



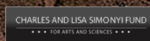
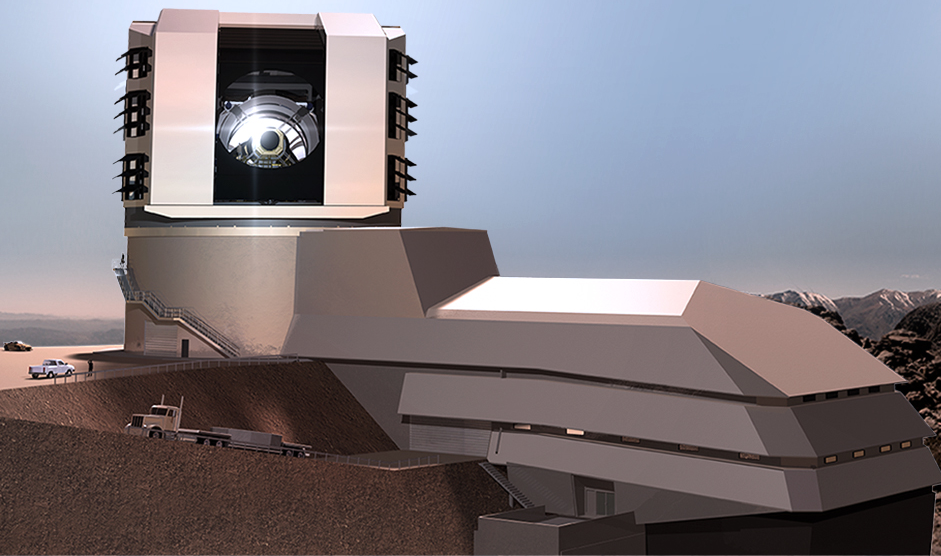
Rubin Observatory Networks

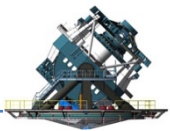
Jeffrey Kantor

Sr. Manager

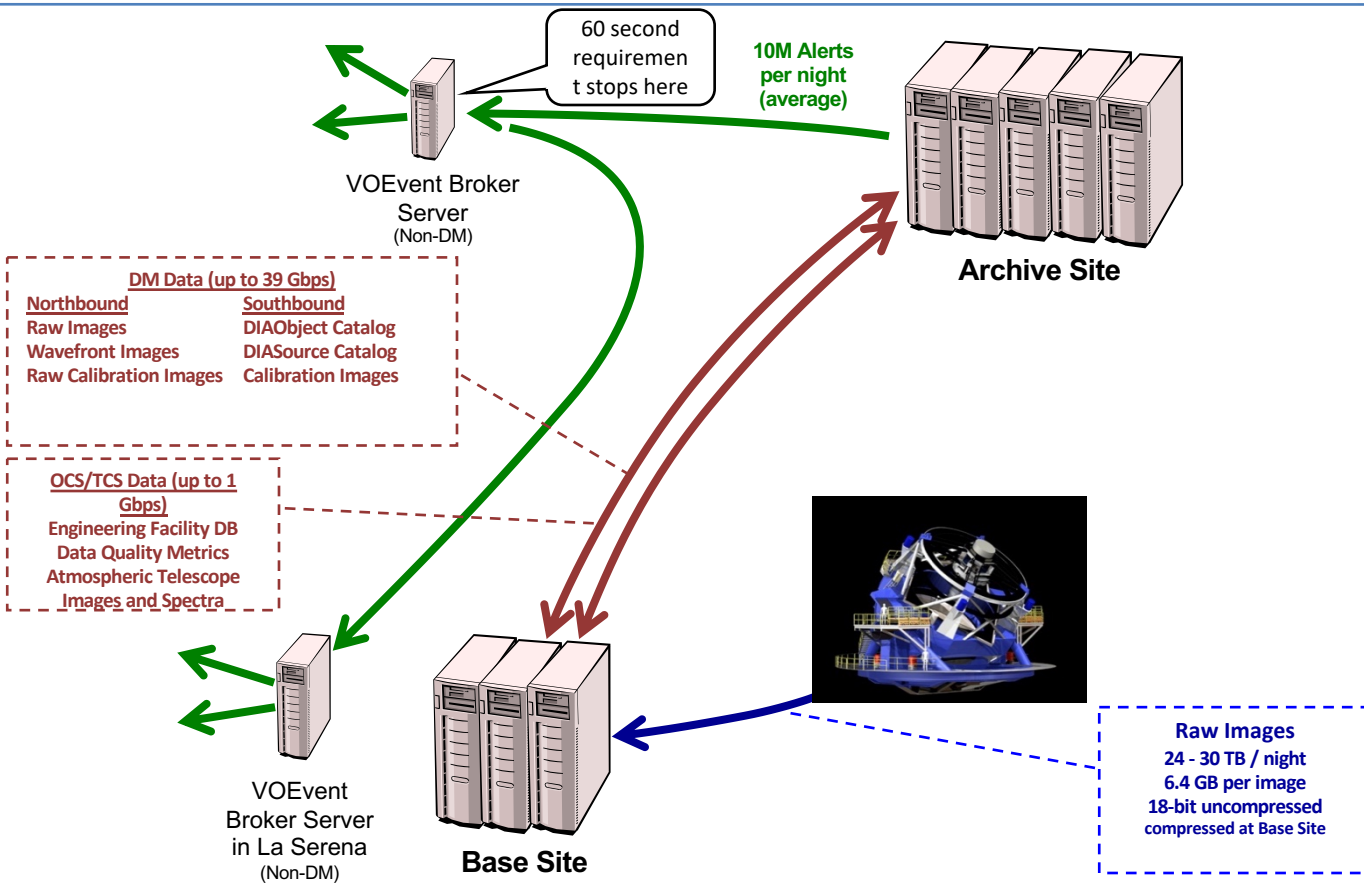
DMLT Meeting

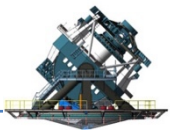
February 25 – 27, 2020



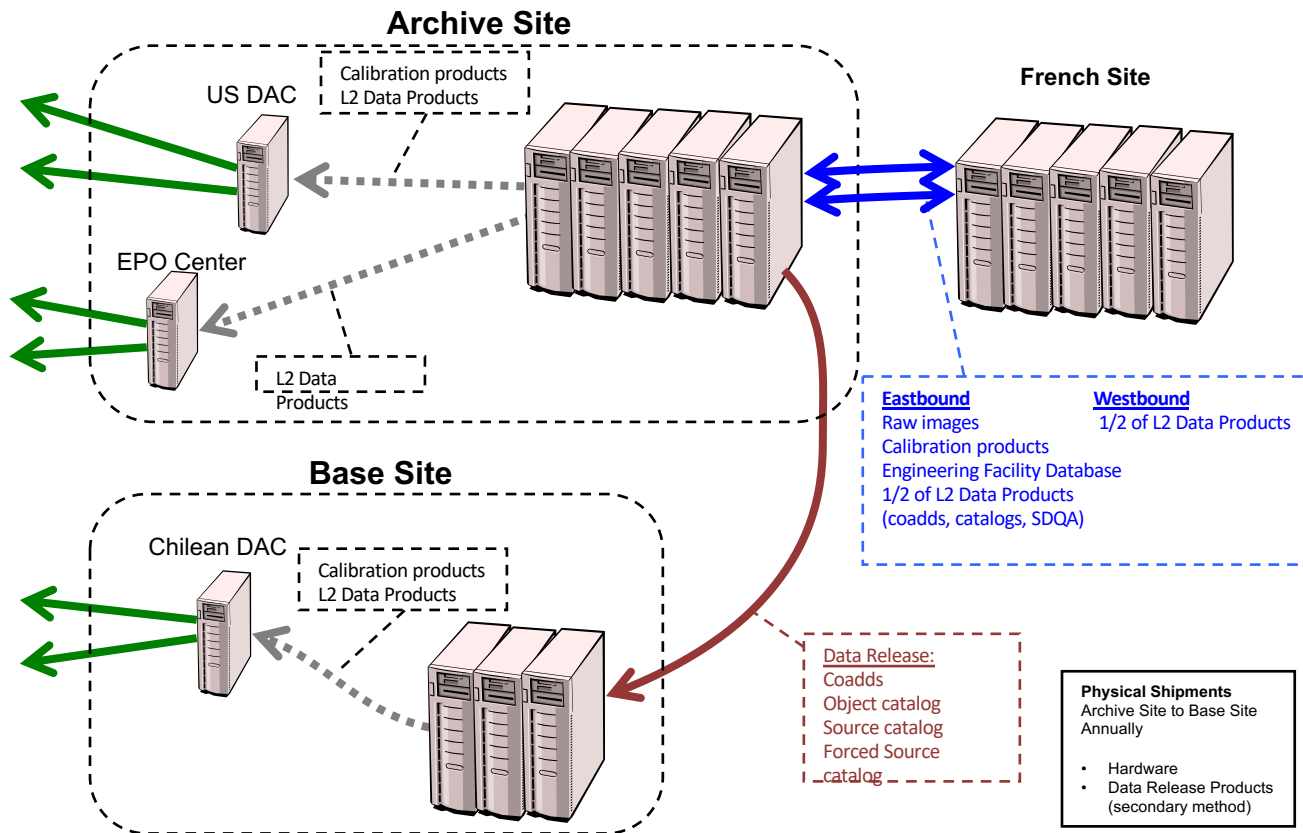


Nightly Data Flows – no crosstalk images



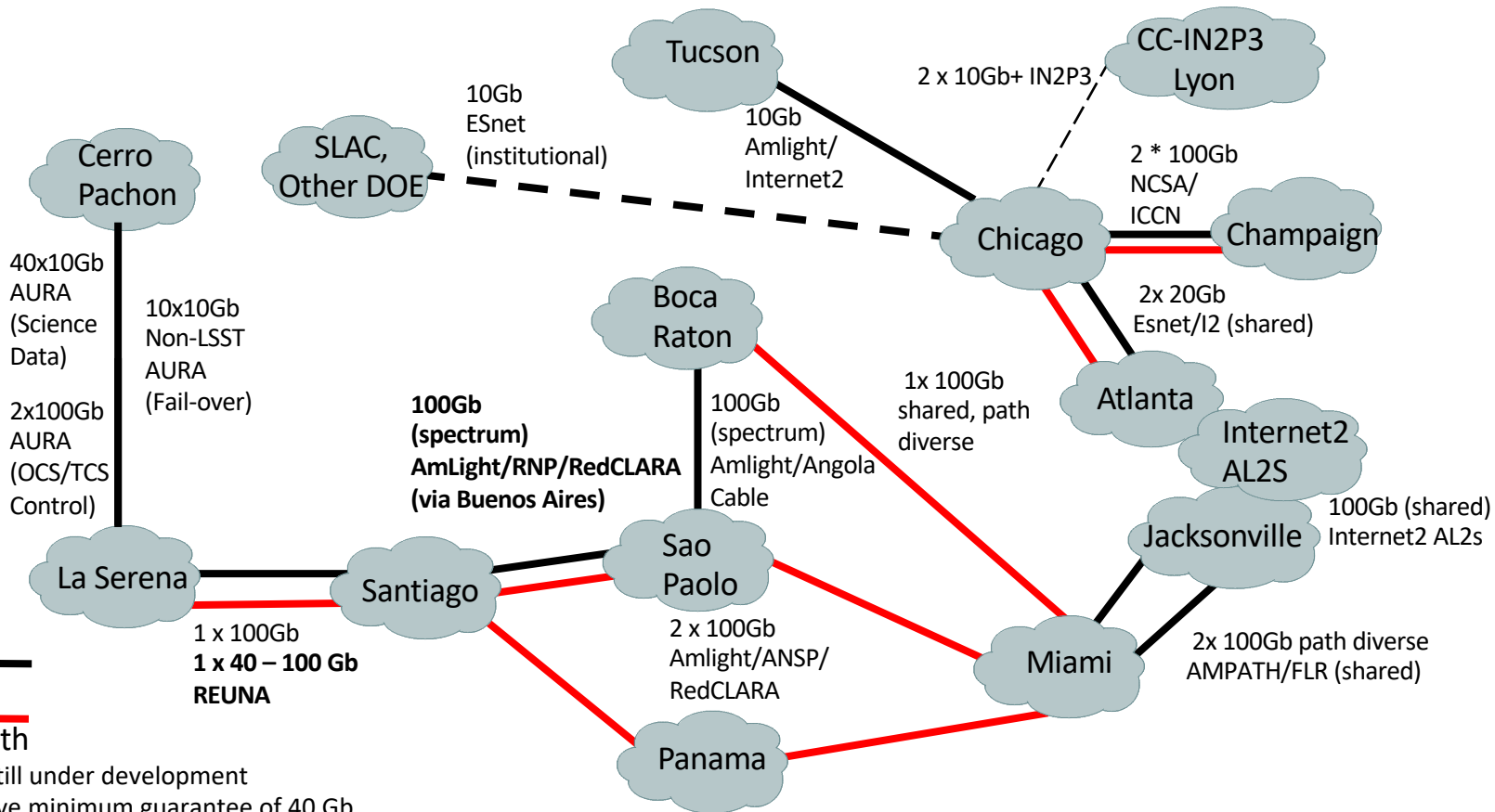


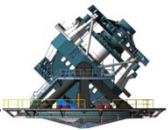
Non-Nightly Data Flows pending DOE decision



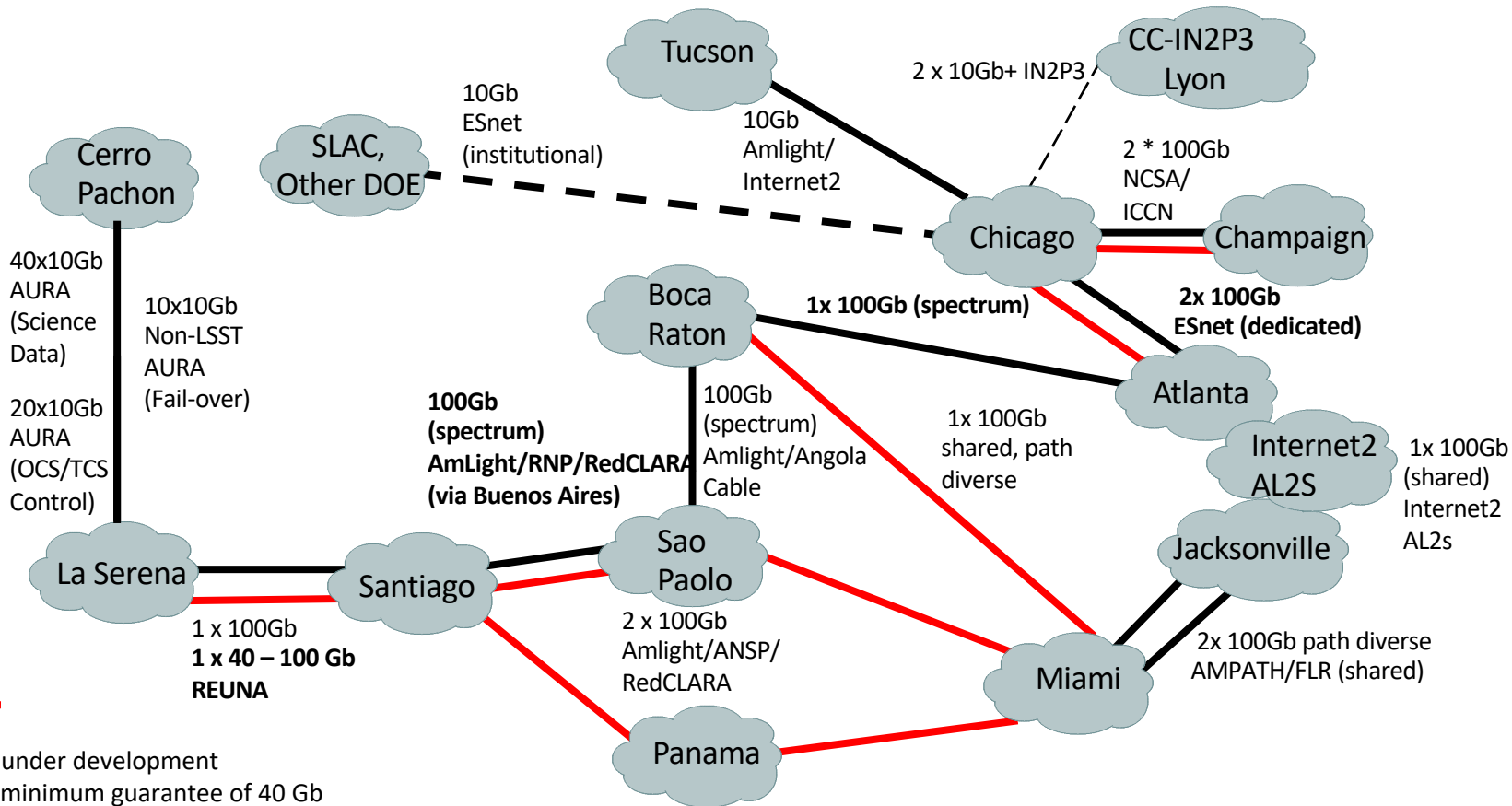


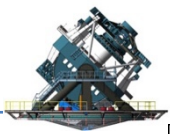
Rubin Obs. Long Haul Network Links (Baseline FY20)





Rubin Obs Long Haul Network Links (Baseline FY21)





End-to-End Network Bandwidth Evolution



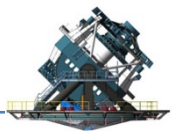
MILESTONE LEVEL	ID	ACTIVITY	BASELINE FINISH	PROJECTED FINISH	END-TO-END B/W, Cerro Pachon - La Serena	END-TO-END B/W, La Serena - NCSA	Bandwidth Achieved through Demonstration
2	DM-NET-1	Base - Archive Network Functional 1 Gbps	6/11/15	6/11/15	0.5 Gbps	Max: 1G Best Effort	0.5 Gbps (operational)
2, 3	DM-NET-2, -3, 6, DMTC-6800-1310	Mountain - Base Network Functional 2 x 100 Gbps, Summit LAN Installed, Initial Network Ready (Summit), Network Acceptance/Verification Review for Early Integration	3/27/18	6/30/18	2 x 100 (shared AURA DWDM)	Max: 20G Best Effort	46Gbps (LSST First Light demo)
3	DM-NET-4, DMTC-6800-1320	Base LAN installed, Network Acceptance/Verification Review for ComCam on bench	9/16/20	9/16/20	6 x 100 (dedicated LSST DWDM) + 2 x 100 (shared AURA DWDM)	Max: 20G Best Effort	80Gbps (LSST SC18 demo)
		Auxiliary Telescope Spectrograph on Sky Observing		1/1/20			
		DM Operations Rehearsal #2 (AuxTel data)		2/15/20			
		Network Pre-Verification Planning/Progress Review		3/31/20			
		Commissioning Camera on Test Bench Observing		4/1/20			
3	DMTC-6800-1325	Network Acceptance/Verification Review for Full Integration	9/16/20	9/16/20	6 x 100 (dedicated LSST DWDM) + 2 x 100 (shared AURA DWDM)	Max: 140G Best Effort	
		DM Operations Rehearsal #3 (ComCam on bench data)		11/1/20			
2	DM-NET-5	Base - Archive Network Functional 100 Gbps	7/3/19	11/30/20	6 x 100 (dedicated LSST DWDM) + 2 x 100 (shared AURA DWDM)	Max: 140G Best Effort	
		Data Preview 0 Start		12/15/20			
		Commissioning Camera on Sky Observing		4/23/21			
3	DMTC-6800-1330	Network Acceptance/Verification Review for Science Verification	7/2/21	7/2/21	6 x 100 (dedicated LSST DWDM) + 2 x 100 (shared AURA DWDM)	Max: 140G Best Effort	
		Data Preview 1 Start		8/24/21			
		Ful Camera on Sky Observing		10/12/21			
		Data Preview 2 Start		2/15/22			
3	DMTC-6800-1340	Network Acceptance/Verification Review for Full Operations	6/30/22	6/30/22	6 x 100 (dedicated LSST DWDM) + 2 x 100 (shared AURA DWDM)	Max Dedicated: 200G dedicated up to NCSA. 300G at NCSA. Burst: 100G	

Note: Rubin Observatory internet, web, voice, video go over AURA circuits, which are shared

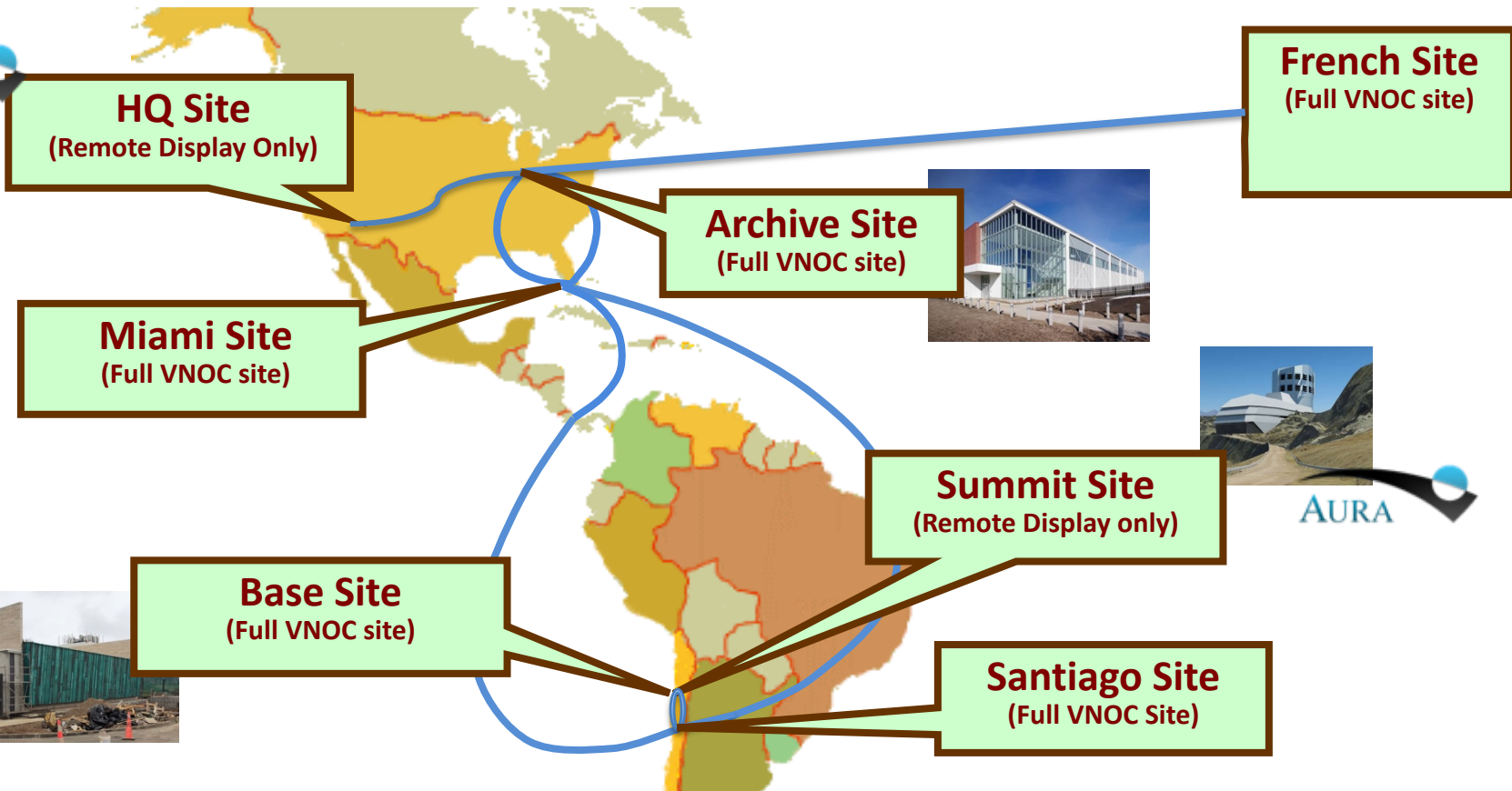


- The Rubin Obs Long-Haul Network is a single operational network implemented with diverse providers and links that must work seamlessly together
- The VNOC provides a single, integrated operational capability for end-to-end engineering, performance monitoring, security, maintenance, and all other operations
- The goal is complete visibility in all links and sites to all participants, with a single entry point for information and assistance

Virtual Network Operations Center (VNOc) Sites



AURA



French Site
(Full VNOc site)

HQ Site
(Remote Display Only)

Archive Site
(Full VNOc site)



Miami Site
(Full VNOc site)



Summit Site
(Remote Display only)

AURA

AURA

Base Site
(Full VNOc site)



Santiago Site
(Full VNOc Site)

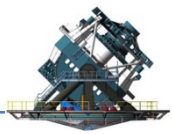


Accomplishments since last DMLT



- Completed install LATISS DAQ and test DAQ over DWDM (successful)
- Completed cabling and campus network in BDC offices and Base Office Building both floors
- Continued support of servers, network for AuxTel, DIMMs, All Sky Camera
- Continued work on installing network in various locations in summit
- Upgraded REUNA DWDM to 2 x 100G cards LS – SCL (formerly 20 x 10G)
- Contracts let for SCL – SP spectrum (RNP)
- Provisioned 2 x 20G path diverse links Atlanta – Chicago (Esnet)
- Configured VLANs for Summit – Base and Base – Archive image data
- Developed LDM-732 Rubin Observatory Network Verification Baseline (JIRA)
- Developed draft charge for pre-Verification Review (late March)

(Details in DM monthly reports)

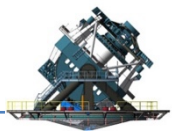


Work in Progress



- Moving LATISS data transfer from AURA general network to Rubin Obs network
- Continuing to install networks in areas of summit (i.e. 1,2,3,5,7 levels)
- Continuing support of AuxTel, DIMM, All Sky Camera testing
- Waiting for entel to install a new in-house microwave backup system which will provide 400Mb bandwidth for all tenants
- Continuing server installs on summit and base
- Preparing for ComCam on bench

(Details in DM monthly reports)



FY20 Remaining Major Activities



- Continue Summit Network cabling, access switches, Wi-Fi, VOIP (all FY)
- Summit and base server installations (all FY)
- Continue support AuxTel, DIMM, All Sky Camera testing (all FY)
- Cable Base offices, rooms, install access switches, Wi-Fi, VOIP (1H)
- Base DM Server installations (all FY)
- Implement 2 x 100 Gbps ESNNet (2H20)
- Complete Santiago – Sao Paolo Spectrum (1H20)
- Complete 40G upgrade La Serena – Santiago secondary (2H20)
- Complete MOUs for NCSA – CC-IN2P3 connection(2H20)

(Details in [JIRA IT Project](#))



Network Verification and Validation (V&V)



- 18 DMS-xxx network requirements to verify (summit – base, base – archive, archive– DACs) documented in Magic Draw Verification Elements
- 2 done and results documented JIRA V&V
- Rest are documented in JIRA, to be scheduled in JIRA and PMCS
 - LDM-732 Rubin Observatory Network Verification Baseline replaces
 - LSST Network Verification and Validation Plan (document 25303 Obsolete)
 - LSST Network Verification and Validation Matrix (document 25304 Obsolete)
- These cover first level of testing (System Engineering terminology):
 - **LL – Lower Level (Subsystem Level) THIS IS DM V&V level**
 - SL – Same Level (LSST System Integration)
 - HL – Higher Level (LSST Commissioning)



Network V&V Verification Element example



[LVV-71] DMS-REQ-0168-V-01: Summit Facility Data Communications

Jira Link	Assignee	Status	Priority	Test Cases
LVV-71	Gregory Dubois-Felsmann	Not Covered	1a	LVV-T1097

Verification Element Description:

Verify that:

- Summit - Base Network has been properly implemented in Summit and Base facilities
- Summit - Base Network is properly integrated with Summit Control Network and DAQ/-Camera Data Backbone

Verify that OCS/DMCS triggers read-out from DAQ and queries EFD. Verify that data from EFD and camera are accepted and transferred to the Summit DWDM. Requirement does not include data transfer to base (LVV-73) or from base to archive center (LVV-81, LVV-82, LVV-83).

Upstream Requirements				
Requirement ID	DMS-REQ-0168			
Requirement Description	De-	Specification: The DMS shall provide data communications infrastructure to accept science data and associated metadata read-outs, and the collection of ancillary and engineering data, for transfer to the base facility.		
Requirement Priority	Prior-	1a		
Upper Level Requirement	Level Re-	OSS-REQ-0002	The Summit Facility	



Network V&V Test Case example



[LVV-T1097] Verify Summit to Base Network Implementation

Test Case

Jira Link	Owner	Status	Version	Critical Event	Verification Type
LVV-T1097	Jeff Kantor	Draft	1	false	Test

Objective:

Control the AuxTel through a night of Observing, read out data and transfer data to LSST Summit DWDM. Verify that data acquired by a AuxTel DAQ can be transferred to LSST Summit DWDM and loaded in EFD without problems.

Precondition:

1. Summit Control Network and Camera Data Backbone installed and operating properly.
2. Summit - Base Network installed and operating properly.
3. AuxTel hardware and control systems are functional with LATISS. AuxTel TCS, AuxTel EFD, AuxTel CCS, AuxTel DAQ are connected via LSST Control Network on Summit to LSST DWDM (with at least 2 x 10 Gbps ethernet port client cards).
4. AuxTel Archiver/forwarders installed in Summit and operating properly.

Predecessors:

PMCS DMTC-7400-2400 Complete
PMCS T&SC-2600-1545 Complete

Test Personnel:

Ron Lambert (LSST), Kian-Tat Lim (LSST), Matt Kollross (NCSA), Tony Johnson (SLAC), Gregg Thayer (SLAC)