Atacama Large Millimeter/submillimeter Array



ALMA AOS/OSF-SCO Comunication Infrastructure Update for the 7th SAACC meeting 2016-04-11 G. Filippi(ESO), C.Saldias, N.Ovando (JAO/ADC)

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.



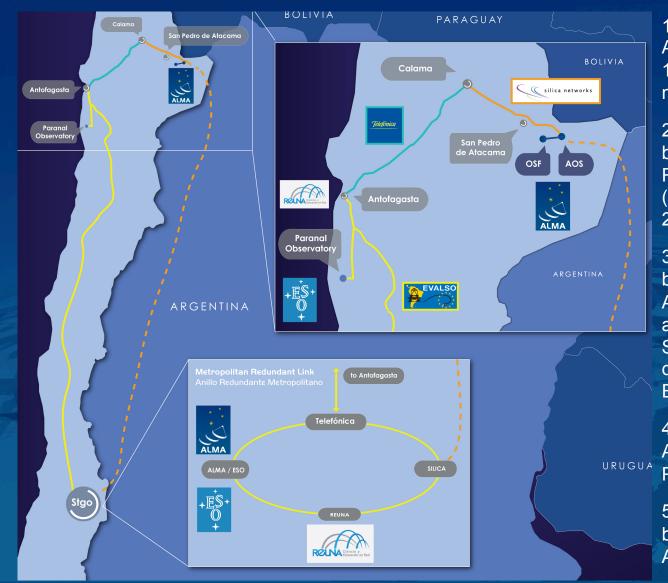
PROJECT GOALS

- 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					
2	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	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

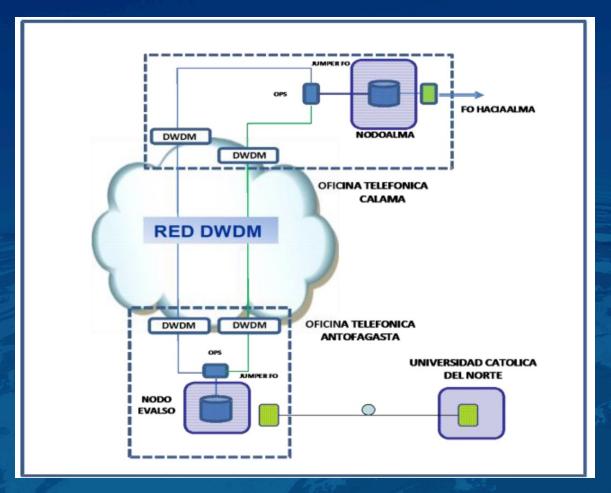






"LAMBDA" between Calama and Antofagasta





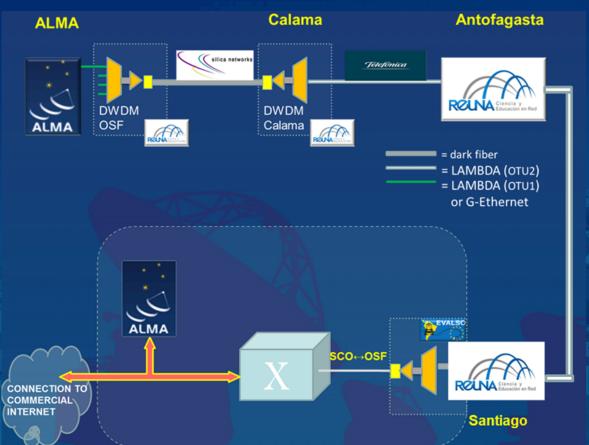
For the transport between Calama and the REUNA PoP in Antofagasta, a dedicated Lambda is provided by Telefonica.

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





The link is operated by REUNA

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.



(Nearly) OPERATIONAL

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

Initial expectations confirmed:

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



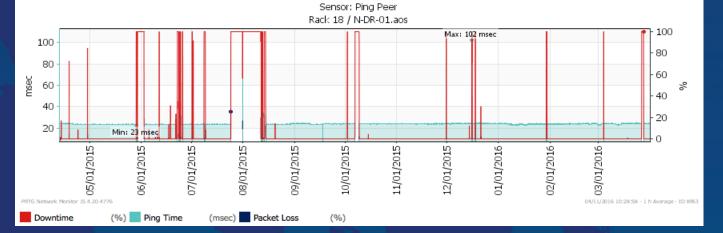
LATENCY

PAESSLER

PRTG Network Monitor

Report for Ping Peer

Report Time Span:	04/13/2015 00:00:00 - 03/31/2016 23:59:00								
Sensor Type:	Ping (60 s Interval)								
Probe, Group, Device:	Cluster P	Cluster Probe > Rack 18 > N-DR-01.aos							
Cluster Node:	SCO - PF	SCO - PRTG							
Uptime Stats:	Up:	91 %	[322d8h45m28s]	Down:	9 %	[31d7h15m58s]			
Request Stats:	Good:	89 %	[734824]	Failed:	11 %	[87048]			
Average (Ping Time):	24 msec	24 msec							
	1								





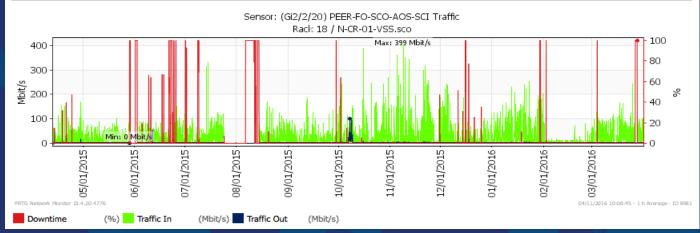
LAST 12 MONTHS SCIENTIFIC DATA TRANSFER

PAESSLER

PRTG Network Monitor

Report for (Gi2/2/20) PEER-FO-SCO-AOS-SCI Traffic

Report Time Span:	04/13/2	04/13/2015 00:00:00 - 03/31/2016 23:59:00									
Sensor Type:	SNMP T	SNMP Traffic 64bit (30 s Interval)									
Probe, Group, Device:	Cluster	Cluster Probe > Rack 18 > N-CR-01-VSS.sco									
Cluster Node:	SCO - P	SCO - PRTG									
Uptime Stats:	Up: 96.247 % [340d8h53m15s] Down: 3.753 % [13d6h30m36s]										
Request Stats:	Good: 96.211 % [979801] Failed: 3.789 % [38586]										
Average (Traffic In):	23 Mbit/	23 Mbit/s									
Total (Traffic In):	81,123,8	81,123,804,398 KByte									





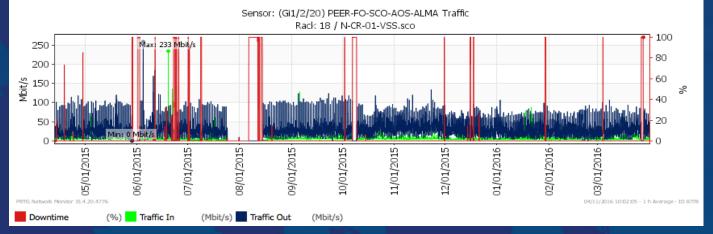
LAST 12 MONTHS OTHER IP TRAFFIC

PAESSLER

PRTG Network Monitor

Report for (Gi1/2/20) PEER-FO-SCO-AOS-ALMA Traffic

Report Time Span:	04/13/2015 00:00:00 - 03/31/2016 23:59:00									
Sensor Type:	SNMP Traffic 64bit (30 s Interval)									
Probe, Group, Device:	Cluster F	Cluster Probe > Rack 18 > N-CR-01-VSS.sco								
Cluster Node:	SCO - P	SCO - PRTG								
Uptime Stats:	Up: 95.605 % [338d2h24m50s] Down: 4.395 % [15d13h2m7s]					[15d13h2m7s]				
Request Stats:	Good:	95.573 %	[973293]	Failed:	4.427 %	[45088]				
Average (Traffic In):	6 Mbit/s									
Total (Traffic In):	21,495,550,259 KByte									





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									