



ALMA AOS/OSF-SCO Communication Infrastructure

Update for the 7th SAACC meeting
2016-04-11

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The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership among Europe, North America and East Asia in cooperation with the Republic of Chile.

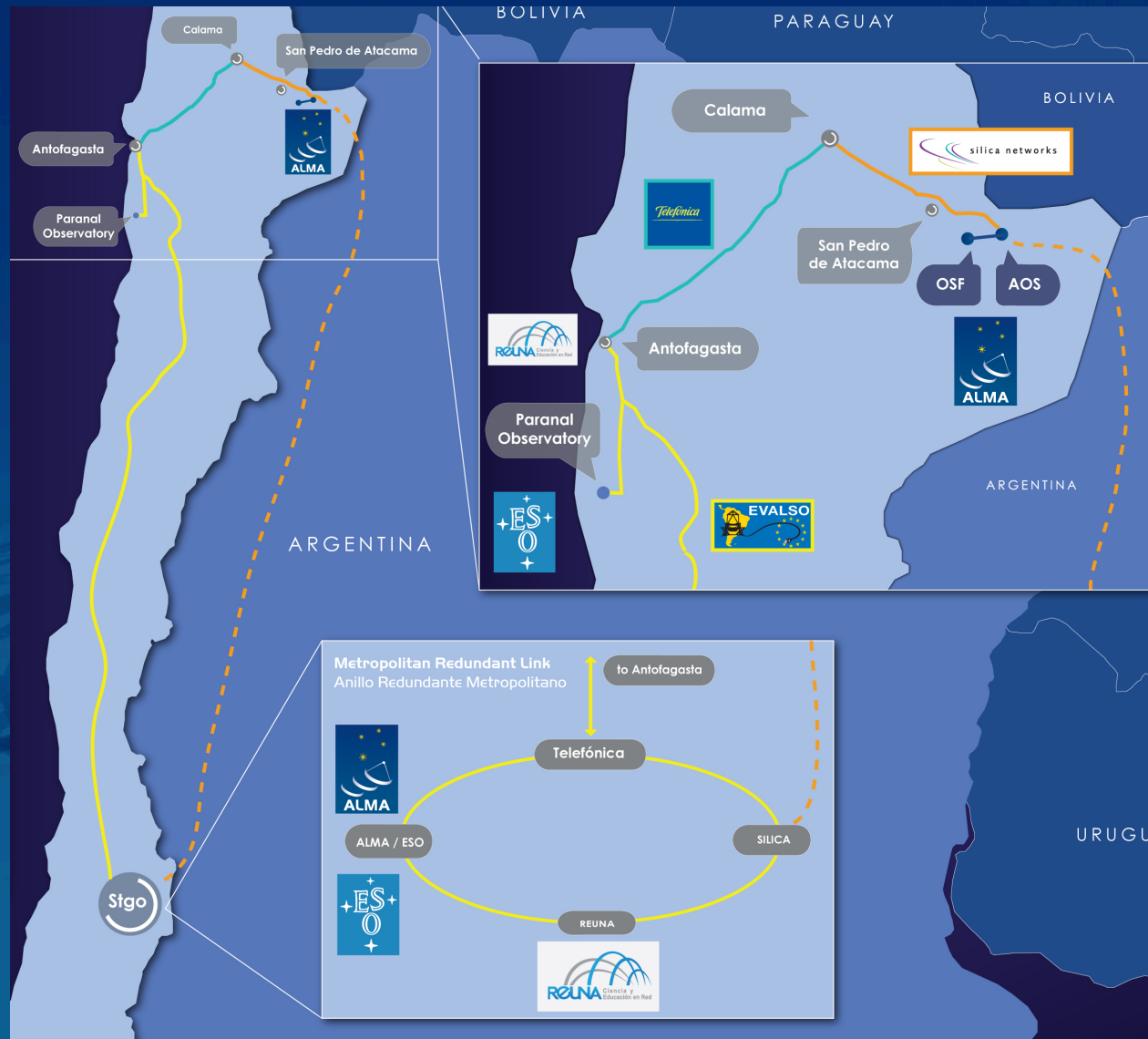


PROJECT GOALS

- Provide a long term (>15 years) solution infrastructure
- Cope with projected operations needs (>1Gbps) and scale further
- Minimize latency between the end sites
- Have reasonable upfront CAPEX and very low OPEX
- Take advantage of the existing EVALSO capacity



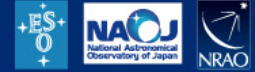
Architecture of the communication system



1. A dark fiber pair between AOS and CALAMA (about 150km): this comes from a newly built fiber cable.
2. A dedicated LAMBDA between CALAMA and the REUNA Point of Presence (PoP) in ANTOFAGASTA (about 200 km).
3. A dedicated sub-LAMBDA between the REUNA PoP in ANTOFAGASTA and the SCO at the Vitacura Campus in Santiago: this is indeed configured on the existing EVALSO backbone.
4. A dark fiber pair between AOS and the town of SAN PEDRO (2016).
5. A dedicated LAMBDA between AOS and Santiago via Argentina (2016-2018).



PROJECT TIMELINE



2011		Feasibility study completed
2012	Mar	Project Plan completed
	Apr	ALMA Board approves the recommendation
	May-Oct	Procurement for AOS/OSF-Antofagasta optical path
	Nov	Contract with Silica and Telefónica signed
2013	Jun	Contract updated with new path and future redundant link
	Aug	Contract with REUNA for equipping & operating AOS-SCO link
	Dec	Fiber AOS-CALAMA: Construction start
	Dec	Lambda CALAMA-ANTOFAGASTA: provisionally accepted
2014	Feb	DWDM equipment selected (PADTEC)
	Sep	DWDM equipment installed
	Nov	Fiber AOS-CALAMA: Construction end (150km of fiber cable)
	Dec 18th	first end-to-end test

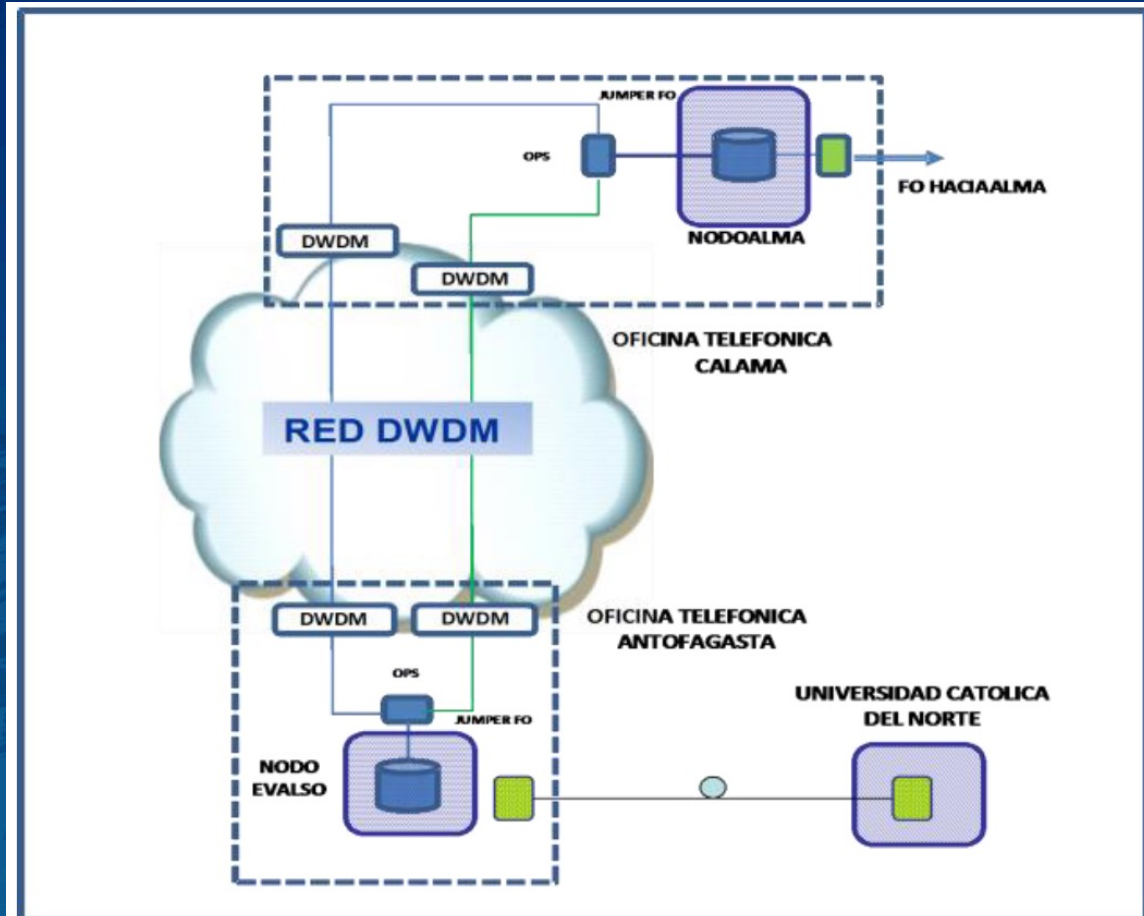




(new) fiber cables AOS – CALAMA



“LAMBDA” between Calama and Antofagasta

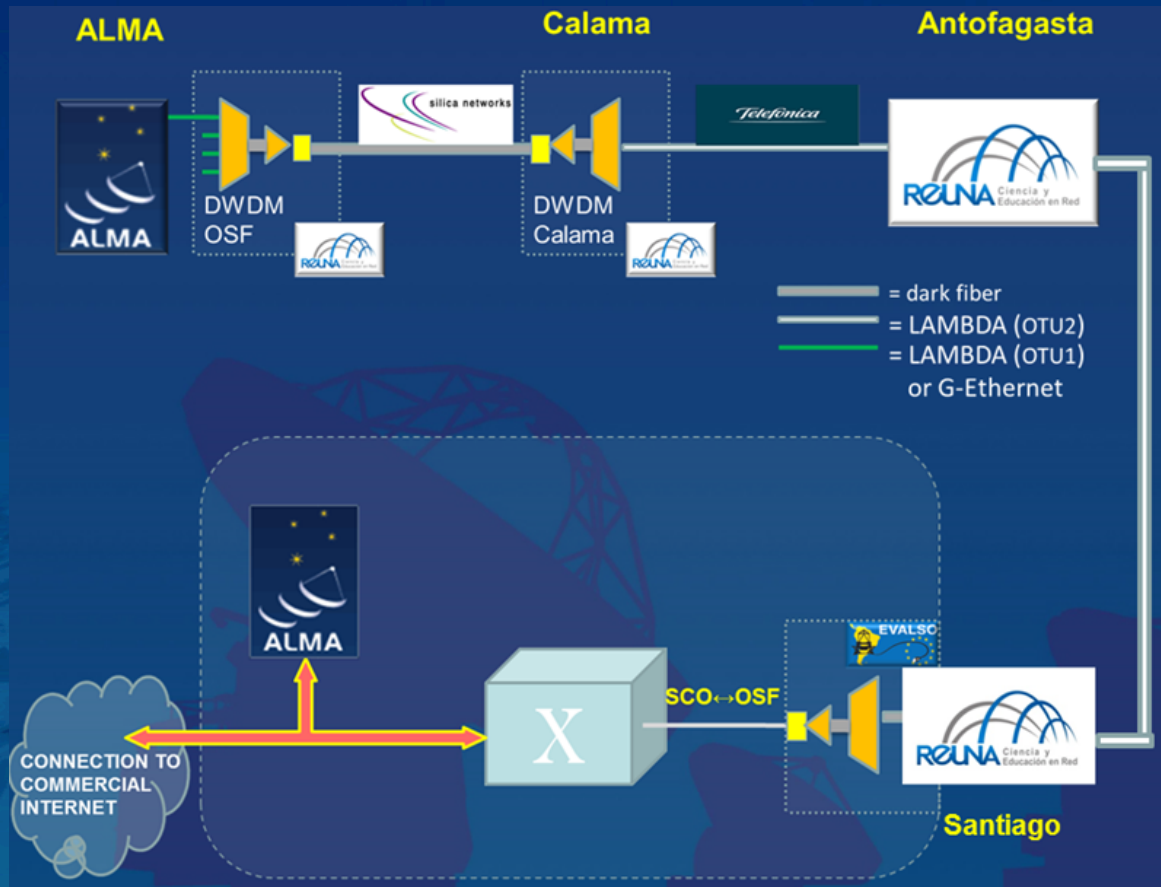


For the transport between Calama and the REUNA PoP in Antofagasta, a dedicated Lambda is provided by Telefonica.

As this is part of the provider backbone, the solution include automatic backup at optical level (1+1). The interface complies with the regulations for an OTU2 (10Gbps) link.



DWDM EQUIPMENT



As NEW installations:

- At the ALMA AOS border. This unit manages the traffic that ALMA generates and sends it, using an OTU2 channel, to the Antofagasta node.
- At the Telefónica PoP in Calama. This unit receives the traffic from the Observatory and feeds the OTU2 to the Telefónica Lambda to Antofagasta.

As upgrade of the existing EVALSO:

- In Antofagasta, the lambda coming from AOS via Calama has to be remapped into the EVALSO backbone.
- in Vitacura, the upgrade is minimal and consists in enabling the two 1Gbps ports where the communication is interfaced with the SCO LAN.

The link is operated by REUNA



(Nearly) OPERATIONAL

Due to administrative hiccups, used in “test mode”, but at full functionality.

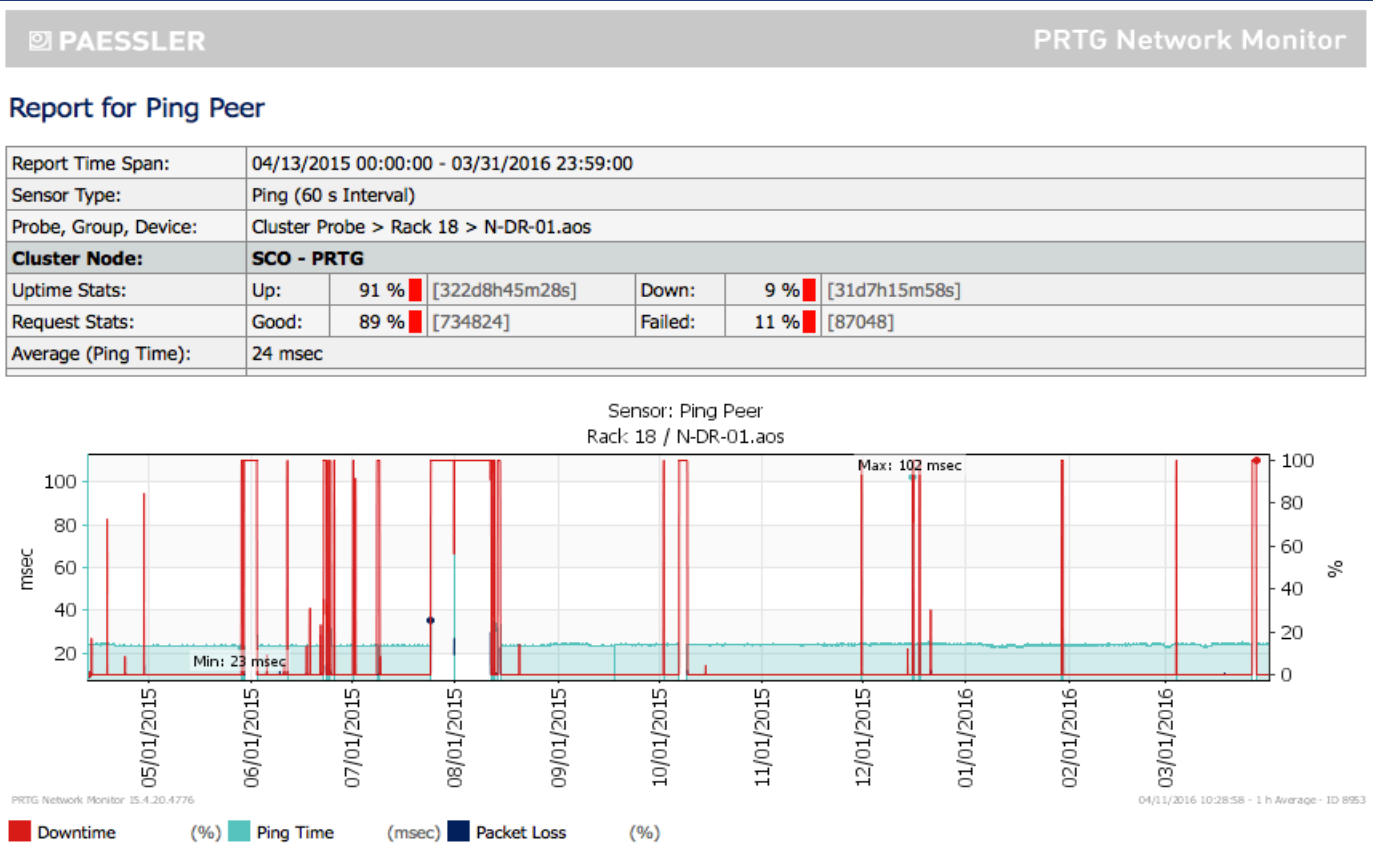
Initial expectations confirmed:

- Delay (PING) between OSF and SCO (for both links is the same). around 24msec.
- Science Data Traffic: between 50 and 100 Mbps, and peaks between 200 and 400Mbps.
- Other ALMA Traffic: around 50 Mbps, with daily peaks to 100-130Mbps.



LAST 12 MONTHS

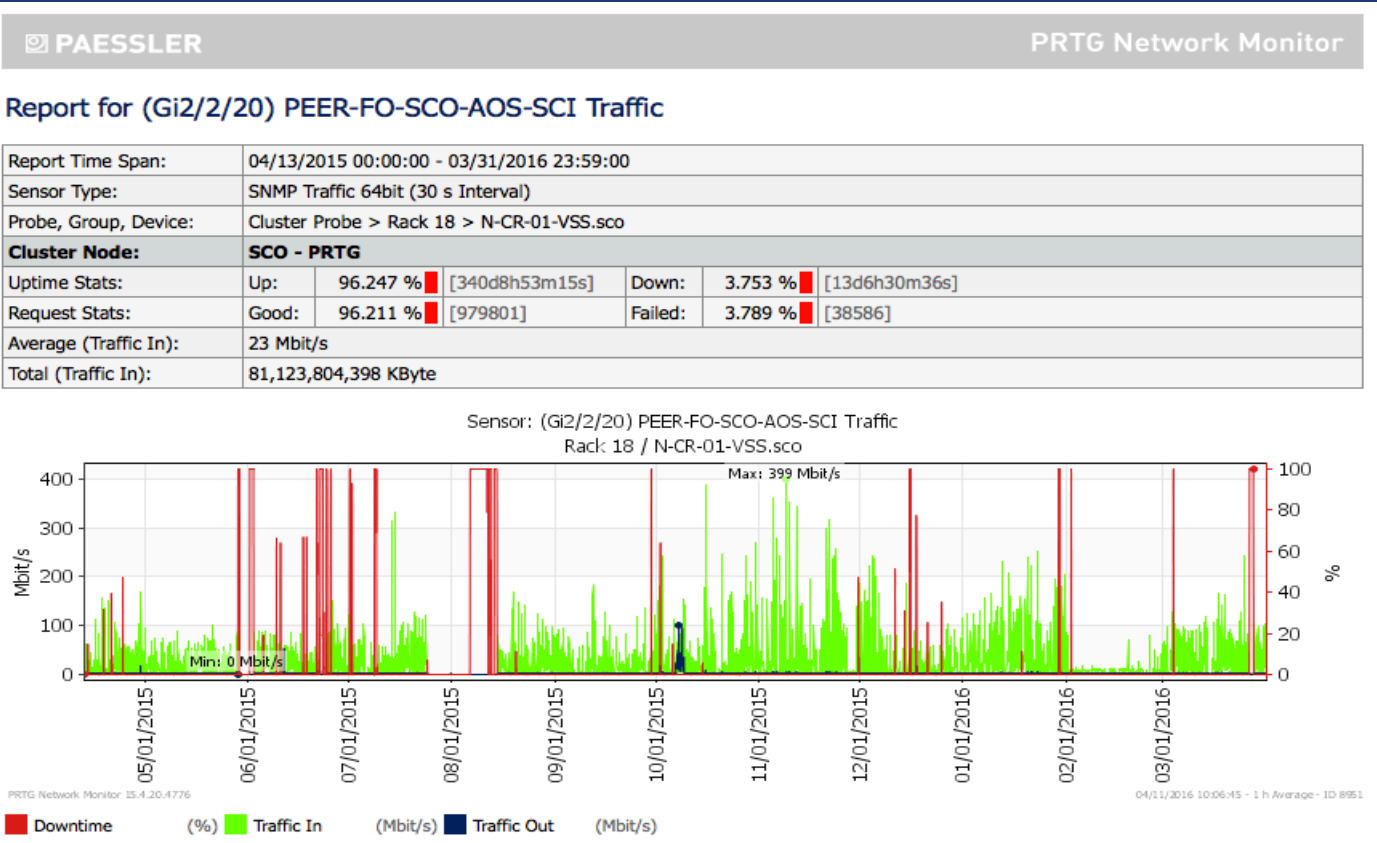
LATENCY





LAST 12 MONTHS

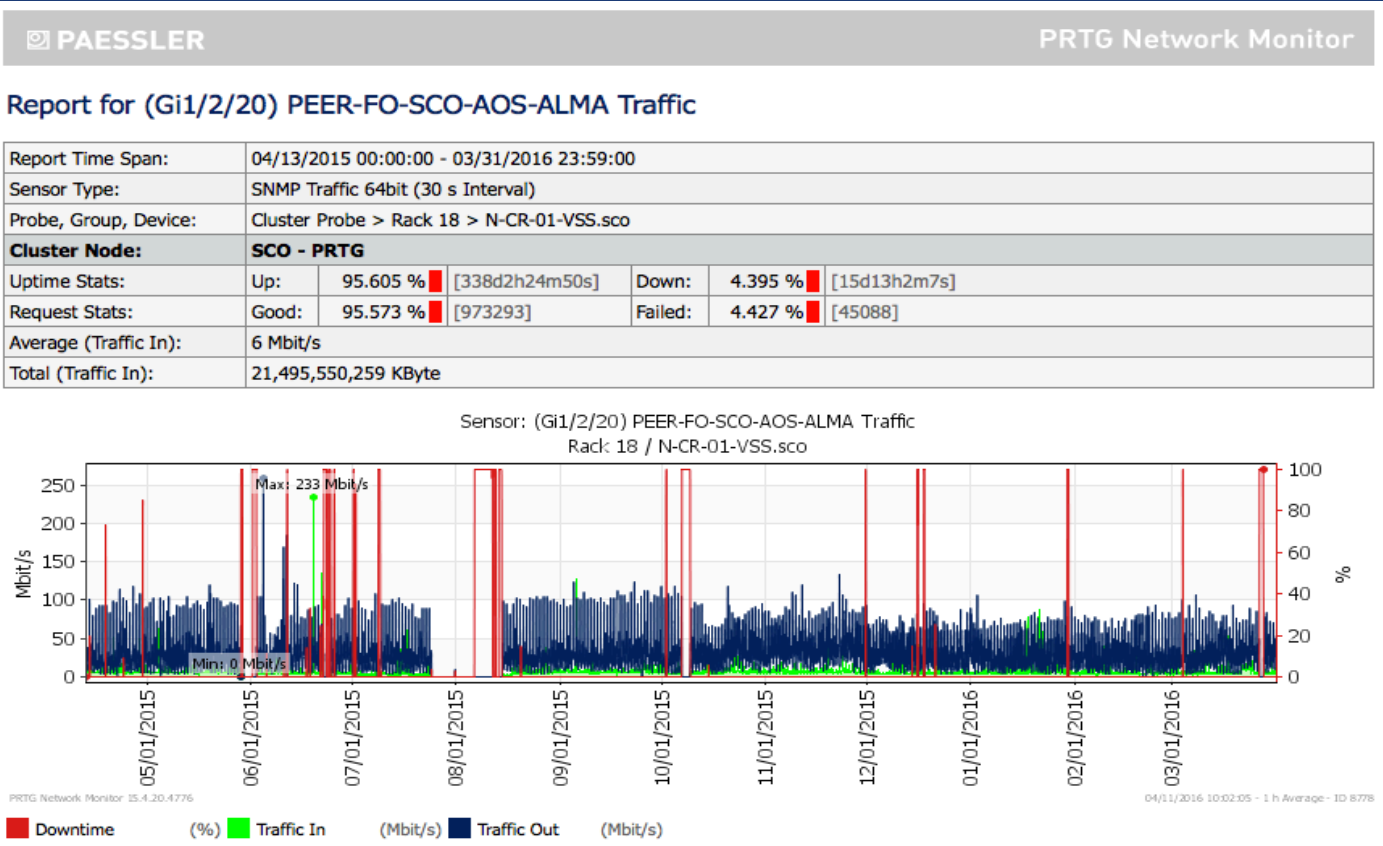
SCIENTIFIC DATA TRANSFER





LAST 12 MONTHS

OTHER IP TRAFFIC





OPERATIONAL REPORTS

- Provided by REUNA since September 2015.
- Report on system performance, single downtime events, both planned and unplanned.
- Provides statistics on availability

Periods:

- Month: February 2015, 29 days, 696 hours
- Trimester: December 2015 to February 2016
- Year: September 2015 to February 2016, 182 days, 4368 hours

Service	Monthly			Yearly		
	Uptime [hours]	Downtime [hours]	Availability [%]	Uptime [hours]	Downtime [hours]	Availability [%]
1	696	0	100%	4350	18	99,58%

Table 3: Availability