SAm-1 cable Lessons from 14 years of operations

Telefonica Global Solutions

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- 1. Overview and history
- 2. Preventive maintenance
- 3. Corrective maintenance
- 4. Future challenges



SAm-1



SAm-1 started operation in December 2000

Lifetime expectation: 25 years

Maximum design capacity: 1.92 Tbps, based on 10 G technology

Current active capacity: 4 Tbps Atlantic route and 4 Tbps Pacific route

Traffic forecast end of 2014: 5 Tbps

Maximum present design capacity: 19.2 Tbps, based on 100G technology
Maximum water depth of laid cable: 8496 m

Late 90s, IP traffic forecast above the network acquisitions for international traffic in South America

Decision to build own cable

Legal entities, permits

Branching units deployed strategically for future growth

Terrestrial links key to the project

⁰¹ Overview and history. Project





Sam-1 upgrades



Sam-1 upgrades



- Fibers built 15 years ago are fine for upgrades
- Large core fibers avoid non linear effects
- Resilient building and landing cables avoid lots of maintenance problems
- It was key to do a good site survey of landing stations and terrestrial accesses
- Terrestrial longhaul segments are much more problematic

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BE MORE

Wet plant outages are caused by third parties, by earthquakes or abrasion

Minimize outages caused by third parties

Cable awareness campaigns carried out from the system's start of operation. Focused on fishermen's associations, ship owners, gas and oil companies, governmental organizations

Thanks to these campaigns Telefonica is aware of future crossings with Sam-1





Preventive maintenance in Sam-1 (II)

Guatemala Colombia Perú & Ecuador Chile Brasil Florida & Puerto Rico Argentina & Uruguay

Cable awareness campaigns



Snapshots of cable exposures









Topographic studies performed in the beaches that have suffered cable exposures

Divers post deployment inspection in 2012 to observe the cable 10 years after cable installation

Conclusions of the actions helped to redefine the Risk Management Chart

TGS belongs to ICPC, International Cable Protection Committee

Risk Management Chart



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Wet Plant corrective maintenance



1ª Failure Segment D MAR 03

Type: Shunt Fault

Elapsed: 23 days Base Port: Montevideo

2ª Failure Segment A JUN 07

Type: Cable cut Elapsed: 9 days Base Port: Montevideo

3^a Failure Segment D NOV 07

Type: Isolation failure Elapsed: 25 days Base Port: Montevideo

4ª Failure Segment A JAN 09

Type: Shunt fault Elapsed: 39 days Base Port: Baltimore

5ª Failure Segment K JUN 09

Type: Cable cut (earthquake) Elapsed: 17 days Base Port: Curaçao

6ª Failure Segment A AUG 09

Type: Shunt fault Elapsed: 74 days Base Port: Curaçao

7th Failure Segment G DEC 10

Type: Shunt fault (earthquake) Elapsed: 201 days Base Port: Curaçao

7th Failure Segment H APR 12

Type: Shunt fault Elapsed: 39 days Base Port: Curaçao

Faults



APMA 2012-2016

Private maintenance agreement

3 ships : 1 based in Western Atlantic, 2 en Eastern Atlantic

TE Subcom in Curaçao (Western)

ASN in Cape Verde and Calais (Eastern)





Repair tasks

No	Action	Commence	Duration	Complete	
			(Hours)		
1	Fault information detailed SMNDAM-4078614 and effective from			04/12/2010 6:24	
	10:24UTC, 04/12/10				
2	Await for depot personnel	04/12/2010 6:24	12,5	04/12/2010 18:55	Loading Plan rcvd @ 15:57
3	Commence loading of Sam 1 cable and kits	04/12/2010 18:55	24,6	05/12/2010 19:30	Testing of cable & plant
4	Vessel departs - FAOP to cable ground	05/12/2010 19:30	52,0	07/12/2010 23:30	KPI @ 12 knots
5	Awaiting back capacity traffic restoration	07/12/2010 23:30	41,0	09/12/2010 16:30	NOC to advise
6	Set up in DP and prepare for DG#1	09/12/2010 16:30	1,0	09/12/2010 17:30	Depth approx 5000m. Take Power Control
7	Cutting drive DG#1at approx fault location	09/12/2010 17:30	10,4	10/12/2010 3:55	Terminals to monitor COTDR to verify cable cut
					(approx +8hrs after start)
8	Contingency for missed grap drives	10/12/2010 3:55	61,1	12/12/2010 17:01	Terminals to monitor COTDR to verify cable cut
					(approx +8hrs after start)
g	Holding Drive DG#7 approx DOW West of initial cutting drive	12/12/2010 17:01	9,0	13/12/2010 2:01	
10	Contingency for missed grap drives	13/12/2010 2:01	89,0	16/12/2010 19:01	
11	Recover Fortaleza cable end to deck - Test clear to Fortaleza Terminal	16/12/2010 19:01	21,0	17/12/2010 16:01	
	station				
	Recovery of repeater 13	17/12/2010 16:01	38,0	19/12/2010 6:01	
	Preparation of Fortaleza side	19/12/2010 6:01	2,5	19/12/2010 8:31	
	Splice1(to repeater)	19/12/2010 8:31	12,0	19/12/2010 20:31	
	Testing by CORE	19/12/2010 20:31	2,2	19/12/2010 22:43	
	Surface Lay ~26,5km	19/12/2010 22:43	14,2	20/12/2010 12:55	
	Seal and Buoy-off FLA side	20/12/2010 12:55	6,0	20/12/2010 18:55	
	Transit to DG#16 position	20/12/2010 18:55	2,0	20/12/2010 20:55	
13	Holding Drive DG#x approx DOW East of initial cutting drive	20/12/2010 20:55	17,0	21/12/2010 13:55	
15	Recover San Juan cable end to deck - Test clear to San Juan Terminal	21/12/2010 13:55	2,0	21/12/2010 15:55	Activación plan B
	station				
17	Construct Initial joint between system cable and system spare.	21/12/2010 15:55	9,0	22/12/2010 0:55	
18	Lay out 22.5 and recover CB1 and Fortaleza cable end	22/12/2010 0:55	12,0	22/12/2010 12:55	OTDR Monitoring during payout
19	Recover Fortaleza cable end to deck - Test clear to Fortaleza Terminal	22/12/2010 12:55	12,0	23/12/2010 0:55	
	station				
20	Construct Final Joint	23/12/2010 0:55	14,0	23/12/2010 14:55	
21	Carry out final Systems tests.	23/12/2010 14:55	24,0	24/12/2010 14:55	Terminal Testing
22	Deploy final splice	24/12/2010 14:55	32,0	25/12/2010 22:55	With BRH. Vessel released from cable ground. Hand
					back power control. Including 24hrs terminal
					testing prior to activating BRH
23	Transit back to Curacao cable depot	25/12/2010 22:55	52,0	28/12/2010 2:55	KPI @ 12 knots
24	Rig and discharge of SAm 1 remaining stock/recovered cable	28/12/2010 2:55	21,5	29/12/2010 0:25	
25	Resume ACMA standby	29/12/2010 0:25	0,0	29/12/2010 0:25	

Spares loading







Cutting and holding grapnels









Initial and Final Splices







ROV operations









Representatives onboard



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Gridless WDM being tested to allow smaller carrier spacing and increase system's capacity

200 Gbps wavelengths being tested

Unisur



- Unisur started operation in 1994
- Testing and repurpose
- Back in operation 4Q2014
- Initial capacity 200 Gbps

New PCCS submarine cable



- Jacksonville (Florida) New TGS
- Tortola (British Virgin Islands) -Existing C&W
- San Juan (Puerto Rico) Existing TGS
- Hudishibana (Aruba) Existing SETAR
- Cartagena de Indias (Colombia) -Existing Telefónica Colombia /TGS
- Maria Chiquita (Panamá) -Existing C&W
- Balboa (Panamá) Existing C&W
- Manta (Ecuador) New Telconet



