LARGE SYNOPTIC SURVEY TELESCOPE

Large Synoptic Survey Telescope (LSST)
Data Management

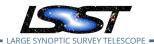# LVV-P47 Summit – Base Network Integration Test Plan and Report

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DMTN-151

Latest Revision: 2019-07-22

Abstract

This is the test plan and report for LVV-P47 (Summit - Base Network Integration), an LSST level 2 milestone pertaining to the Data Management Subsystem.

Change Record

Version	Date	Description	Owner name
	2019-07-09	Draft	Jeff Kantor
1.0	2019-07-22	Test campaign completed. Document issued.	Jeff Kantor

Document curator: Jeff Kantor

Document source location: `https://github.com/lsst-dm/DMTR-151`

Version from source repository: 8703134

Contents

LVV-P47 Summit - Base Network Integration Test Plan and Report

1 Introduction

1.1 Objectives

This test plan documents the Summit - Base Network Integration test activity.

1.2 System Overview

The Summit - Base Network is defined in LSE-78 and LSE-309

1.3 Document Overview

This document was generated from Jira, obtaining the relevant information from the LVV-P47 Jira Test Plan and related Test Cycles (LVV-C82).
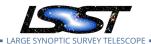
Section 1 provides an overview of the test campaign, the system under test (Networks), the applicable documentation, and explains how this document is organized. Section 2 describes the configuration used for this test. Section 3 describes the necessary roles and lists the individuals assigned to them.

Section 4 provides a summary of the test results, including an overview in Table 1, an overall assessment statement and suggestions for possible improvements. Section 5 provides detailed results for each step in each test case.

The current status of test plan LVV-P47 in Jira is **Completed** .

1.4 References

[1] **[DMTR-82]**, Arcanjo, V., Astudillo, A., Bezerra, J., et al., 2018, *Network Bandwidth Tests between Chile and the United States*, DMTR-82, URL https://ls.st/DMTR-82

[2] **[LSE-309]**, Kantor, J., 2017, *Summit to Base Information Technology and Communication (ITC) Design*, LSE-309, URL `https://ls.st/LSE-309`

[3] **[LSE-78]**, Lambert, R., Kantor, J., Huffer, M., et al., 2017, *LSST Observatory Network Design*, LSE-78, URL `https://ls.st/LSE-78`

2 Test Configuration

2.1 Data Collection

Observing is not required for this test campaign.
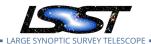
2.2 Verification Environment

Summit - Base Network integration is verified in the actual Cerro Pachon summit and La Serena Base, as well as on the fiber route between them. The integration is done in 3 phases (in collaboration with equipment/installation vendors):

1. Installation of fiber optic cables and Optical Time Domain Reflector (OTDR) fiber testing (completed 20170602 REUNA deliverable RD10)
2. Installation of AURA DWDM and Data Transfer Node (DTN) (completed 20171218 DMTR-82)
3. Installation of LSST DWDM and Bit Error Rate Tester (BERT) data (completed 20190505 collection-7743)

2.3 Entry Criteria

By phase:

1. Posts from Cerro Pachon to AURA Gatehouse repaired/improved. Fiber installed on posts from Cerro Pachon to AURA Gatehouse. Fiber installed from AURA Gatehouse to AURA compound in La Serena. OTDR purchased.
2. AURA DWDM installed in caseta on Cerro Pachon and in existing computer room in La Serena. DTN installed in La Serena. DTN loaded with software and test data staged.

3. Base Data Center (BDC) ready for installation of LSST DWDM. Fiber connecting existing computer room to BDC. LSST DWDM equipment installed in Summit Computer Room and BDC.

2.4   Exit Criteria
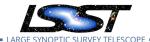
By phase:

1. Fiber tested to within acceptable Db.
2. Summit - Base bandwidth and latency within specifications
3. Summit - Base bandwidth, latency, bit error rate within specifications
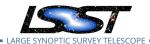
2.5   PMCS Activity

By phase:

1. DMTC-8000-0806
2. DMTC-8000-0826
3. DMTC-8000-0836

3   Personnel

The following personnel are involved in this test activity:

- Test Plan (LVV-P47) owner: Jeff Kantor

- Test Cycles:

    - LVV-C82 owner: Jeff Kantor

        * Test case LVV-T1168 tester: Jeff Kantor

- Additional Test Personnel involved:

    - Test case LVV-T1168: Ron Lambert (LSST), Albert Astudillo (REUNA), Mauricio Rojas (CTIO/CISS), Raylex, Coriant, Telefonica contractors

4   Overview of the Test Results

4.1   Summary

	Test Cycle **LVV-C82: Summit - Base Network Integration**		
test case	**status**	**comment**	**issues**
LVV-T1168	Pass	Tests conducted in 3 phases, each phase passed. Phase 2 was limited by Data Transfer Node capacity to put data onto the network; still passed but could not keep increasing data rate to find top limit.	

Table 1: Test Results Summary

4.2   Overall Assessment

Passed

4.3   Recommended Improvements

None

5   Detailed Test Results

5.1   Test Cycle LVV-C82

Open test cycle *Summit - Base Network Integration* in Jira.

Summit - Base Network Integration
Status: Done

This test cycle covers the Summit - Base Network Integration test activity.

5.1.1   Software Version/Baseline

By phase:

1. Optical Time Domain Reflector (OTDR) firmware/configuration/plots/logs documented in REUNA deliverable RD10
2. Data Transfer Node (DTN) software/configuration/data documented in DMTR-82
3. Bit Error Rate Tester (BERT) firmware/configuration/plots/logs documented in collection-7743

5.1.2   Configuration

By phase:

1. Optical Time Domain Reflector (OTDR) firmware/configuration/plots/logs documented in REUNA deliverable RD10
2. Data Transfer Node (DTN) software/configuration/data documented in DMTR-82
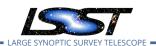3. Bit Error Rate Tester (BERT) firmware/configuration/plots/logs documented in collection-7743

5.1.3   Test Cases in LVV-C82 Test Cycle

5.1.3.1   Test Case LVV-T1168 - Test Summit - Base Network Integration

Open *LVV-T1168*   test case in Jira.

3 phases done (in collaboration with equipment/installation vendors):

1. Installation of fiber optic cables and Optical Time Domain Reflector (OTDR) fiber testing (completed 20170602 REUNA deliverable RD10)
2. Installation of AURA DWDM and Data Transfer Node (DTN) (completed 20171218 DMTR-82)
3. Installation of LSST DWDM and Bit Error Rate Tester (BERT) data (completed 20190505 collection-7743)

Preconditions:
By phase:

1. Posts from Cerro Pachon to AURA Gatehouse repaired/improved.   Fiber installed on posts from Cerro Pachon to AURA Gatehouse. Fiber installed from AURA Gatehouse to AURA compound in La Serena. OTDR purchased.
2. AURA DWDM installed in caseta on Cerro Pachon and in existing computer room in La Serena. DTN installed in La Serena. DTN loaded with software and test data staged.
3. Base Data Center (BDC) ready for installation of LSST DWDM. Fiber connecting existing computer room to BDC. LSST DWDM equipment installed in Summit Computer Room and BDC.
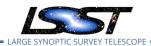
Execution status: **Pass**

Final comment:
Tests conducted in 3 phases, each phase passed. Phase 2 was limited by Data Transfer Node capacity to put data onto the network; still passed but could not keep increasing data rate to find top limit.

Detailed step results:

Step	Description, Results and Status	
1	Description	Test optical fiber with OTDR

- -

	Expected Result	Fiber tested to within acceptable Db.
	Actual Result	• Type of fiber: G.652 PKP-250 • Fiber attenuation: < 0,25 dB/Km at 1550nm • Length: 60Kms (approximately) Number of filaments: 4
	Status	Pass
2	Description	Test AURA DWDM
	Expected Result	Summit - Base bandwidth and latency within specifications
	Actual Result	The goal was to achieve a minimum of 40 Gbps end to end, up to a maximum 60 Gbps, with the test configuration that we had put in place. Iperf3 was utilized to generate the sustained data rates. Initial teething problems were encountered which required some days to troubleshoot and understand, but then the team was ready to perform the test. The limiting factor in obtaining an optimum capacity of 60 Gbps was discovered to be due to the NICs in the DTN machines. The processors were not capable of maintaining a constant 10 Gbps stream and in fact the best we could obtain was approximately 44 Gbps (6x7.5 Gbps) end to end, sustained over a 24-hour period. However, that more than satisfied our expectations given the preliminary nature of the testing and the minimum cost spent to optimize the DTN configurations.
	Status	Pass
3	Description	Test LSST DWDM
	Expected Result	Summit - Base bandwidth, latency, bit error rate within specifications
	Actual Result	Summit - Base bandwidth, latency, bit error rate within specifications, refer to Mediciones OSA Anillo AURA - LSST.pptx in docushare collection-7743
	Status	Pass

A   Acronyms used in this document

Acronym	Description
AURA	Association of Universities for Research in Astronomy
BDC	Base Data Center
CTIO	Cerro Tololo Inter-American Observatory
Center	An entity managed by AURA that is responsible for execution of a federally funded project
DM	Data Management
DMTN	DM Technical Note
DMTR	DM Test Report
DTN	Data Transfer Node
DWDM	Dense Wave Division Multiplex
Data Management Subsystem	The subsystems within Data Management may contain a defined combination of hardware, a software stack, a set of running processes, and the people who manage them: they are a major component of the DM System operations. Examples include the 'Archive Operations Subsystem' and the 'Data Processing Subsystem'"."
LSE	LSST Systems Engineering (Document Handle)
LSST	Large Synoptic Survey Telescope
PMCS	Project Management Controls System
REUNA	Red Universitaria Nacional
Summit	The site on the Cerro Pachón, Chile mountaintop where the LSST observatory, support facilities, and infrastructure will be built.