc.
- Handle extremely large amounts of data to worldwide communities
- communication is key to get the best out of the global investment humankind does all over the globe.

Looking into 2020-2030



CONCLUSIONS

High-bandwidth communication is a key factor for scientific installations as Observatories.

By increasing bandwidth and lowering latency, hence improving applications and processes, communication systems are an enabler for potential processes transformations.

[a]European Southern Observator [b]REUNA [c]Ruhr-Universität Bochum [d]Joint ALMA Observatory