

Large Synoptic Survey Telescope (LSST) Data Management

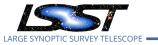
LSST Data Management Acceptance Test Specification

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LDM-639

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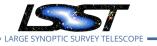


LDM-639

Abstract

This document describes the detailed acceptance test specification for the LSST Data Management System.





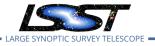
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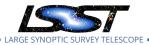
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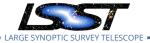


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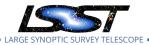
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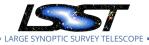
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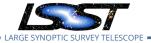
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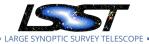
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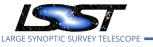


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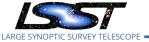


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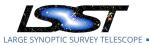
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LSST Data Management Acceptance Test Specification

Test Spec for LSST Data Management

1 Introduction

This document is intended to specify the acceptance test procedures for the LSST Data Management System. It is a work in progress; the current version provides Test Cases covering $\sim 35\%$ of the requirements. It does not yet provide full Test Plans for comprehensive testing nor identify the fraction of each requirement covered by the existing Test Cases.

This document will be updated as work continues on completing Test Cases, Test Plans, and requirements coverage.

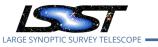
1.1 Objectives

This document describes the test cases required to validate the Data Management System requirements described in the LSST DM Subsystem Requirements document LSE-61. It identifies test cases and procedures for the tests as well as the pass/fail criteria for each test.

A full description of the LSST Data Management System is provided in the Data Management System Design document, LDM-148 with the science requirements detailed in the LSST Science Requirements Document LPM-17.

1.2 Scope

This document provides the acceptance test plan for the whole Data Management System (DMS), as described by the Data Management System Requirements in LSE-61.

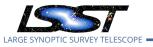


1.3 Applicable Documents

- LPM-17 LSST Science Requirements Document
- LDM-148 LSST Data Management System Design
- LDM-294 LSST DM Organization & Management
- LDM-503 LSST DM Test Plan
- LSE-61 LSST DM Subsystem Requirements
- LSE-163 LSST Data Products Definition Document
- LDM-151 LSST DM Science Pipelines Design
- LSE-180 Level 2 Photometric Calibration for the LSST Survey
- LSE-30 LSST Observatory System Specifications

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-30]**, Claver, C.F., The LSST Systems Engineering Integrated Project Team, 2018, *Observatory System Specifications (OSS)*, LSE-30, URL https://ls.st/LSE-30
- [3] **[LSE-61]**, Dubois-Felsmann, G., Jenness, T., 2018, *LSST Data Management Subsystem Requirements*, LSE-61, URL https://ls.st/LSE-61
- [4] **[LDM-554]**, Dubois-Felsmann, G., Ciardi, D., Mueller, F., Economou, F., 2018, *Science Plat-form Requirements*, LDM-554, URL https://ls.st/LDM-554
- [5] **[LPM-17]**, Ivezić, Ž., The LSST Science Collaboration, 2018, *LSST Science Requirements Document*, LPM-17, URL https://ls.st/LPM-17
- [6] **[LSE-131]**, Jacoby, S., Emmons, B., Selvy, B., 2017, *Interface between Data Management and Education and Public Outreach*, LSE-131, URL https://ls.st/LSE-131
- [7] [LSE-180], Jones, L., 2013, Level 2 Photometric Calibration for the LSST Survey, LSE-180, URL https://ls.st/LSE-180
- [8] [LSE-163], Jurić, M., et al., 2017, LSST Data Products Definition Document, LSE-163, URL https://ls.st/LSE-163



[9] **[LDM-148]**, Lim, K.T., Bosch, J., Dubois-Felsmann, G., et al., 2018, *Data Management System Design*, LDM-148, URL https://ls.st/LDM-148

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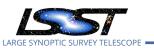
- [10] **[LDM-294]**, O'Mullane, W., Swinbank, J., Jurić, M., DMLT, 2018, *Data Management Organization and Management*, LDM-294, URL https://ls.st/LDM-294
- [11] **[LDM-503]**, O'Mullane, W., Swinbank, J., Jurić, M., Economou, F., 2018, *Data Management Test Plan*, LDM-503, URL https://ls.st/LDM-503
- [12] **[LDM-151]**, Swinbank, J.D., et al., 2017, *Data Management Science Pipelines Design*, LDM-151, URL https://ls.st/LDM-151

1.5 Acronyms

Acronym	Description
AP	Alerts Production
С	Specific programming language (also called ANSI-C)
СРР	C++ Programming language
DAC	Data Access Center
DB	DataBase
DBB	Data BackBone
DM	Data Management
DMCCB	DM Change Control Board
DMS	Data Management Sub-system
DR	Data Release
DRP	Data Release Production
EFD	Engineering Facilities Database
IT	Integration Test
IVOA	International Virtual-Observatory Alliance
К	Kelvin; SI unit of temperature
LAN	Local Area Network
LDM	LSST Data Management (handle for controlled documents)
LPM	LSST Project Management (Document Handle)
LSE	LSST Systems Engineering (Document Handle)
LSP	LSST Science Platform
LSST	Large Synoptic Survey Telescope



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Test Spec for LSST Data Management

М	Mega; SI units prefix for 1E6					
MOPS	Moving Object Pipeline System					
OCS	Observatory Control System					
PDAC	Prototype Data Access Center					
S	Strip (CCD chip along-scan coordinate identifier in focal plane)					
SODA	SCOS ORATOS Distributed Access					
SQL	Structured Query Language					
STS	System Test Specification					
W	Watt; SI unit of power					
р	pico; SI units prefix for 1E-12					

Approach 2

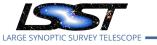
This document describes the acceptance tests for the integrated Data Management System, with a focus on whether the data products and functionality provided satisfy the requirements described in LSE-61.

The requirements from LSE-61 are extracted into the Jira "LSST Verification and Validation" Project, managed through the Jira Test Management Plugin system. Each LSE-61 requirement leads to a "LSST Verification and Validation" (LVV) Element. Each LVV Element comprises one or more more Test Cases. Each Test Case describes a Test Script to be executed, the coverage, pre-conditions, configuration, test results, and other details as specified by LDM-503. Test Scripts may have common set up and analysis steps. The Jira system allows for these steps to be shared by other Test Scripts. This improves clarity and consistency across all Test Cases.

In this document, each Test Case is listed here with the LVV Element it tests, a summary of the Test Items exercised by the Test Case, and the detailed steps to be executed by the Test Case. Shared steps between Test Scripts have been explicitly written out to appear fully in each Test Case.

Features to be tested 2.1

All top-level requirements for the LSST Data Management System described in LSE-61 are to be tested, including



- Data Products
- Alert, Calibration and Data Release Production
- LSST science pipeline software and middleware
- LSST facilities including the data archive, base, summit, and the communications between them to accept science and engineering data

2.2 Features not to be tested

This document does not describe facilities for periodically generating or collecting key performance metrics (KPMs), except insofar as those KPMs are incidentally measured as part of executing the documented test cases.

2.3 Pass/fail criteria

The results of all tests will be assessed using the criteria described in LDM-503 §4.

Note that when executing pipelines, tasks, or individual algorithms, any unexplained or unexpected errors or warnings appearing in the associated log or on screen output must be described in the documentation for the system under test. Any warning or error for which this is not the case must be filed as a software problem report and filed with the DMCCB.

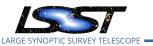
2.4 Suspension criteria and resumption requirements

Refer to individual test cases where applicable.

2.5 Naming convention

LVV : Is the label for the "LSST Verification and Validation" project in Jira.

- **LVV-XXX** : Are Verification Elements, where XXX is the Verification Element identifier. Each Verification Element has at least one Test Case.
- **LVV-TYYY** : Are Test Cases. Each Test Case is associated with a Verification Element, where YYY is the Test Case identifier.



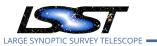
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The Verification Elements are drawn from LSE-61 requirements which have names of the form DMS-REQ-ZZZZ.

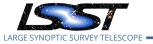






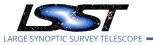
3 Test Cases Summary

Test Id	Test Name					
LVV-T23	Verify implementation of Storing Approximations of Per-pixel Metadata					
LVV-T24	Verify implementation of Computing Derived Quantities					
LVV-T25	Verify implementation of Denormalizing Database Tables					
LVV-T26	Verify implementation of Maximum Likelihood Values and Covariances					
LVV-T27	Verify implementation of Data Availability					
LVV-T28	Verify implementation of Measurements in catalogs					
LVV-T29	Verify implementation of Raw Science Image Data Acquisition					
LVV-T30	Verify implementation of Wavefront Sensor Data Acquisition					
LVV-T31	Verify implementation of Crosstalk Corrected Science Image Data Acqui-					
	sition					
LVV-T32	Verify implementation of Raw Image Assembly					
LVV-T33	Verify implementation of Raw Science Image Metadata					
LVV-T34	Verify implementation of Guider Calibration Data Acquisition					
LVV-T35	Verify implementation of Nightly Data Accessible Within 24 hrs					
LVV-T36	Verify implementation of Difference Exposures					
LVV-T37	Verify implementation of Difference Exposure Attributes					
LVV-T38	Verify implementation of Processed Visit Images					
LVV-T39	Verify implementation of Generate Photometric Zeropoint for Visit Image					
LVV-T40	Verify implementation of Generate WCS for Visit Images					
LVV-T41	Verify implementation of Generate PSF for Visit Images					
LVV-T42	Verify implementation of Processed Visit Image Content					
LVV-T43	Verify implementation of Background Model Calculation					
LVV-T44	Verify implementation of Documenting Image Characterization					
LVV-T45	Verify implementation of Prompt Processing Data Quality Report Defini- tion					
LVV-T46	Verify implementation of Prompt Processing Performance Report Defini-					
	tion					
LVV-T47	Verify implementation of Prompt Processing Calibration Report Definition					
LVV-T48	Verify implementation of Exposure Catalog					
LVV-T49	Verify implementation of DIASource Catalog					
LVV-T50	Verify implementation of Faint DIASource Measurements					



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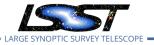
Test ld	Test Name				
LVV-T51	Verify implementation of DIAObject Catalog				
LVV-T52	Verify implementation of DIAObject Attributes				
LVV-T53	Verify implementation of SSObject Catalog				
LVV-T54	Verify implementation of Alert Content				
LVV-T55	Verify implementation of DIAForcedSource Catalog				
LVV-T56	Verify implementation of Characterizing Variability				
LVV-T57	Verify implementation of Calculating SSObject Parameters				
LVV-T58	Verify implementation of Matching DIASources to Objects				
LVV-T59	Verify implementation of Regenerating L1 Data Products During Data Re-				
	lease Processing				
LVV-T60	Verify implementation of Publishing predicted visit schedule				
LVV-T61	Verify implementation of Associate Sources to Objects				
LVV-T62	Verify implementation of Provide PSF for Coadded Images				
LVV-T63	Verify implementation of Produce Images for EPO				
LVV-T64	Verify implementation of Coadded Image Provenance				
LVV-T65	Verify implementation of Source Catalog				
LVV-T66	Verify implementation of Forced-Source Catalog				
LVV-T67	Verify implementation of Object Catalog				
LVV-T68	Verify implementation of Provide Photometric Redshifts of Galaxies				
LVV-T69	Verify implementation of Object Characterization				
LVV-T71	Verify implementation of Detecting extended low surface brightness ob- jects				
LVV-T72	Verify implementation of Coadd Image Method Constraints				
LVV-T73	Verify implementation of Deep Detection Coadds				
LVV-T74	Verify implementation of Template Coadds				
LVV-T75	Verify implementation of Multi-band Coadds				
LVV-T76	Verify implementation of All-Sky Visualization of Data Releases				
LVV-T77	Verify implementation of Best Seeing Coadds				
LVV-T78	Verify implementation of Persisting Data Products				
LVV-T79	Verify implementation of PSF-Matched Coadds				
LVV-T80	Verify implementation of Detecting faint variable objects				
LVV-T81	Verify implementation of Targeted Coadds				
LVV-T82	Verify implementation of Tracking Characterization Changes Between Data Releases				



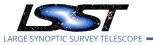
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Test ld	Test Name				
LVV-T83	Verify implementation of Bad Pixel Map				
LVV-T84	Verify implementation of Bias Residual Image				
LVV-T85	Verify implementation of Crosstalk Correction Matrix				
LVV-T86	Verify implementation of Illumination Correction Frame				
LVV-T87	Verify implementation of Monochromatic Flatfield Data Cube				
LVV-T88	Verify implementation of Calibration Data Products				
LVV-T89	Verify implementation of Calibration Image Provenance				
LVV-T90	Verify implementation of Dark Current Correction Frame				
LVV-T91	Verify implementation of Fringe Correction Frame				
LVV-T92	Verify implementation of Processing of Data From Special Programs				
LVV-T93	Verify implementation of Level 1 Processing of Special Programs Data				
LVV-T94	Verify implementation of Special Programs Database				
LVV-T95	Verify implementation of Constraints on Level 1 Special Program Products				
	Generation				
LVV-T96	Verify implementation of Query Repeatability				
LVV-T97	Verify implementation of Uniqueness of IDs Across Data Releases				
LVV-T98	Verify implementation of Selection of Datasets				
LVV-T99	Verify implementation of Processing of Datasets				
LVV-T100	Verify implementation of Transparent Data Access				
LVV-T101	Verify implementation of Transient Alert Distribution				
LVV-T102	Verify implementation of Solar System Objects Available Within Specified Time				
LVV-T103	Verify implementation of Generate Data Quality Report Within Specified Time				
LVV-T104	Verify implementation of Generate DMS Performance Report Within Spec- ified Time				
LVV-T105	Verify implementation of Generate Calibration Report Within Specified Time				
LVV-T106	Verify implementation of Calibration Images Available Within Specified Time				
LVV-T107	Verify implementation of Level-1 Production Completeness				
LVV-T108	Verify implementation of Level 1 Source Association				
LVV-T109	Verify implementation of SSObject Precovery				
LVV-T110	Verify implementation of DIASource Precovery				



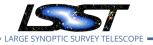
Test ld	Test Name				
LVV-T111	Verify implementation of Use of External Orbit Catalogs				
LVV-T112	Verify implementation of Alert Filtering Service				
LVV-T113	Verify implementation of Performance Requirements for LSST Alert Filter-				
	ing Service				
LVV-T114	Verify implementation of Pre-defined alert filters				
LVV-T115	Verify implementation of Calibration Production Processing				
LVV-T116	Verify implementation of Associating Objects across data releases				
LVV-T117	Verify implementation of DAC resource allocation for Level 3 processing				
LVV-T118	Verify implementation of Level 3 Data Product Self Consistency				
LVV-T119	Verify implementation of Provenance for Level 3 processing at DACs				
LVV-T120	Verify implementation of Software framework for Level 3 catalog process- ing				
LVV-T121	Verify implementation of Software framework for Level 3 image process- ing				
LVV-T122	Verify implementation of Level 3 Data Import				
LVV-T123	Verify implementation of Access Controls of Level 3 Data Products				
LVV-T124	Verify implementation of Software Architecture to Enable Community Re- Use				
LVV-T125	Verify implementation of Simulated Data				
LVV-T126	Verify implementation Image Differencing				
LVV-T127	Verify implementation of Provide Source Detection Software				
LVV-T128	Verify implementation Provide Astrometric Model				
LVV-T129	Verify implementation of Provide Calibrated Photometry				
LVV-T130	Verify implementation of Enable a Range of Shape Measurement Approaches				
LVV-T131	Verify implementation of Provide User Interface Services				
LVV-T132	Verify implementation of Pre-cursor and Real Data				
LVV-T133	Verify implementation of Provide Beam Projector Coordinate Calculation Software				
LVV-T134	Verify implementation of Provide Image Access Services				
LVV-T136	Verify implementation of Data Product and Raw Data Access				
LVV-T137	Verify implementation of Data Product Ingest				
LVV-T138	Verify implementation of Bulk Download Service				
LVV-T140	Verify implementation of Production Orchestration				



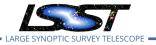
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Test Id	Test Name					
LVV-T141	Verify implementation of Production Monitoring					
LVV-T142	Verify implementation of Production Fault Tolerance					
LVV-T144	Verify implementation of Task Specification					
LVV-T145	Verify implementation of Task Configuration					
LVV-T146	Verify implementation of DMS Initialization Component					
LVV-T147	Verify implementation of Control of Level-1 Production					
LVV-T148	Verify implementation of Unique Processing Coverage					
LVV-T149	Verify implementation of Catalog Queries					
LVV-T150	Verify implementation of Maintain Archive Publicly Accessible					
LVV-T151	Verify Implementation of Catalog Export Formats From the Notebook As-					
	pect					
LVV-T152	Verify implementation of Keep Historical Alert Archive					
LVV-T153	Verify implementation of Provide Engineering and Facility Database					
	Archive					
LVV-T154	Verify implementation of Raw Data Archiving Reliability					
LVV-T155	Verify implementation of Un-Archived Data Product Cache					
LVV-T156	Verify implementation of Regenerate Un-archived Data Products					
LVV-T157	Verify implementation Level 1 Data Product Access					
LVV-T158	Verify implementation Level 1 and 2 Catalog Access					
LVV-T159	Verify implementation of Regenerating Data Products from Previous Data					
	Releases					
LVV-T160	Verify implementation of Providing a Precovery Service					
LVV-T161	Verify implementation of Logging of catalog queries					
LVV-T162	Verify implementation of Access to Previous Data Releases					
LVV-T163	Verify implementation of Data Access Services					
LVV-T164	Verify implementation of Operations Subsets					
LVV-T165	Verify implementation of Subsets Support					
LVV-T166	Verify implementation of Access Services Performance					
LVV-T167	Verify Capability to serve older Data Releases at Full Performance					
LVV-T168	Verify design of Data Access Services allows Evolution of the LSST Data					
	Model					
LVV-T169	Verify implementation of Older Release Behavior					
LVV-T170	Verify implementation of Query Availability					
LVV-T171	Verify implementation of Pipeline Availability					

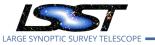


Test Id	Test Name					
LVV-T172	Verify implementation of Optimization of Cost, Reliability and Availability					
LVV-T173	Verify implementation of Pipeline Throughput					
LVV-T174	Verify implementation of Re-processing Capacity					
LVV-T175	Verify implementation of Temporary Storage for Communications Links					
LVV-T176	Verify implementation of Infrastructure Sizing for "catching up"					
LVV-T177	Verify implementation of Incorporate Fault-Tolerance					
LVV-T178	Verify implementation of Incorporate Autonomics					
LVV-T179	Verify implementation of Compute Platform Heterogeneity					
LVV-T180	Verify implementation of Data Management Unscheduled Downtime					
LVV-T181	Verify integration of Summit Facility Data Communications					
LVV-T182	Verify implementation of Prefer Computing and Storage Down					
LVV-T183	Verify implementation of DMS Communication with OCS					
LVV-T185	Verify implementation of Summit to Base Network Availability					
LVV-T186	Verify implementation of Summit to Base Network Reliability					
LVV-T187	Verify implementation of Summit to Base Network Secondary Link					
LVV-T188	Verify implementation of Summit to Base Network Ownership and Oper-					
	ation					
LVV-T189	Verify implementation of Base Facility Infrastructure					
LVV-T190	Verify implementation of Base Facility Co-Location with Existing Facility					
LVV-T191	Verify implementation of Commissioning Cluster					
LVV-T192	Verify implementation of Base Wireless LAN (WiFi)					
LVV-T193	Verify implementation of Base to Archive Network					
LVV-T194	Verify implementation of Base to Archive Network Availability					
LVV-T195	Verify implementation of Base to Archive Network Reliability					
LVV-T196	Verify implementation of Base to Archive Network Secondary Link					
LVV-T197	Verify implementation of Archive Center					
LVV-T198	Verify implementation of Archive Center Disaster Recovery					
LVV-T199	Verify implementation of Archive Center Co-Location with Existing Facility					
LVV-T200	Verify implementation of Archive to Data Access Center Network					
LVV-T201	Verify implementation of Archive to Data Access Center Network Availabil- ity					
LVV-T202	Verify implementation of Archive to Data Access Center Network Reliabil- ity					



Test ld	Test Name				
LVV-T203	Verify implementation of Archive to Data Access Center Network Sec- ondary Link				
LVV-T204	Verify implementation of Access to catalogs for external Level 3 process- ing				
LVV-T205	Verify implementation of Access to input catalogs for DAC-based Level 3 processing				
LVV-T206	Verify implementation of Federation with external catalogs				
LVV-T207	Verify implementation of Access to images for external Level 3 processing				
LVV-T208	Verify implementation of Access to input images for DAC-based Level 3 processing				
LVV-T209	Verify implementation of Data Access Centers				
LVV-T210	Verify implementation of Data Access Center Simultaneous Connections				
LVV-T211	Verify implementation of Data Access Center Geographical Distribution				
LVV-T212	Verify implementation of No Limit on Data Access Centers				
LVV-T376	Verify the Calculation of Ellipticity Correlations				
LVV-T377	Verify Calculation of Photometric Performance Metrics				
LVV-T378	Verify Calculation of Astrometric Performance Metrics				
LVV-T385	Verify Retrieval of a CCD-sized image from a coadd				
LVV-T1097	Verify Summit to Base Network Implementation				
LVV-T1168	Test Summit - Base Network Integration				
LVV-T1232	Verify Implementation of Catalog Export Formats From the Portal Aspect				
LVV-T1240	Verify implementation of minimum astrometric standards per CCD				
LVV-T1250	Verify implementation of minimum number of simultaneous DM EFD query users				
LVV-T1251	Verify implementation of maximum time to retrieve DM EFD query results				
LVV-T1252	Verify number of simultaneous alert filter users				
LVV-T1264	Verify implementation of archiving camera test data				

DRAFT NOT YET APPROVED – The contents of this document are subject to configuration control by the LSST DM Change Control Board. – DRAFT NOT YET APPROVED



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4 Active Test Cases

This section documents all active test cases that have a status in the Jira/ATM system of Draft, Defined or Approved.

4.1 LVV-T23 - Verify implementation of Storing Approximations of Per-pixel Metadata

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

4.1.1 Verification Elements

• LVV-157 - DMS-REQ-0326-V-01: Storing Approximations of Per-pixel Metadata

4.1.2 Test Items

Test Items

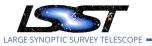
Show that the compressed form depth and mask maps adequately represents the exact version of the same information.

4.1.3 Predecessors

4.1.4 Environment Needs

4.1.4.1 Software

4.1.4.2 Hardware



4.1.5 Input Specification

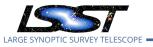
Test data: A data repository containing a full DRP data reduction of the HSC PDR dataset.

4.1.6 Output Specification

4.1.7 Test Procedure

Step	Description, Input Data and Expected Result				
1 1 6	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).			
1-1 from LVV-T12	Test Data				
	Expected				
	Result				
	Description	A "Data Butler" will be initialized to access the repository.			
1-2 from	Test Data				
LVV-T12	Expected				
	Result				
1-3 from LVV-T12	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.			
	Test Data				
	Expected				
	Result				
	Description	Create the coadd pixel level depth map for the HSC PDR dataset from step 1.			
2	Test Data	No data.			
	Expected				

2	Test Data	No data.
	Expected	
	Result	
	Description	Generate compressed representation of the pixel level depth map.
3	Test Data	No data.
	Expected	
	Result	
	Description	Create the coadd pixel level mask map for the HSC PDR dataset from step 1.
4	Test Data	No data.



	Test Spec	for	ISST	Data	Management
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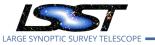
Step Description, Input Data and Expected Result Expected Result Description Generate compressed representation of the mask map. 5 Test Data No data. Expected Result Description Sample randomly from both the pixel level and compressed depth maps. Compare the distribution of depths sampled from the pixel level depth map to that sampled from the 6 compressed representation. Test Data No data. Expected Result Description Divide the mask planes into two groups: INFO and BAD. BAD flags are any that would cause a particular pixel to be excluded from processing: e.g. EDGE, SAT, BAD. Sample 7 masks from both the pixel level mask map and the compressed mask map.

For each sample, compute sum(mask_pixel xor mask_compressed). Produce the distribution of the number of bits that differ between the samples.

	Repeat for both the INFO flags and the BAD flags.
Test Data	No data.
Expected	
Result	

4.2 LVV-T24 - Verify implementation of Computing Derived Quantities

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham



4.2.1 Verification Elements

• LVV-162 - DMS-REQ-0331-V-01: Computing Derived Quantities

4.2.2 Test Items

To confirm that common derived quantities (apparent magnitude, FWHM in arcsec, ellipticity) are available to an end-user by, e.g., ensuring a color-color diagram is easy to construction, fitting functions to derived data, or generating other common scientific derivatives.

4.2.3 Predecessors

- 4.2.4 Environment Needs
- 4.2.4.1 Software

4.2.4.2 Hardware

4.2.5 Input Specification

Example data set (e.g., non-LSST or LSST commissioning) loaded into the Science Platform in a format consistent with the DPDD.

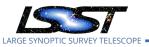
Description, Input Data and Expected Result

4.2.6 Output Specification

4.2.7 Test Procedure

Step

4.4.	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
1-1 from	Test Data	
LVV-T12	Expected	
	Result	



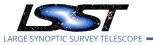
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Step	Description, Input Data and Expected Result		
1 2 4	Description	A "Data Butler" will be initialized to access the repository.	
1-2 from	Test Data		
LVV-T12	Expected		
	Result		
1-3 from	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.	
	Test Data		
	Expected		
	Result		
	Description	Load into DPDD+Science Platform	
2	Test Data	No data.	
	Expected		
	Result		
	Description	Constructing color-color diagram and and fitting stellar locus in Science Platform.	
3	Test Data	No data.	
	Expected		
	Result		
	Description	Invite three members of commissioning team to create color-color diagram from coadd	
4		catalogs based on merged coadd reference catalog.	
	Test Data	No data.	
	Expected		
	Result		

Step Description, Input Data and Expected Result

4.3 LVV-T25 - Verify implementation of Denormalizing Database Tables

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater



4.3.1 Verification Elements

• LVV-163 - DMS-REQ-0332-V-01: Denormalizing Database Tables

4.3.2 Test Items

Verify that commonly useful views of data are easy to obtain through the Science Platform.

4.3.3 Predecessors

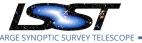
- 4.3.4 Environment Needs
- 4.3.4.1 Software
- 4.3.4.2 Hardware
- 4.3.5 Input Specification

4.3.6 Output Specification

4.3.7 Test Procedure

Step	Description, li	nput Data and Expected Result
	Description	Connect to the Science Platform's portal query interface.
1	Test Data	No data.
	Expected	
	Result	
	Description	List the available views in the database.
2	Test Data	No data.
	Expected	
	Result	
3	Description	Take 20 sampled queries and determine which are easily done on views and which require complicated joins. Discuss the complicated ones and determine if any could be simplified
		by adding additional views.

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Test Spec for LSST Data Management	LDM-639	

Step	Description, Input Data and Expected Result		
	Test Data	No data.	
	Expected		
	Result		

4.4 LVV-T26 - Verify implementation of Maximum Likelihood Values and Covariances

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.4.1 Verification Elements

• LVV-164 - DMS-REQ-0333-V-01: Maximum Likelihood Values and Covariances

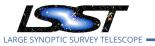
4.4.2 Test Items

- Check that all measurements in source and object schemas include columns containing uncertainties, including covariances between jointly-measured quantities.
- Check that all model-fit measurements in source and object schemas include columns that report goodness-of-fit.
- Check that most sources and objects with successful measurements report finite uncertainty values for those measurements.
- Check that most sources and objects with successful model-fit measurements report finite goodness-of-fit values.

4.4.3 Predecessors

4.4.4 Environment Needs

4.4.4.1 Software



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4.4.4.2 Hardware

4.4.5 Input Specification

4.4.6 Output Specification

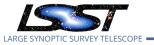
4.4.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
LVV-T12	Test Data	
	Expected	
	Result	
1-2 from	Description	A "Data Butler" will be initialized to access the repository.
	Test Data	
LVV-T12	Expected	
	Result	
1-3 from	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.
200 112	Test Data	
	Expected	
	Result	
2	Description	Verify that maximum likelihood and covariant quantities are provided. Test and manually inspect that they are reasonable (finite, appropriately normed).
_	Test Data	No data.
	Expected	
	Result	

4.5 LVV-T27 - Verify implementation of Data Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann



4.5.1 Verification Elements

• LVV-177 - DMS-REQ-0346-V-01: Data Availability

4.5.2 Test Items

Determine if all required categories of raw data (specifically enumerated: raw exposures, calibration frames, telemetry, configuration metadata) can be located through the Science Platform and are available for download. Verify through (1) administrative review; (2) checking with precursor data; (3) checking on early data feeds from the Summit such as from AuxTel and ComCam.

4.5.3 Predecessors

4.5.4 Environment Needs

4.5.4.1 Software

4.5.4.2 Hardware

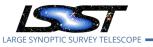
4.5.5 Input Specification

4.5.6 Output Specification

4.5.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Invite two reviewers to review that plan that seems reasonable to expect the archiving and provision of raw data	
-	Test Data	No data.	
	Expected		
	Result		
2	Description	Pass a set of HSC data through (equal in size to the first public data release) the data backbone through ingest and provide interface	

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Test Sp	ec for	LSST	Data	Management

Step	Description, Input Data and Expected Result					
	Test Data	No data.				
	Expected					
	Result					
3	Description	Track the ingestion of AuxTel data during one month in 2018-2019 and verify delivery and test download.				
	Test Data	No data.				
	Expected					
	Result					

4.6 LVV-T28 - Verify implementation of Measurements in catalogs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.6.1 Verification Elements

• LVV-178 - DMS-REQ-0347-V-01: Measurements in catalogs

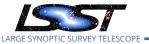
4.6.2 Test Items

Verify that source measurements in catalogs are in flux units.

4.6.3 Predecessors

- 4.6.4 Environment Needs
- 4.6.4.1 Software

4.6.4.2 Hardware



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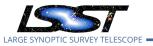
4.6.5 Input Specification

4.6.6 Output Specification

4.6.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T18	Description Test Data Expected Result	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
1-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18		<pre>"bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl "</pre>
	Test Data	and any errors or failures reported.
	Expected Result	
1-3 from LVV-T18	Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
1-4 from LVV-T18	Description Test Data	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs,
	Expected Result	
1-5 from LVV-T18	Description Test Data	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.



	Expected	
	Result	
2-1 from	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
	Test Data	
LVV-T12	Expected	
	Result	
 	Description	A "Data Butler" will be initialized to access the repository.
2-2 from	Test Data	
LVV-T12	Expected	
	Result	
2-3 from	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.
	Test Data	
	Expected	
	Result	
3	Description	Verify that each of the single-visit, coadd, and difference image catalogs from HSC repro- cessing and HiTS reprocessing (which may be the first source of regular difference images) provide measurements in flux units.
	Test Data	No data.
	Expected	
	Result	

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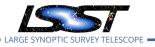
Latest Revision 2019-07-29

4.7 LVV-T29 - Verify implementation of Raw Science Image Data Acquisition

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim

4.7.1 Verification Elements

• LVV-8 - DMS-REQ-0018-V-01: Raw Science Image Data Acquisition



4.7.2 Test Items

Verify acquisition of raw data from L1 Test Stand DAQ while simulating all modes

4.7.3 Predecessors

- 4.7.4 Environment Needs
- 4.7.4.1 Software
- 4.7.4.2 Hardware
- 4.7.5 Input Specification

4.7.6 Output Specification

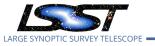
4.7.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Ingest raw data from L1 Test Stand DAQ, simulating each observing mode
1	Test Data	No data.
	Expected	
	Result	
	Description	Observe image and its metadata is present and queryable in the Data Backbone.
2	Test Data	No data.
	Expected	Well-formed image data with appropriate associated metadata.

4.8 LVV-T30 - Verify implementation of Wavefront Sensor Data Acquisition

Version Status Priority Verification Type Owner



1	Defined	Normal	Test	Kian-Tat Lim
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4.8.1 Verification Elements

• LVV-9 - DMS-REQ-0020-V-01: Wavefront Sensor Data Acquisition

4.8.2 Test Items

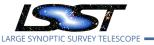
Verify successful ingestion of wavefront sensor data from L1 Test Stand DAQ while simulating all modes.

4.8.3 Predecessors

- 4.8.4 Environment Needs
- 4.8.4.1 Software
- 4.8.4.2 Hardware
- 4.8.5 Input Specification
- 4.8.6 Output Specification

4.8.7 Test Procedure

Step	Description, Ir	Description, Input Data and Expected Result		
	Description	Ingest wavefront sensor data from L1 Test Stand DAQ while simulating all modes		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Observe wavefront sensor data and metadata archived in the Data Backbone.		
2	Test Data	No data.		



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Spec	tor	LSST	Data	Management

Step Description, Input Data and Expected Result

Test

ExpectedWell-formed wavefront sensor image data with appropriate associated metadata.Result

4.9 LVV-T31 - Verify implementation of Crosstalk Corrected Science Image Data Acquisition

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.9.1 Verification Elements

• LVV-10 - DMS-REQ-0022-V-01: Crosstalk Corrected Science Image Data Acquisition

4.9.2 Test Items

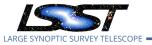
Verify successful ingestion of crosstalk corrected data from L1 Test Stand DAQ while simulating all modes.

4.9.3 Predecessors

- 4.9.4 Environment Needs
- 4.9.4.1 Software
- 4.9.4.2 Hardware

4.9.5 Input Specification

4.9.6 Output Specification



4.9.7 Test Procedure

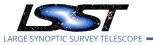
Step	Description, l	Description, Input Data and Expected Result			
	Description	Inject signals of different relative strength			
1	Test Data	No data.			
	Expected				
	Result				
	Description	Apply Camera cross-talk correction			
2	Test Data	No data.			
	Expected				
	Result				
	Description	Verify that DMS sytem can import the cross-talk corrected images			
3	Test Data	No data.			
	Expected				
	Result				
	Description	Verify that images are corrected for crosstalk			
4	Test Data	No data.			
	Expected				
	Result				

4.10 LVV-T32 - Verify implementation of Raw Image Assembly

Versi	on Status	Priority	Verification Type	Owner
1	Define	ed Normal	Test	Kian-Tat Lim

4.10.1 Verification Elements

• LVV-11 - DMS-REQ-0024-V-01: Raw Image Assembly



4.10.2 Test Items

Verify that the raw exposure data from all readout channels in a sensor can be assembled into a single image, and that all required/relevant metadata are associated with the image data.

4.10.3 Predecessors

- 4.10.4 Environment Needs
- 4.10.4.1 Software
- 4.10.4.2 Hardware
- 4.10.5 Input Specification

4.10.6 Output Specification

4.10.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Ingest data from the L1 Camera Test Stand DAQ.
1	Test Data	No data.
	Expected	
	Result	
	Description	Simulate all different modes of data gathering.
2	Test Data	No data.
	Expected	
	Result	
	Description	Verify that a raw image is constructed in correct format.
3	Test Data	No data.
	Expected	A single raw image combining data from all readout channels for a given sensor.
	Result	
	Description	Verify that a raw image is constructed with correct metadata.
Λ		



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Step Description, Input Data and Expected Result

Test D	ata No data.
Expec	ed Image header or ancillary table contains the required metadata about the observing con-
Result	text in which data were gathered.

4.11 LVV-T33 - Verify implementation of Raw Science Image Metadata

Version	Status	Priority	Verification Type	Owner	
1	Draft	Normal	Test	Kian-Tat Lim	

4.11.1 Verification Elements

- LVV-28 DMS-REQ-0068-V-01: Raw Science Image Metadata
- LVV-1234 OSS-REQ-0122-V-01: Provenance

4.11.2 Test Items

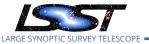
Verify successful ingestion of raw data from L1 Test Stand DAQ and that image metadata is present and queryable.

4.11.3 Predecessors

- 4.11.4 Environment Needs
- 4.11.4.1 Software

4.11.4.2 Hardware

4.11.5 Input Specification



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4.11.6 Output Specification

4.11.7 Test Procedure

Step	Description, Input Data and Expected Result					
1-1 from	Description	Ingest raw data from L1 Test Stand DAQ, simulating each observing mode				
LVV-T29	Test Data					
	Expected					
	Result					
1 2 4	Description	Observe image and its metadata is present and queryable in the Data Backbone.				
1-2 from	Test Data					
LVV-T29	Expected	Well-formed image data with appropriate associated metadata.				
	Result					
216	Description	Ingest data from the L1 Camera Test Stand DAQ.				
2-1 from	Test Data					
LVV-T32	Expected					
	Result					
2.24	Description	Simulate all different modes of data gathering.				
2-2 from	Test Data					
LVV-T32	Expected					
	Result					
2-3 from	Description	Verify that a raw image is constructed in correct format.				
	Test Data					
LVV-T32	Expected	A single raw image combining data from all readout channels for a given sensor.				
	Result					

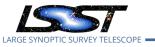
2-4 from Test Data LVV-T32 Expected Image header or ancillary table contains the required metadata about the observing context in which data were gathered.

Verify that a raw image is constructed with correct metadata.

3

Description

Description Verify that time of exposure start/end, site metadata, telescope metadata, and camera metadata are stored in DMS system.



Step	Description, Input Data and Expected Result				
	Test Data	No data.			
	Expected				
	Result				

4.12 LVV-T34 - Verify implementation of Guider Calibration Data Acquisition

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.12.1 Verification Elements

• LVV-96 - DMS-REQ-0265-V-01: Guider Calibration Data Acquisition

4.12.2 Test Items

Verify successful

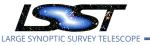
- 1. Ingestion of calibration frames from L1 Test Stand DAQ
- 2. Execution of CPP payloads
- 3. Availability of observe guider calibration products

4.12.3 Predecessors

- 4.12.4 Environment Needs
- 4.12.4.1 Software

4.12.4.2 Hardware

4.12.5 Input Specification



4.12.6 Output Specification

4.12.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Ingest calibration frames from L1 Test Stand DAQ			
1	Test Data	No data.			
	Expected				
	Result				
	Description	Execute CPP payloads			
2	Test Data	No data.			
	Expected				
	Result				
	Description	Observe guider calibration products			
3	Test Data	No data.			
	Expected				
	Result				

4.13 LVV-T35 - Verify implementation of Nightly Data Accessible Within 24 hrs

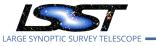
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.13.1 Verification Elements

• LVV-4 - DMS-REQ-0004-V-01: Time to L1 public release_1

4.13.2 Test Items

Test Items



Verify that

- 1. Alerts are available within OTT1
- 2. Level 1 Data Products are available within L1PublicT

3. Solar System Object orbits are available within L1PublicT of the updated calculations completion on the following night.

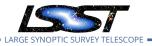
4.13.3 Predecessors

- 4.13.4 Environment Needs
- 4.13.4.1 Software
- 4.13.4.2 Hardware
- 4.13.5 Input Specification
- 4.13.6 Output Specification

4.13.7 Test Procedure

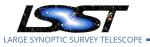
Step Description, Input Data and Expected Result

1-1 from	Description	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
	Test Data	
LVV-T18	Expected	
	Result	



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Step	Description, Input Data and Expected Result					
1-2 from	Description	The alert generation processing will be executed using the verification cluster:				
LVV-T18		"'bash				
		python ap_verify/bin/prepare_demo_slurm_files.py				
		# At present we must run a single ccd+visit to handle ingestion before				
		# parallel processing can begin				
		./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25				
		ln -s ap_verify/bin/demo_run.sl ln -s ap_verify/bin/demo_cmds.conf				
		sbatch demo_run.sl				
		"				
		and any errors or failures reported.				
	Test Data					
	Expected					
	Result					
1-3 from	Description	A "Data Butler" will be initialized to access the repository.				
LVV-T18	Test Data					
	Expected					
	Result					
1-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs				
LVV-T18	Test Data					
	Expected					
	Result					
1-5 from	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence o the database table and its non-empty contents will be verified by directly accessing it using sqlite				
LVV-T18		and executing appropriate SQL queries.				
	Test Data					
	Expected					
	Result					
2-1 from	Description					
	Test Data					
LVV-T217	Expected					
	Result					

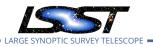


2-2 from	Description	Start a consumer that monitors the full stream and logs a deserialized version of every Nth packet:
LVV-T217		kubectl create -f consumerall-deployment.yaml
	Test Data	
	Expected	Runs without error
	Result	
2-3 from	Description	Start a producer that reads alert packets from disk and loads them into the Kafka queue:
LVV-T217		kubectl create -f sender-deployment.yaml
	Test Data	
	Expected	Runs without error
	Result	
2-4 from	Description	Determine the name of the alert sender pod with
LVV-T217		kubectl get pods
		Examine output log files.
		kubectl logs <pod name=""></pod>
		Verify that alerts are being sent within 40 seconds by subtracting the timing measurements.
	Test Data	
	Expected	Similar to
	Result	
		kubectl logs sender-7d6f98586f-nhwfj visit: 1570. time: 1530588618.0313473 visits finished: 1 time: 1530588653.5614944 visit: 1571. time: 1530588657.0087624
		visits finished: 2 time: 1530588692.506188 visit: 1572. time: 1530588696.0051727

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Test Spec for LSST Data Management

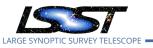


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2-5 from	Description	Determine the name of the consumer pod with
LVV-T217		kubectl get pods
		Examine output log files.
		kubectl logs <pod name=""></pod>
		The packet log should show deserialized alert packets with contents matching the input packets.
	Test Data	
	Expected Result	Similar to {'alertld': 12132024420, 'l1dbld': 71776805594116, 'diaSource': {'diaSourceld': 73499448928374785, 'ccdVisitld': 2020011570, 'diaObjectld': 71776805594116, 'ssO bjectld': None, 'parentDiaSourceld': None, 'midPointTai': 59595.37041, 'filterNa me': 'y', 'ra': 172.24912810036074, 'decl': -80.64214929176521, 'ra_decl_Cov': { 'raSigma': 0.0003428002819418907, 'declSigma': 0.00027273103478364646, 'ra_decl_ Cov': 0.000628734880592674}, 'x': 2979.08837890625, 'y': 3843.328857421875, 'x_y _Cov': {'xSigma': 0.6135467886924744, 'ySigma': 0.77132648229599, 'x_y_Cov': 0.0 007463791407644749}, 'apFlux': None, 'apFluxErr': None, 'snr': 0.366516500711441 04, 'psFlux': 7.698232025177276e-07, 'psRa': None, 'psDecl': None, 'ps_Cov': Non e, 'psLnL': None, 'psChi2': None, 'psNdata': None, 'trailFlux': None, 'trailRa': _etc_
	Description	Time processing of data starting from (pre-ingested) raw files until an alert is available fo
3	Description	Time processing of data starting from (pre-ingested) raw files until an alert is available for distribution; verify that this time is less than OTT1.
3	Test Data	
3		distribution; verify that this time is less than OTT1.
	Test Data Expected	distribution; verify that this time is less than OTT1. No data. Time processing of data starting from (pre-ingested) raw files until the required data proc
	Test Data Expected Result	distribution; verify that this time is less than OTT1. No data.
3	Test Data Expected Result Description	distribution; verify that this time is less than OTT1. No data. Time processing of data starting from (pre-ingested) raw files until the required data proc ucts are available in the Science Platform. Verify that this time is less than L1PublicT.
3 4 5	Test Data Expected Result Description Test Data Expected	distribution; verify that this time is less than OTT1. No data. Time processing of data starting from (pre-ingested) raw files until the required data proc ucts are available in the Science Platform. Verify that this time is less than L1PublicT.

Step Description, Input Data and Expected Result



Step	Description, li	nput Data and Expected Result
	Expected Result	
6	Description	Record time between completion of MOPS processing and availability of the updated SSObject catalogue through the Science Platform; verify this time is less than L1PublicT.
Ũ	Test Data	No data.
	Expected	
	Result	

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4.14 LVV-T36 - Verify implementation of Difference Exposures

Test Spec for LSST Data Management

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.14.1 Verification Elements

• LVV-7 - DMS-REQ-0010-V-01: Difference Exposures

4.14.2 Test Items

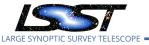
Verify successful creation of a

- 1. PSF-matched template image for a given Processed Visit Image
- 2. Difference Exposure from each Processed Visit Image

4.14.3 Predecessors

- 4.14.4 Environment Needs
- 4.14.4.1 Software

4.14.4.2 Hardware



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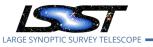
4.14.5 Input Specification

4.14.6 Output Specification

4.14.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T18	Description Test Data Expected Result	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
1-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18		<pre>"bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl "" and any errors or failures reported.</pre>
	Test Data Expected	
1-3 from LVV-T18	Result Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
1-4 from LVV-T18	Description Test Data Expected Result	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs,
1-5 from LVV-T18	Description Test Data	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.



Test	Snec	for	ISST	Data	Management

Step	Description, l	nput Data and Expected Result
	Expected	
	Result	
2	Description	Demonstrate successful creation of a template image from HSC PDF and DECAM HiTS data. Demonstrate successful creation of a Difference Exposure for at least 10 other images from survey, ideally at a range of arimass. In particular, HiTS has 2013A u-band data. While the Blanco 4-m does have an ADC, there are still some chromatic effects and we should demonstrate that we can successfully produce Difference Exposures and templates for diferent airmass bins.
	Test Data	No data.
	Expected	
	Result	

4.15 LVV-T37 - Verify implementation of Difference Exposure Attributes

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.15.1 Verification Elements

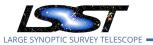
- LVV-32 DMS-REQ-0074-V-01: Difference Exposure Attributes
- LVV-1234 OSS-REQ-0122-V-01: Provenance

4.15.2 Test Items

Verify that for each Difference Exposure the DMS stores

- 1. The identify of the input exposures and related provenance information
- 2. Metadata attributes of the subtraction, including the PSF-matching kernel used.

4.15.3 Predecessors



4.15.4 Environment Needs

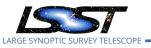
- 4.15.4.1 Software
- 4.15.4.2 Hardware
- 4.15.5 Input Specification

4.15.6 Output Specification

4.15.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T18	Description Test Data Expected Result	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
1-2 from LVV-T18	Description	The alert generation processing will be executed using the verification cluster: "bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl "
1-3 from LVV-T18	Test Data Expected Result Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
	Result	



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1-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty.		
LVV-T18	Test Data			
	Expected			
	Result			
 1-5 from LVV-T18	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.		
	Test Data			
	Expected			
	Result			
2	Description	For each of HSC PDR and DECAM HiTS data: set up three different templates and run subtractions on 10 different images from at least two different filters. Verify that we can recover the provenance information about which template was used for each subtraction,		
		which input images were used for that template, and that we can successfull extract the PSF matching kernel.		

Step Description, Input Data and Expected Result

No data.

4.16 LVV-T38 - Verify implementation of Processed Visit Images

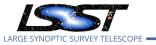
Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm

4.16.1 Verification Elements

Test Data

Expected Result

• LVV-29 - DMS-REQ-0069-V-01: Processed Visit Images



4.16.2 Test Items

Verify that the DMS

1. Successfully produces Processed Visit Images, where the instrument signature has been removed.

2. Successfully combines images obtained during a standard visit.

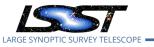
4.16.3 Predecessors

- 4.16.4 Environment Needs
- 4.16.4.1 Software
- 4.16.4.2 Hardware
- 4.16.5 Input Specification

4.16.6 Output Specification

4.16.7 Test Procedure

Step	Description, li	Description, Input Data and Expected Result			
	Description	Identify suitable precursor datasets containing unprocessed raw images.			
1	Test Data	No data.			
	Expected				
	Result				
2	Description	Run the Prompt Processing payload on these data. Verify that Processed Visit Images are generated at correct size and with significant instrumental artifacts removed.			
2	Test Data	No data.			
	Expected	Raw precursor dataset images have been processed into Processed Visit Images, with			
	Result	instrumental artifacts corrected.			
	Description	Run camera test stand data through full acquisition+backbone+ISR.			
3	Test Data	No data.			



Step	Description, l	Description, Input Data and Expected Result				
	Expected					
	Result					
	Description	Run simulated LSST data with calibrations through prompt processing system and inspect				
4		Processed Visit images to verify that they have been cleaned of significant artifacts and				
		are of the correct, shape, and described orientation.				
	Test Data	No data.				
	Expected	Raw images have been processed into Processed Visit Images, with instrumental artifacts				
	Result	corrected.				

4.17 LVV-T39 - Verify implementation of Generate Photometric Zeropoint for Visit Image

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.17.1 Verification Elements

• LVV-12 - DMS-REQ-0029-V-01: Generate Photometric Zeropoint for Visit Image

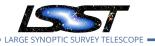
4.17.2 Test Items

Verify that Processed Visit Image data products produced by the DRP and AP pipelines include the parameters of a model that relates the observed flux on the image to physical flux units.

4.17.3 Predecessors

4.17.4 Environment Needs

4.17.4.1 Software



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4.17.4.2 Hardware

4.17.5 Input Specification

4.17.6 Output Specification

4.17.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Delegate to Alert Production			
1	Test Data	No data.			
	Expected				
	Result				

4.18 LVV-T40 - Verify implementation of Generate WCS for Visit Images

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Jim Bosch

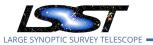
4.18.1 Verification Elements

• LVV-13 - DMS-REQ-0030-V-01: Absolute accuracy of WCS

4.18.2 Test Items

Verify that Processed Visit Images produced by the AP and DRP pipelines include FITS WCS accurate to specified **astrometricAccuracy** over the bounds of the image.

4.18.3 Predecessors



4.18.4 Environment Needs

- 4.18.4.1 Software
- 4.18.4.2 Hardware

4.18.5 Input Specification

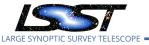
4.18.6 Output Specification

4.18.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	

	Description	Ingest data from an appropriate processed dataset.
2	Test Data	No data.
	Expected	
	Result	~
	Description	Select a single visit from the dataset, and extract its WCS object and the source list.
3	Test Data	No data.
	Expected	A table containing detected sources, and a WCS object associated with that catalog.
	Result	
	Description	Confirm that each CCD within the visit image contains at least astrometricMinStan-
4		dards astrometric standards that were used in deriving the astrometric solution.
	Test Data	No data.
	Expected	At least astrometricMinStandards from each CCD were used in determining the WCS
	Result	solution.



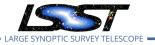
Step	Description, Input Data and Expected Result				
5	Description	Starting from the XY pixel coordinates of the sources, apply the WCS to obtain RA, Dec coordinates.			
	Test Data	No data.			
	Expected	A list of RA, Dec coordinates for all sources in the catalog.			
	Result				
6	Description	We will assume that Gaia provides a source of "truth." Match the source list to Gaia DR2, and calculate the positional offset between the test data and the Gaia catalog.			
Ũ	Test Data	No data.			
	Expected Result	A matched catalog of sources in common between the test source list and Gaia DR2.			
7	Description	Apply appropriate cuts to extract the optimal dataset for comparison, then calculate statis- tics (median, 1-sigma range, etc.; also plot a histogram) of the offsets in milliarcseconds. Confirm that the offset is less than astrometricAccuracy .			
	Test Data	No data.			
	Expected Result	Histogram and relevant statistics needed to confirm that the WCS transformation is			
8	Description	Repeat Step 5, but for subregions of the image, to confirm that the accuracy criterion is met at all positions.			
5	Test Data	No data.			
	Expected	astrometricAccuracy requirement is met over the entire image.			
	Result				

4.19 LVV-T41 - Verify implementation of Generate PSF for Visit Images

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.19.1 Verification Elements

• LVV-30 - DMS-REQ-0070-V-01: Generate PSF for Visit Images



4.19.2 Test Items

Verify that Processed Visit Images produced by the DRP and AP pipelines are associated with a model from which one can obtain an image of the PSF given a point on the image.

4.19.3 Predecessors

- 4.19.4 Environment Needs
- 4.19.4.1 Software
- 4.19.4.2 Hardware
- 4.19.5 Input Specification
- 4.19.6 Output Specification

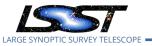
4.19.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to Alert Production
1	Test Data	No data.
-	Expected	
	Result	

4.20 LVV-T42 - Verify implementation of Processed Visit Image Content

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Jim Bosch



4.20.1 Verification Elements

• LVV-31 - DMS-REQ-0072-V-01: Processed Visit Image Content

4.20.2 Test Items

Verify that Processed Visit Images produced by the DRP and AP pipelines include the observed data, a mask array, a variance array, a PSF model, and a WCS model.

4.20.3 Predecessors

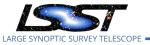
4.20.4 Environment Needs

- 4.20.4.1 Software
- 4.20.4.2 Hardware
- 4.20.5 Input Specification

4.20.6 Output Specification

4.20.7 Test Procedure

Step	Description, I	Description, Input Data and Expected Result					
1-1 from	Description Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the om lowing:						
LVV-T987	Test Data						
	Expected	Butler repo available for reading.					
	Result						
	Description	Ingest the data from an appropriate processed dataset.					
2	Test Data	No data.					
	Expected						
	Result						



Step Description, Input Data and Expected Result Description Select a single visit from the dataset, and extract its WCS object, calexp image, psf model, and source list. 3 Test Data No data. Expected Result Description Inspect the calexp image to ensure that 4 1. A well-formed image is present, 2. The variance plane is present and well-behaved, 3. Mask planes are present and contain information about defects. Test Data No data. Expected An astronomical image with mask and variance planes. This can be readily visualized using Firefly, which displays mask planes by default. Result Description Plot images of the PSF model at various points, and verify that the PSF differs with position. 5 Test Data No data. Expected A "star-like" image of the PSF evaluated at various positions. The PSF should vary slightly with position (this could be readily visualized by taking a difference of PSFs at two posi-Result tions). Description Starting from the XY pixel coordinates of the sources, apply the WCS to obtain RA, Dec coordinates. Plot these positions and confirm that they match the expected values from 6 the WCS object. Test Data No data. Expected RA, Dec coordinates that are returned should be near the central position of the visit coordinate as given in either the calexp metadata or the WCS. Result Description Repeat steps 2-6, but now with difference images created by the Alert Production pipeline (for example, in the 'ap verify' test data processing). 7 Test Data No data. Expected Result

4.21 LVV-T43 - Verify implementation of Background Model Calculation

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch



4.21.1 Verification Elements

• LVV-158 - DMS-REQ-0327-V-01: Background Model Calculation

4.21.2 Test Items

Verify that Processed Visit Images produced by the DRP and AP pipelines have had a model of the background subtracted, and that this model is persisted in a way that permits the background subtracted from any CCD to be retrieved along with the image for that CCD.

4.21.3 Predecessors

LVV-T15 LVV-T19

4.21.4 Environment Needs

4.21.4.1 Software

4.21.4.2 Hardware

4.21.5 Input Specification

4.21.6 Output Specification

4.21.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to Alert Production
1	Test Data	No data.
	Expected	
	Result	



4.22 LVV-T44 - Verify implementation of Documenting Image Characterization

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.22.1 Verification Elements

• LVV-159 - DMS-REQ-0328-V-01: Documenting Image Characterization

4.22.2 Test Items

Verify that the persisted format for Processed Visit Images and associated instrument-signatureremoval data products is documented.

4.22.3 Predecessors

4.22.4 Environment Needs

4.22.4.1 Software

4.22.4.2 Hardware

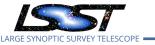
- 4.22.5 Input Specification
- 4.22.6 Output Specification

4.22.7 Test Procedure

Step Description, Input Data and Expected Result

Description Delegate to Alert Production

Test Data 1 No data.



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```

Step Description, Input Data and Expected Result Expected Result

4.23 LVV-T45 - Verify implementation of Prompt Processing Data Quality Report Definition

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm

4.23.1 Verification Elements

• LVV-39 - DMS-REQ-0097-V-01: Level 1 Data Quality Report Definition

4.23.2 Test Items

Verify that the DMS produces a Prompt Processing Data Quality Report. Specifically check absolute value and temporal variation of

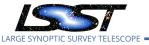
- 1. Photometric zeropoint
- 2. Sky brightness
- 3. Seeing
- 4. PSF
- 5. Detection efficiency

4.23.3 Predecessors

4.23.4 Environment Needs

4.23.4.1 Software

4.23.4.2 Hardware



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4.23.5 Input Specification

4.23.6 Output Specification

4.23.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Ingest raw data from L1 Test Stand DAQ.
1	Test Data	No data.
	Expected	
	Result	
2-1 from LVV-T866	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame process- ing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration, difference imaging, DIASource detection/measurement, source association). During Operations, it is _presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
2-2 from LVV-T866	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
	Test Data	
	Expected	
	Result	
3	Description	Load the Prompt Processing QC reports, and observe that a dynamically updated Data Quality Report has become available at the relevant UI.
-	Test Data	No data.
	Expected	A Prompt Processing QC report is available via a UI, and contains information about the
	Result	photometric zeropoint, sky brightness, seeing, PSF, and detection efficiency, and possibly other relevant quantities.
	Description	Check that a static report is created and archived in a readily-accessible location.
4	Test Data	No data.
	Expected	Persistence of a static QC report in an accessible location, containing the same information
		as in the report from Step 3.



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4.24 LVV-T46 - Verify implementation of Prompt Processing Performance Re-

Test Spec for LSST Data Management

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.24.1 Verification Elements

port Definition

• LVV-41 - DMS-REQ-0099-V-01: Level 1 Performance Report Definition

4.24.2 Test Items

Verify that the DMS produces a Prompt Processing Performance Report. Specifically check that the number of observations that describe each of the following:

- 1. Successfully processed, recoverable failures, unrecoverable failures.
- 2. Archived
- 3. Result in science.

This is testing more the processing rather than the observatory system.

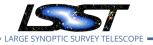
4.24.3 Predecessors

4.24.4 Environment Needs

- 4.24.4.1 Software
- 4.24.4.2 Hardware

4.24.5 Input Specification

4.24.6 Output Specification



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4.24.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Execute single-day operations rehearsal, observe report			
1	Test Data	No data.		
	Expected			
	Result			

4.25 LVV-T47 - Verify implementation of Prompt Processing Calibration Report Definition

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm

4.25.1 Verification Elements

• LVV-43 - DMS-REQ-0101-V-01: Level 1 Calibration Report Definition

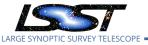
4.25.2 Test Items

Verify that the DMS produces a Prompt Processing Calibration Report. Specifically check that this report is capable of identifying when aspects of the telescope or camera are changing with time.

4.25.3 Predecessors

- 4.25.4 Environment Needs
- 4.25.4.1 Software

4.25.4.2 Hardware



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4.25.5 Input Specification

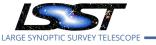
4.25.6 Output Specification

4.25.7 Test Procedure

Step Description, Input Data and Expected Result

1	Description Test Data Expected Result	Identify precursor and simulated calibration datasets on which to run the L1 calibration pipeline. No data.
2-1 from LVV- T1059	Description Test Data Expected Result	Execute the Daily Calibration Products Update payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and _Calibration Database_entries in the DataBackbone
2-2 from LVV- T1059	•	Confirm that the expected Master Calibration images and Calibration Database entries are present _and_well-formed
3	Description Test Data Expected Result	Check that a dynamic report is created that triggers alerts if calibrations go out of range. No data. A dynamic report is available via UI to users, and if any out-of-spec changes have occurred, alerts have been issued.
4	Description Test Data Expected Result	Check that a static report is created and archived in a readily-accessible location. No data. An archived version of the calibration report is available and will be retained in a static file format.

4.26 LVV-T48 - Verify implementation of Exposure Catalog



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Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Jim Bosch

4.26.1 Verification Elements

• LVV-97 - DMS-REQ-0266-V-01: Exposure Catalog

4.26.2 Test Items

Verify that the DMS creates an Exposure Catalog that includes

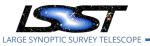
- 1. Observation datetime, exposure time
- 2. Filter
- 3. Dome, telescope orientation and status
- 4. Calibration status
- 5. Airmass and zenith
- 6. Environmental information
- 7. Per-sensor information

4.26.3 Predecessors

4.26.4 Environment Needs

- 4.26.4.1 Software
- 4.26.4.2 Hardware
- 4.26.5 Input Specification
- 4.26.6 Output Specification

4.26.7 Test Procedure



Step	Description, Input Data and Expected Result		
1	Description	Verify that Exposure Catalogs contain the required elements. At present, the form of the exposure catalog is not defined. This information can be found for a given Butler repo from the metadata, but will ultimately be aggregated into a database/table summarizing available exposures.	
	Test Data	No data.	
	Expected	A list of the required metadata for a set of exposures is returned and both human- and	
	Result	machine-readable.	

4.27 LVV-T49 - Verify implementation of DIASource Catalog

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.27.1 Verification Elements

• LVV-100 - DMS-REQ-0269-V-01: DIASource Catalog

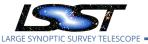
4.27.2 Test Items

Verify that the DMS produces a Source catalog from Difference Exposures with the required attributes.

4.27.3 Predecessors

- 4.27.4 Environment Needs
- 4.27.4.1 Software

4.27.4.2 Hardware



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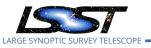
4.27.5 Input Specification

4.27.6 Output Specification

4.27.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Verify that products are produced for DIASource catalog
1	Test Data	No data.
	Expected	
	Result	
2-1 from	Description	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
	Test Data	
LVV-T18	Expected	
	Result	
2-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18		
200 110		"'bash
		python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before
		# parallel processing can begin
		./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25
		In -s ap_verify/bin/demo_run.sl
		ln -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl
		ш
	Test Data	and any errors or failures reported.
	Expected	
	Result	
		A "Data Butler" will be initialized to access the repository.
2-3 from	Test Data	
LVV-T18	Expected	
	Result	
	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs,
2-4 from		_catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty
LVV-T18	Test Data	



Step Description, Input Data and Expected Result

	Expected	
	Result	
2-5 from	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.
	Test Data	
	Expected	
	Result	

4.28 LVV-T50 - Verify implementation of Faint DIASource Measurements

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.28.1 Verification Elements

• LVV-101 - DMS-REQ-0270-V-01: Faint DIASource Measurements

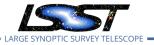
4.28.2 Test Items

Verify that the DMS can produces DIASources measurements for sources below the nominal S/N cutoff that satisfy additional criteria.

4.28.3 Predecessors

- 4.28.4 Environment Needs
- 4.28.4.1 Software

4.28.4.2 Hardware



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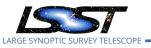
4.28.5 Input Specification

Input Data DECam HiTS data.

4.28.6 Output Specification

4.28.7 Test Procedure

Step	Description, l	Input Data and Expected Result
1-1 from	Description	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
	Test Data	
LVV-T18	Expected	
	Result	
1-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18		"'bash
		python ap_verify/bin/prepare_demo_slurm_files.py
		# At present we must run a single ccd+visit to handle ingestion before
		# parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25
		In -s ap_verify/bin/demo_run.sl
		In -s ap_verify/bin/demo_cmds.conf
		sbatch demo_run.sl
		and any errors or failures reported.
	Test Data	
	Expected	
	Result	
1-3 from	Description	A "Data Butler" will be initialized to access the repository.
	Test Data	
LVV-T18	Expected	
	Result	
1-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs, catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty.
LVV-T18	Test Data	



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Step Description, Input Data and Expected Result

	Expected Result	
1-5 from	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.
20000	Test Data	
	Expected	
	Result	
	Description	As an example of selecting with constrains, Re-run source detection as an afterburner to
2	Description	select isolated sources (defined as more than 2 arcseconds away from any other objects
2	Description Test Data	
2		select isolated sources (defined as more than 2 arcseconds away from any other objects in the single-image-depth catalog) that are fainter than the fiducial transSNR cut.

4.29 LVV-T51 - Verify implementation of DIAObject Catalog

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

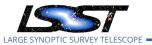
4.29.1 Verification Elements

• LVV-102 - DMS-REQ-0271-V-01: Max nearby galaxies associated with DIASource

4.29.2 Test Items

Verify that the DIAObject includes a unique ID, identifiers for nearest stars and nearest galaxies, and probability of matching to static Object.

4.29.3 Predecessors



4.29.4 Environment Needs

- 4.29.4.1 Software
- 4.29.4.2 Hardware
- 4.29.5 Input Specification

4.29.6 Output Specification

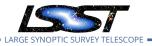
4.29.7 Test Procedure

LVV-T18

Expected Result

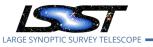
Step Description, Input Data and Expected Result

1-1 from LVV-T21	Description Test Data Expected	The DM Stack shall be initialized using the loadLSST script (as described in LVV-T17 - AG-00-00).
	Result	
1-2 from		A "Data Butler" will be initialized to access the repository.
LVV-T21	Expected	
	Result	
1-3 from	Description	DIASource records will be accessed by querying the Butler, then examined interactively at a Python prompt.
LVV-T21	Test Data	
	Expected	
	Result	
2.1.6	Description	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
2-1 from	Test Data	



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2-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18		
		"bash
		python ap_verify/bin/prepare_demo_slurm_files.py
		# At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin
		./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25
		ln -s ap_verify/bin/demo_run.sl ln -s ap_verify/bin/demo_cmds.conf
		sbatch demo_run.sl
		···
		and any errors or failures reported
	Test Data	and any errors or failures reported.
	Expected	
	Result	
 2-3 from	Description	A "Data Butler" will be initialized to access the repository.
	Test Data	
	Expected	
	Result	
2-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty.
LVV-T18	Test Data	
	Expected	
	Result	
2-5 from	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence o the database table and its non-empty contents will be verified by directly accessing it using sqlites and executing appropriate SQL queries.
LVV-T18	Test Data	
	Expected	
	Result	
	Description	The DM Stack shall be initialized using the loadLSST script (as described in LVV-T17 - AG-00-00).
3-1 from	Test Data	
LVV-T22	Expected	
	Result	
	Description	sqlite3 or Python's sqlalchemy module will be used to access the Level 1 database.
3-2 from ⁻	Test Data	



Step	Description, l	nput Data and Expected Result
	Expected	
	Result	
4	Description	Verify that DIAObjects have diaNearbyObjMaxStar and diaNearbyObjMaxGalaxies that point to the Object catalog and are within dianNearbyObjRadius; the probability of association; and the required DIAObject properties.
	Test Data	No data.
	Expected	
	Result	

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4.30 LVV-T52 - Verify implementation of DIAObject Attributes

Test Spec for LSST Data Management

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.30.1 Verification Elements

• LVV-103 - DMS-REQ-0272-V-01: DIAObject Attributes

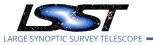
4.30.2 Test Items

Verify that the DMS provides summary attributes for each DIAObject, including periodicity measures.

4.30.3 Predecessors

4.30.4 Environment Needs

4.30.4.1 Software



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4.30.4.2 Hardware

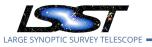
4.30.5 Input Specification

4.30.6 Output Specification

4.30.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from Test Data LW-T18 Expected Result Description 1-2 from The alert generation processing will be executed using the verification cluster: LVV-T18 "bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin	
Expected Result 1-2 from LVV-T18	
Description The alert generation processing will be executed using the verification cluster: 1-2 from LVV-T18 "bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before	
1-2 from LVV-T18 ""bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before	
LVV-T18 "bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before	
"'bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before	
# At present we must run a single ccd+visit to handle ingestion before	
# parallel processing can begin	
./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25	
ln -s ap_verify/bin/demo_run.sl	
In -s ap_verify/bin/demo_cmds.conf	
sbatch demo_run.sl "	
and any errors or failures reported	
Test Data	
Expected	
Result	
Description A "Data Butler" will be initialized to access the repository.	
1-3 from	
LVV-T18 Expected	
Result	
Description For each of the expected data products types (listed in §4.2.2) and each of the exp	ected units (PVIs,
1-4 from catalogs, etc.), the data product will be retrieved from the Butler and verified to be	non-empty.
LVV-T18 Test Data	
Expected	
Result	



Step	Description,	Input Data and Expected Result
	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.
	Test Data	
	Expected	
	Result	

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4.31 LVV-T53 - Verify implementation of SSObject Catalog

Test Spec for LSST Data Management

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.31.1 Verification Elements

• LVV-104 - DMS-REQ-0273-V-01: SSObject Catalog

4.31.2 Test Items

Verify that the DMS produces a catalog of Solar System Objects identify from Moving Object Processing.

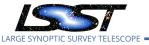
Verify that the SSObject catalog includes orbital elements and additional related quanitites.

4.31.3 Predecessors

4.31.4 Environment Needs

4.31.4.1 Software

4.31.4.2 Hardware



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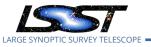
4.31.5 Input Specification

4.31.6 Output Specification

4.31.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T18	Description Test Data Expected Result	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
1-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18		<pre>"bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl ""</pre>
	Test Data	and any errors or failures reported.
	Expected Result	
1-3 from LVV-T18	Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
1-4 from LVV-T18	Description Test Data Expected	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs,
1-5 from LVV-T18	Result Description Test Data	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.



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Step	Description, li	nput Data and Expected Result		
	Expected			
	Result			
	Description	Run the MOPS pipeline on the Promp	t Products database	
2	Test Data	No data.		
	Expected			
	Result			
	Description	Inspect SSObject catalog and verify th	e presence of the re	equired elements (LVV-104).
3	Test Data	No data.		
	Expected			
	Result			

4.32 LVV-T54 - Verify implementation of Alert Content

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

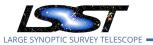
4.32.1 Verification Elements

• LVV-105 - DMS-REQ-0274-V-01: Alert Content

4.32.2 Test Items

Verify that the DMS creates an Alert for each detected DIASource Verify that this Alert is broadcasted using community protocols Verify that the context of the Alert packet match requirements.

4.32.3 Predecessors



4.32.4 Environment Needs

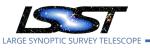
- 4.32.4.1 Software
- 4.32.4.2 Hardware
- 4.32.5 Input Specification

4.32.6 Output Specification

4.32.7 Test Procedure

Step Description, Input Data and Expected Result

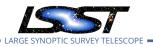
1-1 from LVV-T18	Description Test Data Expected Result	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
1-2 from LVV-T18	Description	The alert generation processing will be executed using the verification cluster: "bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl "
	Test Data Expected Result	_and any errors or failures reported
1-3 from LVV-T18	Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.



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Step	Description, l	Input Data and Expected Result
	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty
LVV-T18	Test Data	
	Expected	
	Result	
1-5 from LVV-T18	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.
LVV-118	Test Data	
	Expected	·····
	Result	
214	Description	
2-1 from	Test Data	
LVV-T217	Expected	
	Result	
2-2 from	Description	Start a consumer that monitors the full stream and logs a deserialized version of every Nth packet:
LVV-T217		kubectl create -f consumerall-deployment.yaml
	Test Data	
	Expected	Runs without error
	Result	
2-3 from	Description	Start a producer that reads alert packets from disk and loads them into the Kafka queue:
LVV-T217		kubectl create -f sender-deployment.yaml
	Test Data	
	Expected	Runs without error
	Result	

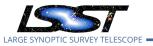


or LSST Data Managem	ent
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Step	Description,	Input Data and Expected Result
2-4 from LVV-T217	Description	Determine the name of the alert sender pod with
		kubectl get pods
		Examine output log files.
		kubectl logs <pod name=""></pod>
	- – – – – – – – – – – – – – – – – – – –	Verify that alerts are being sent within 40 seconds by subtracting the timing measurements.
	Expected	Similar to
	Result	
		kubectl logs sender-7d6f98586f-nhwfj visit: 1570. time: 1530588618.0313473 visits finished: 1 time: 1530588653.5614944 visit: 1571. time: 1530588657.0087624 visits finished: 2 time: 1530588692.506188 visit: 1572. time: 1530588696.0051727 visits finished: 3 time: 1530588731.5900314
2-5 from	Description	Determine the name of the consumer pod with
LVV-T217		kubectl get pods
		Examine output log files.
		kubectl logs <pod name=""></pod>
		The packet log should show deserialized alert packets with contents matching the input packets.
	Test Data	

Step Description, Input Data and Expected Result



Step	Description, l	nput Data and Expected Result
	Expected Result	Similar to {'alertld': 12132024420, '11dbld': 71776805594116, 'diaSource': {'diaSourceld': 73499448928374785, 'ccdVisitld': 2020011570, 'diaObjectld': 71776805594116, 'ssO bjectld': None, 'parentDiaSourceld': None, 'midPointTai': 59595.37041, 'filterNa me': 'y', 'ra': 172.24912810036074, 'decl': -80.64214929176521, 'ra_decl_Cov': { 'raSigma': 0.0003428002819418907, 'declSigma': 0.00027273103478364646, 'ra_decl_ Cov': 0.000628734880592674}, 'x': 2979.08837890625, 'y': 3843.328857421875, 'x_y _Cov': {'xSigma': 0.6135467886924744, 'ySigma': 0.77132648229599, 'x_y_Cov': 0.0 007463791407644749}, 'apFlux': None, 'apFluxErr': None, 'snr': 0.366516500711441 04, 'psFlux': 7.698232025177276e-07, 'psRa': None, 'psDecl': None, 'ps_Cov': Non e, 'psLnL': None, 'psChi2': None, 'psNdata': None, 'trailFlux': None, 'trailRa': etc_
3	Description	Examine the serialized alert packets to confirm the presence of the required elements (LVV-105).
5	Test Data	No data.
	Expected	
	Result	

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4.33 LVV-T55 - Verify implementation of DIAForcedSource Catalog

Test Spec for LSST Data Management

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

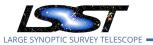
4.33.1 Verification Elements

• LVV-148 - DMS-REQ-0317-V-01: DIAForcedSource Catalog

4.33.2 Test Items

Verify that the DMS produces a DIAForcedSource Catalog and that the catalog contains measured fluxes for DIAObjects.

4.33.3 Predecessors



4.33.4 Environment Needs

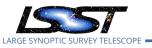
- 4.33.4.1 Software
- 4.33.4.2 Hardware
- 4.33.5 Input Specification

4.33.6 Output Specification

4.33.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T18	Description Test Data Expected Result	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
1-2 from LVV-T18	Description	The alert generation processing will be executed using the verification cluster: "bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl "
1-3 from LVV-T18	Test Data Expected Result Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
	Result	



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1-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs,
LVV-T18	Test Data	
	Expected	
	Result	
 1-5 from LVV-T18	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.
	Test Data	
	Expected	
	Result	

Step Description, Input Data and Expected Result

4.34 LVV-T56 - Verify implementation of Characterizing Variability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.34.1 Verification Elements

• LVV-150 - DMS-REQ-0319-V-01: Characterizing Variability

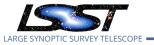
4.34.2 Test Items

Verify that the variability characterization in the DIAObject catalog includes data collected within previous "diaCharacterizationCutoff" period of time.

4.34.3 Predecessors

4.34.4 Environment Needs

4.34.4.1 Software



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4.34.4.2 Hardware

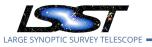
4.34.5 Input Specification

4.34.6 Output Specification

4.34.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
	Test Data	
LVV-T18	Expected	
	Result	
1-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18		
LVV-110		"'bash
		python ap_verify/bin/prepare_demo_slurm_files.py
		# At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin
		./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25
		In -s ap_verify/bin/demo_run.sl
		ln -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl
		m
		and any errors or failures reported
	Test Data	
	Expected	
	Result	
4 2 .	Description	A "Data Butler" will be initialized to access the repository.
1-3 from	Test Data	
LVV-T18	Expected	
	Result	
1-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs, catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty.
LVV-T18	Test Data	
	Expected	
	Result	



Step	p Description, Input Data and Expected Result			
	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.		
	Test Data			
	Expected			
	Result			
	Description	Verify that the issued alerts contain measurements during the diaCharacterizationCutoff.		
2	Test Data	No data.		

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Test Spec for LSST Data Management

4.35 LVV-T57 - Verify implementation of Calculating SSObject Parameters

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.35.1 Verification Elements

Expected Result

• LVV-154 - DMS-REQ-0323-V-01: Calculating SSObject Parameters

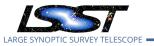
4.35.2 Test Items

Verify that the DMS database provides functions to compute phase angles and magnitudes in LSST bands for every SSObject.

4.35.3 Predecessors

4.35.4 Environment Needs

4.35.4.1 Software



LDM-639

4.35.4.2 Hardware

4.35.5 Input Specification

4.35.6 Output Specification

4.35.7 Test Procedure

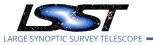
Step Description, Input Data and Expected Result

1-1 from LVV-T53	Description Test Data Expected Result	
1-2 from LVV-T53	Description Test Data Expected Result	Run the MOPS pipeline on the Prompt Products database.
1-3 from LVV-T53	Description Test Data Expected Result	Inspect SSObject catalog and verify the presence of the required elements (LVV-104).

2	Description	Computer the phase angle, reduced and absolute asteroid magnitudes for objects iden- tified in SSObject Catalog
2	Test Data	No data.
	Expected	
	Result	

4.36 LVV-T58 - Verify implementation of Matching DIASources to Objects

	Version	Status	Priority	Verification Type	Owner
-	1	Draft	Normal	Test	Eric Bellm



4.36.1 Verification Elements

• LVV-155 - DMS-REQ-0324-V-01: Matching DIASources to Objects

4.36.2 Test Items

Verify that a cross-match table is available between DIASources and Objects.

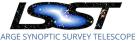
- 4.36.3 Predecessors
- 4.36.4 Environment Needs
- 4.36.4.1 Software
- 4.36.4.2 Hardware
- 4.36.5 Input Specification

4.36.6 Output Specification

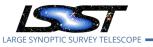
4.36.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T12	Description Test Data Expected Result	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
1-2 from LVV-T12	Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
1-3 from LVV-T12	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to



Step	Description, l	nput Data and Expected Result
	Test Data	
	Expected	
	Result	
2-1 from LVV-T18	Description Test Data	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
	Expected Result	
2-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18	Test Data Expected	<pre>"bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl "</pre>
2-3 from LVV-T18	Result Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
 2-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs, catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty.
LVV-T18	Test Data Expected Result	
 2-5 from LVV-T18	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.



Step	Description, l	nput Data and Expected Result
	Expected	
	Result	
3	Description	Verify that a cross-match table between the Prompt DIASources and DRP Objects is avail- able.
J	Test Data	No data.
	Expected	
	Result	

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Test Spec for LSST Data Management

4.37 LVV-T59 - Verify implementation of Regenerating L1 Data Products During Data Release Processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.37.1 Verification Elements

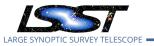
 LVV-156 - DMS-REQ-0325-V-01: Regenerating L1 Data Products During Data Release Processing

4.37.2 Test Items

Verify that the Prompt Processing data products are regenerated during DRP.

- 4.37.3 Predecessors
- 4.37.4 Environment Needs

4.37.4.1 Software



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4.37.4.2 Hardware

4.37.5 Input Specification

4.37.6 Output Specification

4.37.7 Test Procedure

Step	Description, li	put Data and Expected Result		
	Description	Execute DRP		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Observe production of difference image data products		
2	Test Data	No data.		
	Expected			
	Result			

4.38 LVV-T60 - Verify implementation of Publishing predicted visit schedule

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

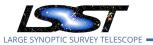
4.38.1 Verification Elements

• LVV-184 - DMS-REQ-0353-V-01: Publishing predicted visit schedule

4.38.2 Test Items

Verify that a predict-visit schedule can be published by the OCS.

4.38.3 Predecessors



4.38.4 Environment Needs
4.38.4.1 Software
4.38.4.2 Hardware
4.38.5 Input Specification
4.38.6 Output Specification
4.38.7 Test Procedure
Step Description, Input Data and Expected Result
Description
1 Test Data No data.
Expected
Result

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4.39 LVV-T61 - Verify implementation of Associate Sources to Objects

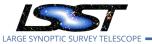
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.39.1 Verification Elements

• LVV-16 - DMS-REQ-0034-V-01: Associate Sources to Objects

4.39.2 Test Items

Verify that each Source record contains an ID that associates it with a best guess at the Object it corresponds to.



4.39.3 Predecessors

4.39.4 Environment Needs

4.39.4.1 Software

4.39.4.2 Hardware

4.39.5 Input Specification

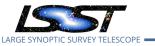
4.39.6 Output Specification

4.39.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T12	Description Test Data	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
	Expected Result	
1-2 from LVV-T12	Description Test Data Expected	A "Data Butler" will be initialized to access the repository.
	Result	
1-3 from	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.
1-3 from LVV-T12	Description Test Data	expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to
		expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to
	Test Data	expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to

	Description	Verify that sources have objects
2	Test Data	No data.
	Expected	
	Result	



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Step	Description, l	Description, Input Data and Expected Result		
3	Description Test Data	Verify that objects list sources that seem reasonably near them.		
-	Expected Result			

4.40 LVV-T62 - Verify implementation of Provide PSF for Coadded Images

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.40.1 Verification Elements

• LVV-20 - DMS-REQ-0047-V-01: Provide PSF for Coadded Images

4.40.2 Test Items

Verify that all coadd images produced by the DRP pipelines include a model from which an image of the PSF at any point on the coadd can be obtained.

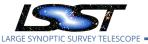
4.40.3 Predecessors

- 4.40.4 Environment Needs
- 4.40.4.1 Software

4.40.4.2 Hardware

4.40.5 Input Specification

Fully covered by preconditions for LVV-T16.



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4.40.6 Output Specification

4.40.7 Test Procedure

	Description	The DM Stack shall be initialized using the loadLSST script (as described in LVV-T10 - DRP-00-00)
1-1 from	Test Data	
LVV-T16	Expected	
	Result	
1 7 4	Description	A "Data Butler" will be initialized to access the repository.
1-2 from	Test Data	
LVV-T16	Expected	
	Result	
1-3 from	Description	For each combination of tract/patch/filter, the PVI will be retrieved from the Butler, and the existence of all components described in Test items section §4.6.2 will be verified.
LVV-T16	Test Data	
	Expected	
	Result	
1-4 from	Description	Scripts from the pipe_analysis package will be run on every visit to check for the presence of data _products and make plots
LVV-T16	Test Data	
	Expected	
	Result	
1-5 from	Description	Ten patches will be chosen at random and inspected by eye for unmasked artifacts.
	Test Data	
LVV-T16	Expected	
	Result	

2	Description	Select Objects classified as point sources on 10 different coadd images (including all bands). Evaluate the PSF model at the positions of these Objects, and verify that subtract- ing a scaled version of the PSF model from the coadd image yields residuals consistent with pure noise.
	Test Data	No data.
	Expected	
	Result	

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4.41 LVV-T63 - Verify implementation of Produce Images for EPO

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann

4.41.1 Verification Elements

• LVV-45 - DMS-REQ-0103-V-01: Produce Images for EPO

4.41.2 Test Items

This test will verify that the DRP pipelines produce the image data products called out in LSE-131. Currently this is limited to a color all-sky HiPS map. This will be verified (1) by inspection of pipeline configurations and (2) in operations rehearsals on precursor data. The production of a usable HiPS map will be verified by browsing it with community tools.

4.41.3 Predecessors

4.41.4 Environment Needs

4.41.4.1 Software

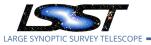
4.41.4.2 Hardware

4.41.5 Input Specification

In order for an operational test to be successful, as a precondition the inputs to that production must exist. For the only currently mandated image data production in LSE-131, a color all-sky HiPS map down to 1 arcsecond resolution, the prerequisite inputs to that are the single-filter coadds in the bands required by the yet-to-be-specified color prescription.

4.41.6 Output Specification

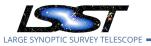




4.41.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T12	Description Test Data Expected Result	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
1-2 from LVV-T12	Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
1-3 from LVV-T12	Description Test Data Expected Result	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to _be non-empty.
2	Description	Verify that a HiPS image map covering the LSST survey area, with a limiting depth yielding 1 arcsecond resolution, has been produced matching the color prescriptions provided by EPO (in updates to LSE-131 which are expected to be made "once ComCam data is available").
	Test Data	No data.
	Expected Result	
3	Description	Place the image map in a location accessible to a Firefly and an Aladin Lite client, ideally with the client running in the EPO data systems environment.
	Test Data	No data.
	Expected Result	
4	Description	Use Firefly to manually explore the image map at the largest scales to verify coverage of the entire sky. Sample in various locations to confirm the 1 arcsecond maximum depth. Confirm using Aladin Lite that the format of the image map is supported by this common community tool.
	Test Data	No data.
	Expected Result	



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Step Description, Input Data and Expected Result

5	Description	Verify programmatically, perhaps both by sampling a variety of locations, and by counting the tiles created at the 1-arcsecond-resolution depth, that the map is complete and meets its specifications.
	Test Data	No data.
	Expected	
	Result	
	Description	Apply an IVOA-community HiPS service validation tool, if available, to the service location.
6	Test Data	No data.
	Expected	
	Result	
	Description	Verify that the HiPS map created is in a location accessible to the EPO data systems.
7	Test Data	No data.
	Expected	
	Result	

4.42 LVV-T64 - Verify implementation of Coadded Image Provenance

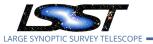
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.42.1 Verification Elements

- LVV-46 DMS-REQ-0106-V-01: Coadded Image Provenance
- LVV-1234 OSS-REQ-0122-V-01: Provenance

4.42.2 Test Items

Verify that all coadd data products produced by the DRP pipelines are associated with provenance information that includes the set of input epochs contributing to that coadd as well as any additional information needed to exactly produce that coadd.



4.42.3 Predecessors

4.42.4 Environment Needs

4.42.4.1 Software

4.42.4.2 Hardware

4.42.5 Input Specification

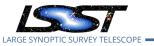
4.42.6 Output Specification

4.42.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T12	Description Test Data Expected Result	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
1-2 from LVV-T12	Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
1-3 from LVV-T12	Test Data Expected Result	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.

	Description	Query and verify provenance of input images, and software versions that went into pro-
2		ducing stack.
	Test Data	No data.
	Expected	
	Result	



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Step	Description, Input Data and Expected Result			
3	Description	Test re-generating 10 different coadds tract+patches based on the provenance image given		
	Test Data	No data.		
	Expected			
	Result			

4.43 LVV-T65 - Verify implementation of Source Catalog

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.43.1 Verification Elements

• LVV-98 - DMS-REQ-0267-V-01: Source Catalog

4.43.2 Test Items

Verify that all Sources produced by the DRP pipelines contain the entries listed in DMS-REQ-0267.

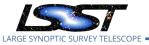
4.43.3 Predecessors

4.43.4 Environment Needs

4.43.4.1 Software

4.43.4.2 Hardware

4.43.5 Input Specification



4.43.6 Output Specification

4.43.7 Test Procedure

	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
1-1 from	Test Data	·
LVV-T12	Expected	
	Result	
1 7 4	Description	A "Data Butler" will be initialized to access the repository.
1-2 from LVV-T12	Test Data	
	Expected	
	Result	
1-3 from LVV-T12	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to
		_be non-empty
	Test Data	
	Expected	
	Result	

4.44 LVV-T66 - Verify implementation of Forced-Source Catalog

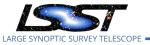
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.44.1 Verification Elements

• LVV-99 - DMS-REQ-0268-V-01: Forced-Source Catalog

4.44.2 Test Items

Verify that all ForcedSources produced by the DRP pipelines contain fluxes measured on difference and direct single-epoch images, associated uncertainties, an Object ID, and a Visit



ID.

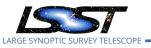
4.44.3 Predecessors

- 4.44.4 Environment Needs
- 4.44.4.1 Software
- 4.44.4.2 Hardware
- 4.44.5 Input Specification

4.44.6 Output Specification

4.44.7 Test Procedure

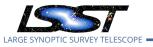
Step	Description, I	Description, Input Data and Expected Result		
1-1 from LVV-T18	Description Test Data Expected Result	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).		
1-2 from LVV-T18	Description	The alert generation processing will be executed using the verification cluster: "bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl "		
	Test Data	and any errors or failures reported.		



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Step Description, Input Data and Expected Result

2	Test Data	No data.
3	Description	Verify that there exist entries in the forced-photometry table for all coadd objects for the PVIs on which the object should appear.
	Expected Result	
	Test Data	
LVV-T12		be non-empty
2-3 from	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to
	Result	
	Expected	
LVV-T12	Test Data	
2-2 from	Description	A "Data Butler" will be initialized to access the repository.
	Result	
LVV-T12	Expected	
	Test Data	
2-1 from	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
	Result	
	Expected	
LVV-T18	Test Data	and executing appropriate SQL queries.
1-5 from	Description	the database table and its non-empty contents will be verified by directly accessing it using sqlites
	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence o
	Expected Result	
LVV-T18	Test Data	
1-4 from		_catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty.
	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs
	Result	
LVV-T18	Expected	
1-3 from	Description Test Data	A "Data Butler" will be initialized to access the repository.
	Result	
	Expected	



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Step	Description, Input Data and Expected Result			
	Expected			
	Result			
	Description Verify that there exist entries in a forced-photometry table for each image for all	-		
4	DIAObjects.			

Test Data	No data.		
Expected			
Result			

4.45 LVV-T67 - Verify implementation of Object Catalog

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.45.1 Verification Elements

• LVV-106 - DMS-REQ-0275-V-01: Object Catalog

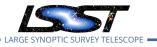
4.45.2 Test Items

Verify that the DRP pipelines produce an Object catalog derived from detections made on both coadded images and difference images and measurements performed on coadds and possibly overlapping single-epoch images.

4.45.3 Predecessors

4.45.4 Environment Needs

4.45.4.1 Software



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4.45.4.2 Hardware

4.45.5 Input Specification

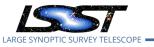
Input Data

DECam HiTS data (raw science images and master calibrations) HSC "RC2" data (raw science images and master calibrations)

4.45.6 Output Specification

4.45.7 Test Procedure

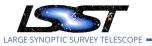
Step	Description, l	Description, Input Data and Expected Result				
	Description	load LSST DM Stack				
1	Test Data	No data.				
	Expected					
	Result					
	Description	Run the single-frame processing and self-calibration steps of the DRP pipeline.				
2	Test Data	No data.				
	Expected					
	Result					
	Description	Insert simulated sources into all single-frame images, including:				
3		 static objects (e.g. galaxies), including some too faint to be detectable in single- epoch images; 				
		 objects with static positions that are sufficiently bright and variable that they should be detectable in single-epoch difference images; 				
		 transient objects that appear in only a few epochs; 				
		 stars with significant proper motions and parallaxes, some below the single-epoch detection limit 				
		 simulated solar system objects with orbits that can be constrained from just the epochs in the test dataset 				
	Test Data	No data.				



Step	Description, l	nput Data and Expected Result
	Expected	
	Result	
	Description	Run all remaining DRP pipeline steps.
4	Test Data	No data.
	Expected	
	Result	
	Description	Load data into DRP database
5	Test Data	No data.
	Expected	
	Result	
	Description	Verify that the injected simulated objects are recovered at a rate consistent with their S/N
6		when not blended with each other or real objects, and that flags indicating how each Object was detected are consistent with their properties:
		 static objects should be detected in coadds only (not difference images)
		 static-position/variable-flux objects should be detected in coadds and possibly dif- ference images
		transient objects should be detected in difference images only
		 stars with significant proper motions may be detected in either coadds or differ- ence images
		 solar system objects should be detected in difference images only.
	Test Data	No data.
	Expected	
	Result	

4.46 LVV-T68 - Verify implementation of Provide Photometric Redshifts of Galaxies

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch



4.46.1 Verification Elements

• LVV-19 - DMS-REQ-0046-V-01: Provide Photometric Redshifts of Galaxies

4.46.2 Test Items

Verify that Object catalogs produced by the DRP Pipeline include photometric redshift information.

4.46.3 Predecessors

- 4.46.4 Environment Needs
- 4.46.4.1 Software
- 4.46.4.2 Hardware

4.46.5 Input Specification

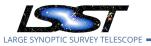
Input Data

HSC Public Data Release (raw science images, master calibrations) Assorted public spectroscopic catalogs and high-accuracy photometric redshift catalogs in the HSC PDR footprint.

4.46.6 Output Specification

4.46.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Run DRP processing steps through (at least) final galaxy photometry measurements.		
1	Test Data	No data.		
	Expected			
	Result			



Step Description, Input Data and Expected Result Description Train photometric redshift algorithm(s) on spectroscopic and high-accuracy photometric redshift catalogs. 2 Test Data No data. Expected Result Description Estimate photometric redshifts for all Objects generated by DRP processing. 3 Test Data No data. Expected Result Description Load into DRP Database Test Data 4 No data. Expected Result Description Inspect database to verify that photometric redshifts are present for all objects 5 Test Data No data. Expected Result

4.47 LVV-T69 - Verify implementation of Object Characterization

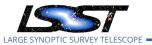
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.47.1 Verification Elements

• LVV-107 - DMS-REQ-0276-V-01: Object Characterization

4.47.2 Test Items

Verify that Object catalogs produced by the DRP pipeline include all measurements listed in DMS-REQ-0276: a point-source model fit, a bulge-disk model fit, standard colors, a centroid,



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adap- tive moments, Petrosian and Kron fluxes, surface brightness at multiple apertures, proper motion and parallax, and a variability characterization.

4.47.3 Predecessors

- 4.47.4 Environment Needs
- 4.47.4.1 Software
- 4.47.4.2 Hardware
- 4.47.5 Input Specification

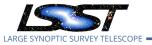
4.47.6 Output Specification

4.47.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Precursor data, execute DRP, load results, observe catalog contents			
1	Test Data	No data.			
	Expected				
	Result				

4.48 LVV-T71 - Verify implementation of Detecting extended low surface brightness objects

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch



4.48.1 Verification Elements

• LVV-180 - DMS-REQ-0349-V-01: Detecting extended low surface brightness objects

4.48.2 Test Items

Verify that low-surface brightness objects (including those whose PSF S/N is lower than the detection threshold) are detected in coadds.

4.48.3 Predecessors

- 4.48.4 Environment Needs
- 4.48.4.1 Software
- 4.48.4.2 Hardware

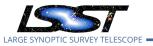
4.48.5 Input Specification

Input Data HSC "RC2" data (raw science images and master calibrations)

4.48.6 Output Specification

4.48.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	load LSST DM Stack	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Run the single-frame processing and self-calibration steps of the DRP pipeline.	
2	Test Data	No data.	



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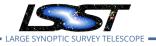
galaxies (with exponential profiles) consistently
are recovered at a rate consistent with their S/N ch other or real objects.

4.49 LVV-T72 - Verify implementation of Coadd Image Method Constraints

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.49.1 Verification Elements

• LVV-109 - DMS-REQ-0278-V-01: Coadd Image Method Constraints



4.49.2 Test Items

Verify the implementation of how Coadd images are created.

4.49.3 Predecessors

- 4.49.4 Environment Needs
- 4.49.4.1 Software
- 4.49.4.2 Hardware

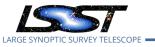
4.49.5 Input Specification

4.49.6 Output Specification

4.49.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from LVV-T12	Description Test Data Expected Result	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
1-2 from LVV-T12	Description Test Data Expected Result	A "Data Butler" will be initialized to access the repository.
1-3 from LVV-T12	Description Test Data Expected Result	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.



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Step	Description, Input Data and Expected Result	
	Description	Verify that coadds were created following specification
2	Test Data	No data.
	Expected	
	Result	

4.50 LVV-T73 - Verify implementation of Deep Detection Coadds

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.50.1 Verification Elements

• LVV-110 - DMS-REQ-0279-V-01: Deep Detection Coadds

4.50.2 Test Items

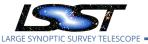
Verify that the DRP pipelines produce a suite of per-band coadded images that are optimized for depth.

4.50.3 Predecessors

- 4.50.4 Environment Needs
- 4.50.4.1 Software

4.50.4.2 Hardware

4.50.5 Input Specification



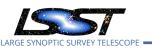
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4.50.6 Output Specification

4.50.7 Test Procedure

Step	Description, I	nput Data and Expected Result
11.	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
1-1 from LVV-T12	Test Data	
	Expected	
	Result	
1-2 from	Description	A "Data Butler" will be initialized to access the repository.
	Test Data	
LVV-T12	Expected	
	Result	
1-3 from	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the
		expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.
LVV-T12	Test Data	
	Expected	
	Result	
	Description	Verify through inspection that per-filter coadds exist for each tract+patch possible
2	Description Test Data	Verify through inspection that per-filter coadds exist for each tract+patch possible No data.
2	· · ·	
2	Test Data	
	Test Data Expected	No data. Verify through inspection that the images used to generate those coadds met specified
2	Test Data Expected Result	No data.
	Test Data Expected Result Description	No data. Verify through inspection that the images used to generate those coadds met specified conditions
	Test Data Expected Result Description Test Data	No data. Verify through inspection that the images used to generate those coadds met specified conditions
	Test Data Expected Result Description Test Data Expected	No data. Verify through inspection that the images used to generate those coadds met specified conditions
	Test Data Expected Result Description Test Data Expected Result Description	No data. Verify through inspection that the images used to generate those coadds met specified conditions No data.
3	Test Data Expected Result Description Test Data Expected Result Description Test Data	No data. Verify through inspection that the images used to generate those coadds met specified conditions No data. Visually inspect a subset of the coadds to verify that they visually appear reasonable and
3	Test Data Expected Result Description Test Data Expected Result Description Test Data Expected	No data. Verify through inspection that the images used to generate those coadds met specified conditions No data. Visually inspect a subset of the coadds to verify that they visually appear reasonable and to be from good quality data.
3	Test Data Expected Result Description Test Data Expected Result Description Test Data	No data. Verify through inspection that the images used to generate those coadds met specified conditions No data. Visually inspect a subset of the coadds to verify that they visually appear reasonable and to be from good quality data.





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4.51 LVV-T74 - Verify implementation of Template Coadds

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.51.1 Verification Elements

• LVV-111 - DMS-REQ-0280-V-01: Template Coadds

4.51.2 Test Items

Verify that the DMS can produce Template Coadds for DIA processing.

4.51.3 Predecessors

- 4.51.4 Environment Needs
- 4.51.4.1 Software

4.51.4.2 Hardware

4.51.5 Input Specification

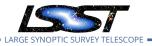
4.51.6 Output Specification

4.51.7 Test Procedure

Description, Input Data and Expected Result Step

1-1 from	Description	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
LVV-T18	Test Data	
	Expected	
	Result	

DRAFT NOT YET APPROVED - The contents of this document are subject to configuration control by the LSST DM Change Control Board. - DRAFT NOT YET APPROVED

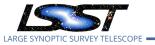


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1-2 from	Description	The alert generation processing will be executed using the verification cluster:
LVV-T18		
		"'bash python ap_verify/bin/prepare_demo_slurm_files.py
		# At present we must run a single ccd+visit to handle ingestion before
		# parallel processing can begin
		./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl
		In -s ap_verify/bin/demo_cmds.conf
		sbatch demo_run.sl
		u i
		and any errors or failures reported.
	Test Data	
	Expected	
	Result	
	Description	A "Data Butler" will be initialized to access the repository.
LVV-T18	Test Data	
LVV-110	Expected	
	Result	
1-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs, catalogs, etc.), the data product will be retrieved from the Butler and verified to be non-empty.
LVV-T18	Test Data	
	Expected	
	Result	
1-5 from	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlite3 and executing appropriate SQL queries.
LVV-110	Test Data	
	Expected	
	Result	

4.52 LVV-T75 - Verify implementation of Multi-band Coadds

Version Status Priority Verification Type Owner



1 Draft Normal Test Jim Bosch

4.52.1 Verification Elements

• LVV-112 - DMS-REQ-0281-V-01: Multi-band Coadds

4.52.2 Test Items

Verify that the DRP pipelines produce multi-band coadds for detection purposes.

4.52.3 Predecessors

- 4.52.4 Environment Needs
- 4.52.4.1 Software
- 4.52.4.2 Hardware

4.52.5 Input Specification

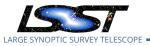
4.52.6 Output Specification

4.52.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
	Test Data	
LVV-T12	Expected	
	Result	
1-2 from	Description	A "Data Butler" will be initialized to access the repository.
LVV-T12	Test Data	
	Expected	
	Result	

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Test	Snec	for	LSST	Data	Mana	gement

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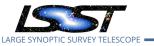
1-3 from LVV-T12	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.
200 112	Test Data	
	Expected	
	Result	
2-1 from	Description	The DM Stack shall be initialized using the loadLSST script (as described in LVV-T10 - DRP-00-00)
	Test Data	
LVV-T16	Expected	
	Result	
	Description	A "Data Butler" will be initialized to access the repository.
2-2 from	Test Data	
	Expected	
	Result	
2-3 from	Description	For each combination of tract/patch/filter, the PVI will be retrieved from the Butler, and the existence of all components described in Test items section §4.6.2 will be verified.
LVV-T16	Test Data	
	Expected	
	Result	
2-4 from	Description	Scripts from the pipe_analysis package will be run on every visit to check for the presence of data products and make plots
LVV-T16	Test Data	
	Expected	
	Result	
	Description	Ten patches will be chosen at random and inspected by eye for unmasked artifacts.
2-5 from	Test Data	
LVV-T16	Expected	
	Result	

Step Description, Input Data and Expected Result

Description Verify that deep detection coadds exist based on all filters.

3

Test Data No data.



Step Description, Input Data and Expected Result Expected Result

4.53 LVV-T76 - Verify implementation of All-Sky Visualization of Data Releases

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

4.53.1 Verification Elements

• LVV-160 - DMS-REQ-0329-V-01: All-Sky Visualization of Data Releases

4.53.2 Test Items

Show that it's possible to produce large area visualizations from Data Release data products.

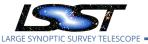
- 4.53.3 Predecessors
- 4.53.4 Environment Needs
- 4.53.4.1 Software

4.53.4.2 Hardware

4.53.5 Input Specification

Input Data

Dataset of perhaps ~100 square degrees. The first HSC Public Data Release will be used for this test. Larger (in sky area) datasets should be identified for further testing.



4.53.6 Output Specification

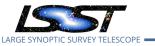
4.53.7 Test Procedure

	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
Test Data	
Expected	
Result	
Description	A "Data Butler" will be initialized to access the repository.
Test Data	
Expected	
Result	
Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the
	expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.
Test Data	
Expected	
Result	
Description	Run all sky tile generation task to produce the data products necessary for serving the all
	sky visualization.
Test Data	No data.
	no uuu.
	Result Description Test Data Expected Result Description Test Data Expected Result Description

3 Description Manually perform, and log (including timing where applicable), the following steps against that all sky visualization application. At all steps take special care to note any missing or un-rendered image tiles:

- 1. Navigate to the all sky viewer and log the URL, browser and version.
- 2. Zoom to native pixel display (1 image pixel per display pixel)
- 3. Zoom to fit the full PDR footprint
- 4. Zoom to 1/4x native resolution
- 5. Pan to eastern edge of the footprint.
- 6. Pan to western edge of the footprint.
- 7. Navigate to the middle of the footprint.
- 8. Zoom to max magnification
- Test Data No data.

Result



Step Description, Input Data and Expected Result Expected Result

4.54 LVV-T77 - Verify implementation of Best Seeing Coadds

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.54.1 Verification Elements

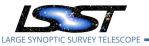
• LVV-161 - DMS-REQ-0330-V-01: Best Seeing Coadds

4.54.2 Test Items

Verify that the DRP pipelines produce a suite of per-band coadds with input images filtered to optimize the size of the effective PSF on the coadd.

4.54.3 Predecessors

- 4.54.4 Environment Needs
- 4.54.4.1 Software
- 4.54.4.2 Hardware
- 4.54.5 Input Specification
- 4.54.6 Output Specification
- 4.54.7 Test Procedure



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Step Description, Input Data and Expected Result

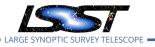
-		
1-1 from	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
LVV-T12	Test Data	
LVV-IIZ	Expected	
	Result	
1 2 .	Description	A "Data Butler" will be initialized to access the repository.
1-2 from	Test Data	
LVV-T12	Expected	
	Result	
1-3 from	Description	For each of the expected data products types (listed in Test Items section §4.3.2) and each of the expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty.
	Test Data	
	Expected	
	Result	
	Description	Explicitly create a coadd for a specified seeing range in each filter.
2	Test Data	No data.
	Expected	
	Result	
	Description	Verify that these coadds exist.
3	Test Data	No data.
	Expected	
	Result	

4.55 LVV-T78 - Verify implementation of Persisting Data Products

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.55.1 Verification Elements

• LVV-165 - DMS-REQ-0334-V-01: Persisting Data Products



4.55.2 Test Items

Verify that per-band deep coadds and best-seeing coadds are present, kept, and available.

4.55.3 Predecessors

- 4.55.4 Environment Needs
- 4.55.4.1 Software

4.55.4.2 Hardware

4.55.5 Input Specification

Precursor data from HSC PDR.

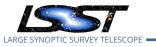
4.55.6 Output Specification

4.55.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Produce some relevant coadds and store them in the Archive
1	Test Data	No data.
	Expected	
	Result	
	Description	Examine the data retention policies for those products
2	Description Test Data	Examine the data retention policies for those products No data.
2	·	
2	Test Data	

4.56 LVV-T79 - Verify implementation of PSF-Matched Coadds



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Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.56.1 Verification Elements

• LVV-166 - DMS-REQ-0335-V-01: PSF-Matched Coadds

4.56.2 Test Items

Verify that the DRP pipelines produce PSF matched coadds.

- 4.56.3 Predecessors
- 4.56.4 Environment Needs
- 4.56.4.1 Software

4.56.4.2 Hardware

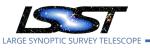
4.56.5 Input Specification

4.56.6 Output Specification

4.56.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00).
	Test Data	
LVV-T12	Expected	
	Result	



Step	Description, l	Description, Input Data and Expected Result						
1-2 from	Description	A "Data Butler" will be initialized to access the repository.						
	Test Data							
LVV-T12	Expected							
	Result							
1-3 from	expected units (PVIs, coadus, etc), the data product will be retrieved from the butter and w							
200 112	Test Data							
	Expected							
	Result							
	Description	Verify that PSF-matched coadds were created.						
2	Test Data	No data.						
	Expected							
	Result							
-								

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Test Spec for LSST Data Management

4.57 LVV-T80 - Verify implementation of Detecting faint variable objects

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham

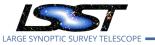
4.57.1 Verification Elements

• LVV-168 - DMS-REQ-0337-V-01: Detecting faint variable objects

4.57.2 Test Items

To verify that the Data Release Production pipeline will be able to detect faint sources with long-term variability (e.g., quasars, proper motion stars) via, e.g., shorter timescale coadds (month to a few months).

4.57.3 Predecessors



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4.57.4 Environment Needs

4.57.4.1 Software

4.57.4.2 Hardware

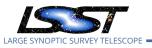
4.57.5 Input Specification

Input Data such as: DECam HiTS data. Gaia catalog of faint moving objects. Catalog of spectroscopically confirmed quasars. (Alternative: input data injected with faint variable sources).

4.57.6 Output Specification

4.57.7 Test Procedure

Step	Description,	Input Data and Expected Result
1-1 from LVV-T18	Description Test Data Expected Result	The DM Stack and Alert Processing packaged shall be initialized as described in LVT-T17 (AG-00-00).
1-2 from LVV-T18	Description	The alert generation processing will be executed using the verification cluster: ""bash python ap_verify/bin/prepare_demo_slurm_files.py # At present we must run a single ccd+visit to handle ingestion before # parallel processing can begin ./ap_verify/bin/exec_demo_run_1ccd.sh 410915 25 In -s ap_verify/bin/demo_run.sl In -s ap_verify/bin/demo_cmds.conf sbatch demo_run.sl ""
	Test Data	_and any errors or failures reported

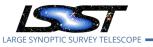


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Step Description, Input Data and Expected Result

otep		
	Expected	
	Result	
1-3 from	Description	A "Data Butler" will be initialized to access the repository.
	Test Data	
LVV-T18	Expected	
	Result	
1-4 from	Description	For each of the expected data products types (listed in §4.2.2) and each of the expected units (PVIs
LVV-T18	Test Data	
	Expected	
	Result	
1-5 from LVV-T18	Description	DIAObjects are currently only stored in a database, without shims to the Butler, so the existence of the database table and its non-empty contents will be verified by directly accessing it using sqlites and executing appropriate SQL queries.
	Test Data	
	Expected	
	Result	
2	Description	Identify 100 objects from Gaia with proper motions high enough to have detectably moved during HSC observations.
	Test Data	No data.
	Expected	
	Result	
3	Description	Measure reported proper motion of these objects in DM Stack processing. Verify that i is consistent with Gaia objects.
5	Test Data	No data.
	Expected	
	Result	
	Description	Identify 100 quasars from color-space or existing extragalactic spectroscopic catalog.
4	Test Data	No data.
	Expected	
	Result	
	Description	Measure lightcurves of these quasars. Determine if structure function is reasonable (mag require at least a year to determine if the structure function of 100 quasars is "reason
5		able").



Step Description, Input Data and Expected Result Expected Result 6 Description (Alternative: if faint variable source can be injected into the input data, test to see if they are recovered). Test Data No data. Expected (This Alternative would enable us not only to tell if faint variable objects are detected, but exactly which kinds, how faint, and with what efficiency.)

4.58 LVV-T81 - Verify implementation of Targeted Coadds

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jim Bosch

4.58.1 Verification Elements

• LVV-169 - DMS-REQ-0338-V-01: Targeted Coadds

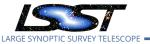
4.58.2 Test Items

Verify that small sections of any coadd produced by the DRP pipelines can be retained, even if the full coadd is not.

4.58.3 Predecessors

- 4.58.4 Environment Needs
- 4.58.4.1 Software

4.58.4.2 Hardware



4.58.5 Input Specification

4.58.6 Output Specification

4.58.7 Test Procedure

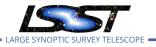
Step	Description, Input Data and Expected Result		
	Description	Remove DR from disk	
1	Test Data	No data.	
	Expected		
	Result		
	Description	Observe retention of designated coadd sections	
2	Test Data	No data.	
	Expected		
	Result		
	Description	Observe accessibility of designated coadd sections via simulated DAC LSP instance	
3	Test Data	No data.	
	Expected		
	Result		

4.59 LVV-T82 - Verify implementation of Tracking Characterization Changes Between Data Releases

Versior	n Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Jim Bosch

4.59.1 Verification Elements

• LVV-170 - DMS-REQ-0339-V-01: Tracking Characterization Changes Between Data Releases



4.59.2 Test Items

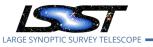
Verify that small-area subsets of a DR can be retained when most of that DR is retired, for comparison with future DRs.

- 4.59.3 Predecessors
- 4.59.4 Environment Needs
- 4.59.4.1 Software
- 4.59.4.2 Hardware
- 4.59.5 Input Specification
- 4.59.6 Output Specification

4.59.7 Test Procedure

Step Description, Input Data and Expected Result

1	Description Test Data Expected	Prepare a second DRP run -> DPDD with different configuration parameters for this sec- ond test Data Release. No data.
	Result	
2-1 from LVV-	Description	Process data with the Data Release Production payload, starting from raw science images and gen- _erating science data products, placing them in the Data Backbone.
T1064	Test Data	
	Expected	
	Result	
	Description	Stage subset of products from first test Data Release to separate storage.
3	Test Data	No data.



Step	Description, l	Description, Input Data and Expected Result		
	Expected Result			
4	Description	Scientifically compare the results of the subset of that region of sky to those in the second test Data Release comparing the results of the DRP Scientific Verification tests.		
	Test Data	No data.		
	Expected	Diagnostic plots quantifying the differences between scientific outputs between the first		
	Result	and second test datasets.		

4.60 LVV-T83 - Verify implementation of Bad Pixel Map

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton

4.60.1 Verification Elements

• LVV-22 - DMS-REQ-0059-V-01: Bad Pixel Map

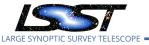
4.60.2 Test Items

Verify that the DMS can produce a map of detector pixels that suffer from pathologies, and that these pathologies are encoded in at least 32-bit values.

4.60.3 Predecessors

- 4.60.4 Environment Needs
- 4.60.4.1 Software

4.60.4.2 Hardware



4.60.5 Input Specification

4.60.6 Output Specification

4.60.7 Test Procedure

Step Description, Input Data and Expected Re	sult
----------------------------------------------	------

1	Description	Interrogate the calibRegistry for the metadata associated with a bad pixel map, where the validity range contains the date of interest.
	Test Data	No data.
	Expected	A bad pixel map for the requested date has been returned.
	Result	
2	Description	Check that the bad pixel pathologies are encoded as at least 32-bit values, and that the various pathologies are represented by different encoding.
-	Test Data	No data.
	Expected	Bad pixel values can be decoded to determine their pathologies using their 32-bit values.

4.61 LVV-T84 - Verify implementation of Bias Residual Image

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton

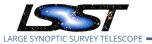
4.61.1 Verification Elements

• LVV-23 - DMS-REQ-0060-V-01: Bias Residual Image

4.61.2 Test Items

Verify that DMS can construct a bias residual image that corrects for temporally-stable bias structures.

Verify that DMS can do this on demand.



4.61.3 Predecessors

4.61.4 Environment Needs

4.61.4.1 Software

4.61.4.2 Hardware

4.61.5 Input Specification

4.61.6 Output Specification

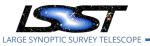
4.61.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Identify the location of an appropriate precursor dataset.
1	Test Data	No data.
	Expected	
	Result	
2-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	

	Description	Import the standard libraries required for the rest of this test:
3	Test Data	No data.
	Example	import osimport lsst.afw.display as afwDisplay
	Code	from lsst.daf.persistence import Butler
		from lsst.ip.isr import IsrTask
		from firefly_client import FireflyClient
		from IPython.display import IFrame
	Expected	
	Result	

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Step Description, Input Data and Expected Result

	Description	Ingest the dataset from step 1 using the Butler (e.g., following example code below).
4	No data.	
	Example	<pre>butler = Butler(\$REPOSITORY_PATH)</pre>
	Code	raw = butler.get(``raw'', visit=\$VISIT_ID, detector=2)
		bias = butler.get(``bias'', visit=\$VISIT_ID, detector=2)
	Expected	
	Result	
	Description	Display the bias image and inspect that its pixels contain unique values.
5	Test Data	No data.
	Expected	A relatively flat image showing the bias level with roughly Poisson noise.
	Result	
6	Description	Configure and run an Instrument Signature Removal (ISR) task on the raw data. Most corrections are disabled for simplicity, but the bias frame is applied.

	Test Data	No data.
	Example	<pre>isr_config = IsrTask.ConfigClass()</pre>
	Code	isr_config.doDark=False
		isr_config.doFlat=False
		isr_config.doFringe=False
		<pre>isr_config.doDefect=False</pre>
		<pre>isr_config.doAddDistortionModel=False</pre>
		isr_config.doLinearize=False
		<pre>isr = IsrTask(config=isr_config)</pre>
		result = isr.run(raw, bias=bias)
	Expected	A trimmed, bias-corrected image in 'result'.
	Result	
	Description	Display the 'result' image and confirm that the bias correction has been performed.
,	Test Data	No data.
	Expected	A displayed image with bias removed (i.e., typical background counts reduced relative to
	Result	the raw frame).

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Verification Elements	
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• LVV-24 - DMS-REQ-0061-V-01: Crosstalk Correction Matrix

4.62.2 Test Items

4.62.1

Verify that the DMS can generate a cross-talk correction matrix from appropriate calibration data.

Verify that the DMS can measure the effectiveness of the cross-talk correction matrix.

4.62.3 Predecessors

4.62.4 Environment Needs

- 4.62.4.1 Software
- 4.62.4.2 Hardware
- 4.62.5 Input Specification
- 4.62.6 Output Specification
- 4.62.7 Test Procedure

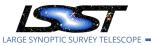
	Description	Identify an appropriate calibration dataset that can be used to derive the crosstalk cor-
1		rection matrix.
I	Test Data	No data.

4.62 LVV-T85 - Verify implementation of Crosstalk Correction Matrix

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Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton

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Step Description, Input Data and Expected Result

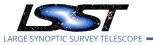
	Expected Result	
2-1 from LVV-	Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and Cali-
T1060	Test Data	
	Expected	
	Result	
2-2 from		Confirm that the expected Master Calibration images and Calibration Database entries are present and well-formed.
LVV-	Test Data	
T1060	Expected	
	Result	
	Description	Confirm that the crosstalk correction matrix is produced and persisted.
3	Test Data	No data.
	Expected Result	A correction matrix quantifying what fraction of the signal detected in any given amplifier on each sensor in the focal plane appears in any other amplifier.
4	Description	Apply the crosstalk correction to simulated images, and confirm that the correction is performing as expected.
	Test Data	No data.
	Expected	A noticeable difference between images before and after applying the correction.
	Lypected	A noticeable difference between images before and after applying the confection.

4.63 LVV-T86 - Verify implementation of Illumination Correction Frame

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton

4.63.1 Verification Elements

• LVV-25 - DMS-REQ-0062-V-01: Illumination Correction Frame



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4.63.2 Test Items

Verify that the DMS can produce an illumination correction frame calibration product. Verify that the DMS can determine the effectiveness of an illumination correction and determine how often it should be updated.

4.63.3 Predecessors

- 4.63.4 Environment Needs
- 4.63.4.1 Software
- 4.63.4.2 Hardware
- 4.63.5 Input Specification
- 4.63.6 Output Specification

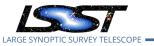
4.63.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to CPP
1	Test Data	No data.
	Expected	
	Result	

4.64 LVV-T87 - Verify implementation of Monochromatic Flatfield Data Cube

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton



4.64.1 Verification Elements

• LVV-26 - DMS-REQ-0063-V-01: Monochromatic Flatfield Data Cube

4.64.2 Test Items

Verify that the DMS can generate a calibration image/cube that corrects for pixel-to-pixel wavelength-dependent detector response.

Verify that the DMS can measure the effectiveness of this monochromatic flatfield data cube.

4.64.3 Predecessors

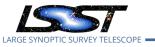
- 4.64.4 Environment Needs
- 4.64.4.1 Software
- 4.64.4.2 Hardware
- 4.64.5 Input Specification

4.64.6 Output Specification

4.64.7 Test Procedure

Step	Description, Input Data and Expected Result	
	Description	Delegate to CPP
1	Test Data	No data.
	Expected	
	Result	

4.65 LVV-T88 - Verify implementation of Calibration Data Products



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Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton

4.65.1 Verification Elements

• LVV-57 - DMS-REQ-0130-V-01: Calibration Data Products

4.65.2 Test Items

Verify that the DMS can produce and archive the required Calibration Data Products: cross talk correction, bias, dark, monochromatic dome flats, broad-band flats, fringe correction, and illumination corrections.

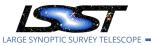
4.65.3 Predecessors

4.65.4 Environment Needs

- 4.65.4.1 Software
- 4.65.4.2 Hardware
- 4.65.5 Input Specification
- 4.65.6 Output Specification
- 4.65.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Identify a suitable set of calibration frames, including biases, dark frames, and flat-field
1		frames.
I	Test Data	No data.



Step Description, Input Data and Expected Result

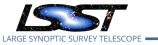
	Expected Result	
2-1 from LVV-	Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and Calibration Database entries in the Data Backbone.
T1060	Test Data	
	Expected	
	Result	
	•	Confirm that the expected Master Calibration images and Calibration Database entries are present
LVV-	Test Data	
T1060	Expected	
	Result	
3	Description	Confirm that the expected data products are created, and that they have the expected properties.
0	Test Data	No data.
	Expected	A full set of calibration data products has been created, and they are well-formed.
	Result	
4	Description	Test that the calibration products are archived, and can readily be applied to science data to produce the desired corrections.
ſ	Test Data	No data.
	Expected Result	Confirmation that application of the calibration products to processed data has the de- sired effects.

4.66 LVV-T89 - Verify implementation of Calibration Image Provenance

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton

4.66.1 Verification Elements

• LVV-59 - DMS-REQ-0132-V-01: Calibration Image Provenance



• LVV-1234 - OSS-REQ-0122-V-01: Provenance

4.66.2 Test Items

Verify that the DMS records the required provenance information for the Calibration Data Products.

4.66.3 Predecessors

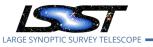
- 4.66.4 Environment Needs
- 4.66.4.1 Software
- 4.66.4.2 Hardware
- 4.66.5 Input Specification
- 4.66.6 Output Specification

4.66.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Ingest an appropriate precursor calibration dataset into a Butler repo.
1	Test Data	No data.
	Expected	
	Result	
2-1 from LVV-	Description	Execute the Calibration Products Production payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and Calibration Database entries in the Data Backbone.
T1060	Test Data	
	Expected	
	Result	
2-2 from	Description	Confirm that the expected Master Calibration images and Calibration Database entries are present
LVV-	Test Data	_and_well-formed
T1060		

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Test Snec	for	ISST	Data	Management

Step	Description, Input Data and Expected Result					
	Expected					
	Result					
3	Description	Load the relevant database/Butler data product, and observe that all provenance infor- mation has been retained.				
	Test Data	No data.				
	Expected	A dataset consisting of calibration images, with provenance information recorded and				
	Result	properly associated with the calibration images.				

4.67 LVV-T90 - Verify implementation of Dark Current Correction Frame

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton

4.67.1 Verification Elements

• LVV-113 - DMS-REQ-0282-V-01: Dark Current Correction Frame

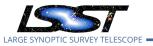
4.67.2 Test Items

Verify that the DMS can produce a dark correction frame calibration product. Verify that the DMS can determine the effectiveness of a dark correction and determine how often it should be updated.

4.67.3 Predecessors

4.67.4 Environment Needs

4.67.4.1 Software



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4.67.4.2 Hardware

4.67.5 Input Specification

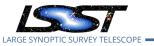
4.67.6 Output Specification

4.67.7 Test Procedure

Step	Description, li	escription, Input Data and Expected Result				
1	Description	Identify the path to a dataset containing dark frames (i.e., exposures taken with the shut- ter closed).				
	Test Data	No data.				
	Expected					
	Result					
2	Description	Execute the relevant steps from 'cp_pipe' (the calibration pipeline) to produce dark cor- rection frames.				
2	Test Data	No data.				
	Expected					
	Result					
	Description	Inspect the resulting dark correction frame to confirm that it appears as expected.				
3	Test Data	No data.				
	Expected	A well-formed dark correction frame is present and accessible via the Data Butler.				
	Result					
4	Description	Determining whether the dark correction is being done properly will require on-sky sci- ence data. The dark correction can be applied to these frames and the results inspected to ensure that the correction was correctly measured and applied.				
	Test Data	No data.				
	Expected	Applying the dark correction to a dataset produces noticeable differences between the				
	Result	original frame(s) and the corrected outputs.				

4.68 LVV-T91 - Verify implementation of Fringe Correction Frame

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton



4.68.1 Verification Elements

• LVV-114 - DMS-REQ-0283-V-01: Fringe Correction Frame

4.68.2 Test Items

Verify that the DMS can produce an fringe-correction frame calibration product. Verify that the DMS can determine the effectiveness of the fringe-correction frame and determine how often it should be updated.

4.68.3 Predecessors

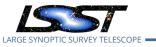
- 4.68.4 Environment Needs
- 4.68.4.1 Software
- 4.68.4.2 Hardware
- 4.68.5 Input Specification

4.68.6 Output Specification

4.68.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Delegate to CPP		
1	Test Data	No data.		
	Expected			
	Result			

4.69 LVV-T92 - Verify implementation of Processing of Data From Special Programs



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Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham

4.69.1 Verification Elements

• LVV-151 - DMS-REQ-0320-V-01: Processing of Data From Special Programs

4.69.2 Test Items

For a simulated night of observing that includes some special program observations, show that the SP observations are reduced using their designated reconfigured pipelines (i.e., that the image metadata is sufficient to trigger the processing and include all other relevant images in the processing).

4.69.3 Predecessors

- 4.69.4 Environment Needs
- 4.69.4.1 Software

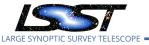
4.69.4.2 Hardware

4.69.5 Input Specification

A variety of imaging data from Special Programs, including these scenarios:

(1) Special Programs data that can be processed by the Prompt pipeline (i.e., standard visits)
(2) Special Programs data that requires 'real-time' (~24) processing with a reconfigured pipeline (e.g., DDF imaging sequence)

(3) Special Programs data that can (should) be processed by the Data Release pipeline (e.g., North Ecliptic Spur standard visits)



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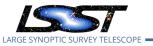
4.69.6 Output Specification

4.69.7 Test Procedure

Step Description, Input Data and Expected Result				
1	Description	(1) Special Programs data that can be processed by the Prompt pipeline (i.e., standard visits).		
·		Check that all images with the header keyword for SP were processed by the Prompt pipeline. Check that the Prompt pipeline's data products – DIASource, DIAObject catalogs and the Alerts – contain items flagged with their origin as that SP.		
	Test Data	No data.		
	Expected			
	Result			
	Description	(2) Special Programs data that requires 'real-time' (~24) processing with a reconfigured		
2		pipeline (e.g., DDF imaging sequence) Check that all images with the header keywords for a given SP were processed by their		
		reconfigured pipeline. Check that the pipeline's data products have been updated, and passed their QA.		
	Test Data	No data.		
	Expected			
	Result			
	Description	(3) Special Programs data that can (should) be processed by the Data Release pipeline		
3		(e.g., North Ecliptic Spur standard visits).		
		SP data would be added manually to the DRP processing. Check that the DRP's data prod-		
	Test Data	ucts – Source, Object, CoAdds – contain items flagged as originating in that SP. No data.		
	Expected			
	Result			

4.70 LVV-T93 - Verify implementation of Level 1 Processing of Special Programs Data

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham



4.70.1 Verification Elements

• LVV-152 - DMS-REQ-0321-V-01: Level 1 Processing of Special Programs Data

4.70.2 Test Items

Execute multi-day operations rehearsal. Observe whether Prompt Processing data products generated in time and confirm whether processing has completed before the start of the next simulated night.

4.70.3 Predecessors

- 4.70.4 Environment Needs
- 4.70.4.1 Software

4.70.4.2 Hardware

4.70.5 Input Specification

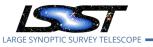
Imaging data obtained under a Special Program: for example, a sequence of consecutive images of a deep drilling field.

4.70.6 Output Specification

4.70.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result			
1	Description	If imaging data for a Special Program that requires processing with the Prompt pipeline was obtained the previous night, check that there exist DIASources/Objects/Alerts with flags that they originated from the Special Program.			
	Test Data	No data.			
	Expected				
	Result				

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Latest Revision 2019-07-29

Step	Description, Input Data and Expected Result					
2	Description	If imaging data for a Special Program that requires prompt processing with a reconfigured pipeline was obtained the previous night, check that the relevant data products have been updated.				
	Test Data	No data.				
	Expected					
	Result					

4.71 LVV-T94 - Verify implementation of Special Programs Database

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham

4.71.1 Verification Elements

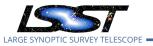
• LVV-153 - DMS-REQ-0322-V-01: Special Programs Database

4.71.2 Test Items

To confirm that data products from Special Programs are based solely on images obtained as part of SP via, e.g., metadata queries. To confirm that the SP data products can be joined to Prompt and DRP products by attempting to do so via, e.g., coordinate table joins, and attempting to e.g., find the faint counterparts in a Deep Drilling stack to variables with no Object detections in the DRP coadds.

4.71.3 Predecessors

- 4.71.4 Environment Needs
- 4.71.4.1 Software



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4.71.4.2 Hardware

4.71.5 Input Specification

Databases created by reconfigured pipelines for processing Special Programs data (e.g., DIAObject/DIASource catalogs for a Deep Drilling Field).

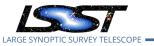
4.71.6 Output Specification

4.71.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result				
DescriptionSP data product: DDF DIAObjects catalog1Non-SP data product: WFD DIAObjects catalog						
		Test: join the two catalogs by coordinate (e.g., to get a longer time baseline for variable stars in the DDF)				
	Test Data	No data.				
	Expected					
	Result					
Description SP data product: DDF Objects catalog		SP data product: DDF Objects catalog				
2		Non-SP data product: WFD DIAObjects catalog				
		Test: join the two catalogs by coordinate to identify faint host galaxies of transients found in WFD				
	Test Data	No data.				
Expected						
	Result					

4.72 LVV-T95 - Verify implementation of Constraints on Level 1 Special Program Products Generation

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Melissa Graham



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4.72.1 Verification Elements

- LVV-175 DMS-REQ-0004-V-01: Time to L1 public release
- LVV-1276 OSS-REQ-0127-V-01: Level 1 Data Product Availability

4.72.2 Test Items

Execute single-day operations rehearsal. Observe Prompt Processing data products generated in time. Confirm that data from Special Programs is processed with the same latency as required for main survey data: release of public data within L1publicT and Alerts within OTT1.

4.72.3 Predecessors

- 4.72.4 Environment Needs
- 4.72.4.1 Software

4.72.4.2 Hardware

4.72.5 Input Specification

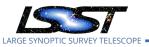
Data from a Special Program that is appropriate for the Prompt pipeline (i.e., a Deep Drilling type series of standard visits from a non-crowded field).

4.72.6 Output Specification

4.72.7 Test Procedure

Step	Description, Input Data and Expected Result
1-1 from LVV-T35	Description Test Data Expected Result

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Latest Revision 2019-07-29

Step	Description,	Input Data and Expected Result
1-2 from	Description Test Data	·
LVV-T35	Expected	
	Result	
1-3 from	Description	Time processing of data starting from (pre-ingested) raw files until an alert is available for distribution; verify that this time is less than OTT1
LVV-T35	Test Data	
	Expected	
	Result	
1-4 from	Description	Time processing of data starting from (pre-ingested) raw files until the required data products are available in the Science Platform. Verify that this time is less than L1PublicT.
LVV-T35	Test Data	
	Expected	
	Result	
1-5 from	Description	Run MOPS on 1 night equivalent of LSST observing worth of precursor data and verify that Solar System Object orbits can be updated within 24 hours.
LVV-T35	Test Data	
	Expected	
	Result	
1-6 from	Description	Record time between completion of MOPS processing and availability of the updated SSObject cata- logue_through_the Science Platform; verify this time is less than L1PublicT.
LVV-T35	Test Data	
	Expected	
	Result	

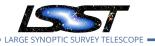
. _

4.73 LVV-T96 - Verify implementation of Query Repeatability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.73.1 Verification Elements

• LVV-122 - DMS-REQ-0291-V-01: Query Repeatability



4.73.2 Test Items

Verify that prior queries can be rerun with identical results, or with new additional data for live (Alert Production) databases.

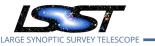
4.73.3 Predecessors

- 4.73.4 Environment Needs
- 4.73.4.1 Software
- 4.73.4.2 Hardware
- 4.73.5 Input Specification
- 4.73.6 Output Specification

4.73.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Select and download (deterministic) random subsample of records from Data Release
1		Object and Source tables.
	Test Data	No data.
	Expected	
	Result	
	Description	Select and download random subsample of PPDB DIAObject and DIASource tables.
2	Test Data	No data.
	Expected	
	Result	
	Description	As appropriate, wait for some amount of non-trivial database usage to occur, such as
3		Prompt Processing ingestion or ingestion of other DRP database tables.
	Test Data	No data.
	Expected	
	Result	



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Step	Description, Input Data and Expected Result				
	Description	Re-run the queries in steps 1 and 2 and verify that the resulting data are identical.			
4	Test Data	No data.			
	Expected				
	Result				

4.74 LVV-T97 - Verify implementation of Uniqueness of IDs Across Data Releases

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim

4.74.1 Verification Elements

• LVV-123 - DMS-REQ-0292-V-01: Uniqueness of IDs Across Data Releases

4.74.2 Test Items

Verify that the IDs of Objects, Sources, DIAObjects, and DIASources from different Data Releases are unique.

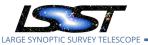
4.74.3 Predecessors

4.74.4 Environment Needs

4.74.4.1 Software

4.74.4.2 Hardware

4.74.5 Input Specification



4.74.6 Output Specification

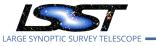
4.74.7 Test Procedure

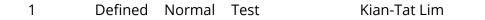
Step	Description, Input Data and Expected Result				
1	Description	Identify an appropriate precursor dataset to be processed through Data Release Produc- tion.			
I	Test Data	No data.			
	Expected				
	Result				
2-1 from LVV-	Description	Process data with the Data Release Production payload, starting from raw science images and gen			
T1064	Test Data				
11004	Expected				
	Result				
3-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- lowing:			
LVV-T987	Test Data				
	Expected	Butler repo available for reading.			
	Result				
4	Description	After running the DRP payload multiple times, load the resulting data products (both data release and prompt products) using the Butler.			
·	Test Data	No data.			
	Expected	Multiple datasets resulting from processing of the same input data.			
	Result				
	Description	Inspect the IDs in the multiple data products and confirm that all IDs are unique.			
5	Test Data	No data.			
	Expected	No IDs are repeated between multiple processings of the identical input dataset.			
	Result				

4.75 LVV-T98 - Verify implementation of Selection of Datasets

Version Status Priority Verification Type Owner

DRAFT NOT YET APPROVED – The contents of this document are subject to configuration control by the LSST DM Change Control Board. – DRAFT NOT YET APPROVED





4.75.1 Verification Elements

• LVV-124 - DMS-REQ-0293-V-01: Selection of Datasets

4.75.2 Test Items

Verify that the DMS can identify and retrieve datasets consisting of logical groupings of Exposures, metadata, provenance, etc., or other groupings that are processed or produced as a logical unit.

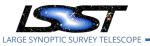
4.75.3 Predecessors

- 4.75.4 Environment Needs
- 4.75.4.1 Software
- 4.75.4.2 Hardware
- 4.75.5 Input Specification
- 4.75.6 Output Specification

4.75.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- _lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	



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Step Description, Input Data and Expected Result

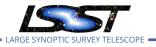
	Description	Ingest data from an appropriate processed dataset.
2	Test Data	No data.
	Expected	
	Result	
	Description	Observe retrieval of single Processed Visit Image (PVI) with metadata.
3	Test Data	No data.
	Expected	A PVI and its associated metadata.
	Result	
	Description	Observe retrieval of multiple PVIs with metadata.
4	Test Data	No data.
	Expected	A set of PVIs and their associated metadata.
	Result	
	Description	Observe retrieval of coadd patch with metadata and provenance information.
5	Test Data	No data.
	Expected	An image of coadded data in a patch, along with its metadata and information describing
	Result	the provenance of the patch constituents.
	Description	Observe retrieval of subset of rows in each of the above catalogs.
6	Test Data	No data.
	Expected	
	Result	

4.76 LVV-T99 - Verify implementation of Processing of Datasets

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.76.1 Verification Elements

• LVV-125 - DMS-REQ-0294-V-01: Processing of Datasets



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4.76.2 Test Items

Execute AP and DRP, simulate failures, observe correct processing

4.76.3 Predecessors

- 4.76.4 Environment Needs
- 4.76.4.1 Software
- 4.76.4.2 Hardware
- 4.76.5 Input Specification

4.76.6 Output Specification

4.76.7 Test Procedure

Description, Input Data and Expected Result Step Description Execute AP and DRP 1 Test Data No data. Expected Result Description Simulate failures 2 Test Data No data. Expected Result Description Observe correct processing 3 Test Data No data. Expected Result



4.77 LVV-T100 - Verify implementation of Transparent Data Access

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.77.1 Verification Elements

• LVV-126 - DMS-REQ-0295-V-01: Transparent Data Access

4.77.2 Test Items

Test Items

Observe dataset retrieval from multiple LSP instances

4.77.3 Predecessors

4.77.4 Environment Needs

4.77.4.1 Software

4.77.4.2 Hardware

4.77.5 Input Specification

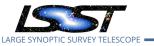
4.77.6 Output Specification

4.77.7 Test Procedure

Description, Input Data and Expected Result Step

Description Observe dataset retrieval from multiple LSP instances

1 Test Data No data.



Step	Description, Input Data and Expected Result			
	Expected			
	Result			

4.78 LVV-T101 - Verify implementation of Transient Alert Distribution

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.78.1 Verification Elements

• LVV-3 - DMS-REQ-0002-V-01: Transient Alert Distribution

4.78.2 Test Items

Precursor or simulated data, execute AP, observe distribution to simulated clients using standard protocols

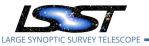
4.78.3 Predecessors

- 4.78.4 Environment Needs
- 4.78.4.1 Software

4.78.4.2 Hardware

4.78.5 Input Specification

Obtain precursor or simulated data; duplicated by LVV-T217 – delete?



4.78.6 Output Specification

4.78.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Execute AP		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Observe distribution to simulated clients using standard protocols		
2	Test Data	No data.		
	Expected			
	Result			

4.79 LVV-T102 - Verify implementation of Solar System Objects Available Within Specified Time

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

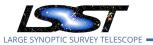
4.79.1 Verification Elements

- LVV-36 DMS-REQ-0089-V-01: Solar System Objects Available Within Specified Time
- LVV-1276 OSS-REQ-0127-V-01: Level 1 Data Product Availability
- LVV-9803 DMS-REQ-0004-V-03: Time to availability of Solar System Object orbits

4.79.2 Test Items

Execute single-day operations rehearsal, observe data products generated in time

4.79.3 Predecessors



4.79.4 Environment Needs

- 4.79.4.1 Software
- 4.79.4.2 Hardware
- 4.79.5 Input Specification
- 4.79.6 Output Specification

4.79.7 Test Procedure

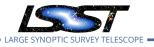
Step	Description, Input Data and Expected Result				
	Description Execute single-day operations rehearsal				
1	Test Data No data.				
	Expected				
	Result				
	Description Observe data products generated in time				
2	Test Data No data.				
	Expected				
	Result				

4.80 LVV-T103 - Verify implementation of Generate Data Quality Report Within Specified Time

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim

4.80.1 Verification Elements

• LVV-38 - DMS-REQ-0096-V-01: Generate Data Quality Report Within Specified Time



4.80.2 Test Items

Verify that the DMS can generate a nightly L1 Data Quality Report within **dqReportCom-plTime = 4[hour]**, in both human- and machine-readable formats.

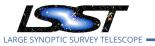
- 4.80.3 Predecessors
- 4.80.4 Environment Needs
- 4.80.4.1 Software
- 4.80.4.2 Hardware
- 4.80.5 Input Specification
- 4.80.6 Output Specification

4.80.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Execute single-day operations rehearsal
1	Test Data	No data.
	Expected	
	Result	
2	Description	After dqReportComplTime = 4[hour] has passed, confirm (via timestamps) that the data quality report has been generated within dqReportComplTime = 4[hour], and that it contains the correct contents.
	Test Data	No data.
	Expected	Both human- and machine-readable versions of the L1 Data Quality Report are available
	Result	with dqReportComplTime.

4.81 LVV-T104 - Verify implementation of Generate DMS Performance Report Within Specified Time



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Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.81.1 Verification Elements

• LVV-40 - DMS-REQ-0098-V-01: Generate DMS Performance Report Within Specified Time

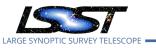
4.81.2 Test Items

Verify that the DMS can generate a nightly Perfomance Report within perfReportComplTime

- 4.81.3 Predecessors
- 4.81.4 Environment Needs
- 4.81.4.1 Software
- 4.81.4.2 Hardware
- 4.81.5 Input Specification
- 4.81.6 Output Specification

4.81.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Execute single-day operations rehearsal			
1	Test Data	No data.			
	Expected				
	Result				
	Description	Observe performance report is generated on time and with correct contents			
2					



Step	Description,	Input Data and Expected Result
	Test Data	No data.
	Expected	
	Result	

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4.82 LVV-T105 - Verify implementation of Generate Calibration Report Within Specified Time

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.82.1 Verification Elements

• LVV-42 - DMS-REQ-0100-V-01: Generate Calibration Report Within Specified Time

4.82.2 Test Items

Verify that the DMS can generate a night Calibration Report in both human-readable and machine-parseable forms.

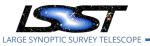
4.82.3 Predecessors

4.82.4 Environment Needs

4.82.4.1 Software

4.82.4.2 Hardware

4.82.5 Input Specification



4.82.6 Output Specification

4.82.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Execute single-day operations rehearsal			
1	Test Data	No data.			
	Expected				
	Result				
	Description	Observe calibration report is generated on time and with correct contents			
2	Test Data	No data.			
	Expected				
	Result				

4.83 LVV-T106 - Verify implementation of Calibration Images Available Within Specified Time

Versio	on S	tatus	Priority	Verification Type	Owner
1	٢	Draft	Normal	Test	Kian-Tat Lim

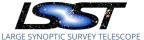
4.83.1 Verification Elements

• LVV-58 - DMS-REQ-0131-V-01: Time allowed to process calibs

4.83.2 Test Items

Execute single-day operations rehearsal, observe data products generated

4.83.3 Predecessors



	Test Spec for LSST Data Management	LDM-639	Latest Revision 2019-07-29
4.83.4 Environment N	leeds		
4.83.4.1 Software			
4.83.4.2 Hardware			
4.83.5 Input Specifica	tion		
4.83.6 Output Specifi	cation		

4.83.7 Test Procedure

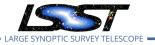
Step	Description, Input Data and Expected Result				
	Description Execute single-day operations rehearsal				
1	Test Data No data.				
	Expected				
	Result				
	Description Observe data products generated				
2	Test Data No data.				
	Expected				
	Result				

4.84 LVV-T107 - Verify implementation of Level-1 Production Completeness

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.84.1 Verification Elements

• LVV-115 - DMS-REQ-0284-V-01: Level-1 Production Completeness



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4.84.2 Test Items

Verify that the DMS successfully processes all images of sufficiently quality for processing are eventually processed even after connectivity failures.

4.84.3 Predecessors

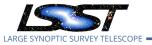
LVV-T284

- 4.84.4 Environment Needs
- 4.84.4.1 Software
- 4.84.4.2 Hardware
- 4.84.5 Input Specification
- 4.84.6 Output Specification
- 4.84.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Ingest raw data while simulating failures and outages, observe eventual recovery	
1	Test Data	No data.	
	Expected		
	Result		

4.85 LVV-T108 - Verify implementation of Level 1 Source Association

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm



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4.85.1 Verification Elements

• LVV-116 - DMS-REQ-0285-V-01: Level 1 Source Association

4.85.2 Test Items

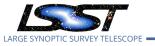
Verify that the DMS associates DIASources into a DIAObject or SSObject.

- 4.85.3 Predecessors
- 4.85.4 Environment Needs
- 4.85.4.1 Software
- 4.85.4.2 Hardware
- 4.85.5 Input Specification
- 4.85.6 Output Specification
- 4.85.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to AP	
1	Test Data	No data.	
	Expected		
	Result		

4.86 LVV-T109 - Verify implementation of SSObject Precovery

Version Status Priority Verification Type Owner



Test Spec for LSST Data Management	
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1 Draft Normal Test Eric Bellm

4.86.1 Verification Elements

• LVV-117 - DMS-REQ-0286-V-01: SSObject Precovery

4.86.2 Test Items

Verify that the DMS associates additional DIAObjects (both forward and back in time) with objects classified as SSObjects.

4.86.3 Predecessors

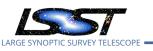
- 4.86.4 Environment Needs
- 4.86.4.1 Software
- 4.86.4.2 Hardware
- 4.86.5 Input Specification
- 4.86.6 Output Specification

4.86.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to AP
1	Test Data	No data.
	Expected	
	Result	





4.87 LVV-T110 - Verify implementation of DIASource Precovery

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.87.1 Verification Elements

• LVV-118 - DMS-REQ-0287-V-01: Max look-back time for precovery

4.87.2 Test Items

Verify that DMS performs forced photometry for new DIAObjects at all available images within the precoveryWindow.

4.87.3 Predecessors

4.87.4 Environment Needs

4.87.4.1 Software

4.87.4.2 Hardware

4.87.5 Input Specification

4.87.6 Output Specification

4.87.7 Test Procedure

1

Description, Input Data and Expected Result Step

Description	Execute single-day operations rehearsal, observe data products generated in time
Test Data	No data.



Step Description, Input Data and Expected Result Expected Result

4.88 LVV-T111 - Verify implementation of Use of External Orbit Catalogs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.88.1 Verification Elements

• LVV-119 - DMS-REQ-0288-V-01: Use of External Orbit Catalogs

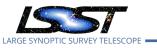
4.88.2 Test Items

Verify that the DMS can make use of external catalogs to improve identification of SSObjects.

4.88.3 Predecessors

- 4.88.4 Environment Needs
- 4.88.4.1 Software
- 4.88.4.2 Hardware
- 4.88.5 Input Specification
- 4.88.6 Output Specification

4.88.7 Test Procedure



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Step	Description, Input Data and Expected Result		
	Description	Delegate to AP	
1	Test Data	No data.	
	Expected		
	Result		

4.89 LVV-T112 - Verify implementation of Alert Filtering Service

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm

4.89.1 Verification Elements

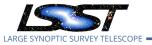
• LVV-173 - DMS-REQ-0342-V-01: Alert Filtering Service

4.89.2 Test Items

Verify that user-defined filters can be used to generate a basic alert filtering service.

4.89.3 Predecessors

- 4.89.4 Environment Needs
- 4.89.4.1 Software
- 4.89.4.2 Hardware
- 4.89.5 Input Specification
- 4.89.6 Output Specification

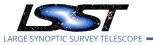


4.89.7 Test Procedure

Step	Description, li	nput Data and Expected Result
	Description	Identify a suitable precursor dataset for processing through the Alert Production pipeline.
1	Test Data	No data.
	Expected	
	Result	
216	Description	Perform the steps of Alert Production (including, but not necessarily limited to, single frame process-
2-1 from		ing, ISR, source detection/measurement, PSF estimation, photometric and astrometric calibration,
LVV-T866		difference imaging, DIASource detection/measurement, source association). During Operations, it is presumed that these are automated for a given dataset.
	Test Data	
	Expected	An output dataset including difference images and DIASource and DIAObject measurements.
	Result	
2-2 from	Description	Verify that the expected data products have been produced, and that catalogs contain reasonable values for measured quantities of interest.
LVV-T866	Test Data	
	Expected	
	Result	
3	Description	Confirm that alerts are generated, and that an Alert Distribution service is making them available via a stream.
5	Test Data	No data.
	Expected	Via either a UI or API, confirmation that a stream of alerts are available.
	Result	
	Description	Confirm that a UI (or API) exists that allows users to define simple filters. Define a fil-
4		ter, and observe both the full and the filtered alert streams to confirm that the filter has reduced the volume of alerts.
	Test Data	No data.
	Expected	The user-defined filter has reduced the number of alerts being received relative to the full
	Result	stream.

4.90 LVV-T113 - Verify implementation of Performance Requirements for LSST Alert Filtering Service

Version Status Priority Verification Type Owner



1 Defined Normal Test Eric Bellm

4.90.1 Verification Elements

• LVV-174 - DMS-REQ-0343-V-01: Number of full-size alerts

4.90.2 Test Items

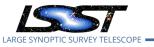
Verify that the DMS alert filter service provides sufficient bandwidth for **numBrokerUsers = 100** simultaneously-operating brokers to receive up to **numBrokerAlerts = 20** alerts per visit.

4.90.3 Predecessors

- 4.90.4 Environment Needs
- 4.90.4.1 Software
- 4.90.4.2 Hardware
- 4.90.5 Input Specification
- 4.90.6 Output Specification

4.90.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Create a simulated alert stream.	
1	Test Data	No data.	
	Expected		
	Result		
2	Description	Simultaneously execute user-defined alert filters for at least numBrokerUsers = 100 users, and confirm that the system successfully filters the stream as requested. Confirm	
2		that the bandwidth requirement of numBrokerAlerts = 20 per user was met.	



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Step Description, Input Data and Expected Result

Test Data	No data.
Expected	All of the (simulated) users successfully receive their requested filtered alerts, with num -
Result	BrokerAlerts = 20 per user.

4.91 LVV-T114 - Verify implementation of Pre-defined alert filters

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm

4.91.1 Verification Elements

• LVV-179 - DMS-REQ-0348-V-01: Pre-defined alert filters

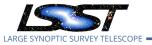
4.91.2 Test Items

Verify that users of the Alert Filtering service can use a predefined set of filters.

4.91.3 Predecessors

- 4.91.4 Environment Needs
- 4.91.4.1 Software
- 4.91.4.2 Hardware
- 4.91.5 Input Specification

4.91.6 Output Specification



4.91.7 Test Procedure

Step	Description, Input Data and Expected Result			
1	Description	Create a simulated alert stream. Confirm that alerts are generated, and that an Alert Distribution service is making them available.		
	Test Data	No data.		
	Expected	A stream of alerts that is confirmed to be generated and distributed.		
_	Result			
	Description	Confirm that a UI (or API) exists that presents users some pre-defined filters.		
2	Test Data	No data.		
	Expected	The UI (or API) for accessing alert streams has some pre-defined filters available for users.		
	Result			
3	Description	Select one of the pre-defined filters, and confirm that the results have been properly fil- tered.		
J	Test Data	No data.		
	Expected	After applying the pre-defined filter, the number of alerts has decreased relative to the		
	Result	raw stream.		

4.92 LVV-T115 - Verify implementation of Calibration Production Processing

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim

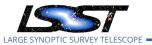
4.92.1 Verification Elements

• LVV-120 - DMS-REQ-0289-V-01: Calibration Production Processing

4.92.2 Test Items

Execute CPP on a variety of representative cadences, and verify that the calibration pipeline correctly produces necessary calibration products.

4.92.3 Predecessors



4.92.4 Environment Needs

- 4.92.4.1 Software
- 4.92.4.2 Hardware
- 4.92.5 Input Specification

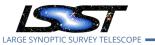
4.92.6 Output Specification

4.92.7 Test Procedure

Step Description, Input Data and Expected Result

1	Description Test Data Expected Result	Identify a suitable set of calibration frames, including biases, dark frames, and flat-field frames. No data.
2-1 from LVV- T1060	Description Test Data Expected Result	Execute the Calibration Products Production payload. The payload uses raw calibration images and information from the Transformed EFD to generate a subset of Master Calibration Images and Cali_bration Database entries in the Data Backbone.
2-2 from LVV- T1060	Description Test Data Expected Result	Confirm that the expected Master Calibration images and Calibration Database entries are presentand_well-formed

	Description	Confirm that the expected data products are created, and that they have the expected
3		properties.
0	Test Data	No data.
	Expected	Repos containing valid calibration products that are well-formed and ready to be applied
	Result	to processed datasets.



4.93 LVV-T116 - Verify implementation of Associating Objects across data releases

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.93.1 Verification Elements

• LVV-181 - DMS-REQ-0350-V-01: Associating Objects across data releases

4.93.2 Test Items

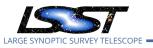
Load DR, observe queryable association

4.93.3 Predecessors

- 4.93.4 Environment Needs
- 4.93.4.1 Software
- 4.93.4.2 Hardware
- 4.93.5 Input Specification
- 4.93.6 Output Specification
- 4.93.7 Test Procedure
- Step Description, Input Data and Expected Result

Description Load DR

1 Test Data No data.



Step	Description, Input Data and Expected Result				
	Expected				
	Result				
	Description Observe queryable association				
2	Test Data No data.				
	Expected				
	Result				

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Test Spec for LSST Data Management

4.94 LVV-T117 - Verify implementation of DAC resource allocation for Level 3 processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.94.1 Verification Elements

• LVV-47 - DMS-REQ-0119-V-01: DAC resource allocation for Level 3 processing

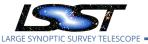
4.94.2 Test Items

Verify that compute time and storage space allocations can be granted to science users.

4.94.3 Predecessors

- 4.94.4 Environment Needs
- 4.94.4.1 Software

4.94.4.2 Hardware

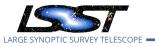


4.94.5 Input Specification

4.94.6 Output Specification

4.94.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Create a test user account for the Science Platform.		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Set the LSP resource allocations for the test user to very low values.		
2	Test Data	No data.		
	Expected			
	Result			
3	Description	Initiate example batch jobs and notebook sessions that will exceed the specified resource limits.		
5	Test Data	No data.		
	Expected	Quota error.		
	Result			
	Description	Transfer sufficient data volumes into the user workspace and MyDB tables that would		
4		exceed the resource quotas.		
	Test Data	No data.		
	Expected	Quota error.		
	Result			
	Description	Reset the user resource quotas to normal values.		
5	Test Data	No data.		
	Expected			
	Result			
6	Description	Initiate the same example batch jobs and notebook sessions that previously caused an error.		
0	Test Data	No data.		
	Expected	Successful notebook and batch job execution.		
	Result			
	Description	Transfer the same data volumes into the user workspace and MyDB tables that previously		
7		caused an error.		



Step	Description,	Input Data and Expected Result
Test DataNo data.ExpectedSuccessful d		No data.
		Successful data transfer.
	Result	

4.95 LVV-T118 - Verify implementation of Level 3 Data Product Self Consistency

Version	Status Priority Verification Type		Owner	
1	Draft	Normal	Test	Colin Slater

4.95.1 Verification Elements

• LVV-48 - DMS-REQ-0120-V-01: Level 3 Data Product Self Consistency

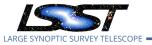
4.95.2 Test Items

Verify that user-driven Level 3 processing is conducted on consistent sets of input data.

4.95.3 Predecessors

- 4.95.4 Environment Needs
- 4.95.4.1 Software
- 4.95.4.2 Hardware
- 4.95.5 Input Specification

4.95.6 Output Specification



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4.95.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Execute representative processing on DR in PDAC, observe consistency	
1	Test Data	No data.	
	Expected		
	Result		

4.96 LVV-T119 - Verify implementation of Provenance for Level 3 processing at DACs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.96.1 Verification Elements

- LVV-49 DMS-REQ-0121-V-01: Provenance for Level 3 processing at DACs
- LVV-1234 OSS-REQ-0122-V-01: Provenance

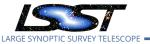
4.96.2 Test Items

Verify that provenance information is recorded and accessible for user-generated Level 3 products.

4.96.3 Predecessors

- 4.96.4 Environment Needs
- 4.96.4.1 Software

4.96.4.2 Hardware



4.96.5 Input Specification

4.96.6 Output Specification

4.96.7 Test Procedure

Description, l	nput Data and Expected Result
Description	Execute representative processing on DR in PDAC, observe provenance recording
Test Data	No data.
Expected	
Result	
	Description Test Data Expected

4.97 LVV-T120 - Verify implementation of Software framework for Level 3 catalog processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

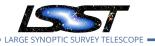
4.97.1 Verification Elements

• LVV-53 - DMS-REQ-0125-V-01: Software framework for Level 3 catalog processing

4.97.2 Test Items

Verify that user-driven Level 3 processing can be consistently applied to all records in a catalog.

- 4.97.3 Predecessors
- 4.97.4 Environment Needs
- 4.97.4.1 Software



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4.97.4.2 Hardware

4.97.5 Input Specification

4.97.6 Output Specification

4.97.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Execute representative processing on DR in PDAC, observe recognition of and recovery			
1		from failures		
	Test Data	No data.		
	Expected			
	Result			

4.98 LVV-T121 - Verify implementation of Software framework for Level 3 image processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

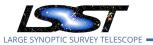
4.98.1 Verification Elements

• LVV-56 - DMS-REQ-0128-V-01: Software framework for Level 3 image processing

4.98.2 Test Items

Verify that user-specified Level 3 processing can be applied to the desired set of images.

4.98.3 Predecessors



4.98.4 Environment Needs

- 4.98.4.1 Software
- 4.98.4.2 Hardware
- 4.98.5 Input Specification
- 4.98.6 Output Specification

4.98.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Execute representative proces	sing on DR in PDAC, observe recognition of and recovery
1		from failures	
I	Test Data	No data.	
	Expected		
	Result		

4.99 LVV-T122 - Verify implementation of Level 3 Data Import

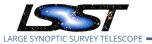
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.99.1 Verification Elements

• LVV-121 - DMS-REQ-0290-V-01: Level 3 Data Import

4.99.2 Test Items

Verify that the Science Platform can ingest data from community-standard file formats.



- 4.99.3 Predecessors
- 4.99.4 Environment Needs
- 4.99.4.1 Software
- 4.99.4.2 Hardware
- 4.99.5 Input Specification
- 4.99.6 Output Specification

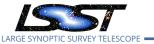
4.99.7 Test Procedure

- Step Description, Input Data and Expected Result Description Use the Science Platform catalog upload tool to ingest a small example FITS table. 1 Test Data No data. Expected Result Description Use the Science Platform catalog upload tool to ingest a small example CSV table. 2 Test Data No data. Expected Result Description Use the Science Platform catalog upload tool to ingest a large FITS table that needs to be spatially-sharded in the database. 3 Test Data No data. Expected Result
- 4
 Description
 Perform example queries on each of the three tables to verify that all data is present.

 4
 Test Data
 No data.

 Expected
 Data returned in the queries is identical to the data uploaded.

 Result
 Feasure



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4.100 LVV-T123 - Verify implementation of Access Controls of Level 3 Data Products

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.100.1 Verification Elements

• LVV-171 - DMS-REQ-0340-V-01: Access Controls of Level 3 Data Products

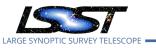
4.100.2 Test Items

This test touches upon the interface between the following areas: IT Security, Identity Management, LSP Portal, and Parallel Distributed Database. The purpose is to show that access to user generated data products (previously Level 3) can have a variety of access restrictions varying from single-user, a list, a named group, or open access.

4.100.3 Predecessors

- 4.100.4 Environment Needs
- 4.100.4.1 Software
- 4.100.4.2 Hardware
- 4.100.5 Input Specification
- 4.100.6 Output Specification

4.100.7 Test Procedure



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Step	Description, Input Data and Expected Result		
	Description	Configure representative access controls in PDAC, observe proper restrictions	
1	Test Data	No data.	
	Expected		
	Result		

4.101 LVV-T124 - Verify implementation of Software Architecture to Enable Community Re-Use

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

4.101.1 Verification Elements

• LVV-139 - DMS-REQ-0308-V-01: Software Architecture to Enable Community Re-Use

4.101.2 Test Items

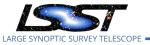
Show that the LSST software is capable of being executed in multiple contexts: single user instance, batch processing, continuous integration.

Also show that the algorithms are can be reconfigured and, if desired, completely replaced at run time.

4.101.3 Predecessors

- 4.101.4 Environment Needs
- 4.101.4.1 Software

4.101.4.2 Hardware



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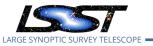
4.101.5 Input Specification

4.101.6 Output Specification

4.101.7 Test Procedure

Description, Input Data and Expected Result Step Description Using curated test datasets for multiple precursor instruments, verify and log that the prototype DRP pipelines execute successfully in three contexts: 1 1. The CI system 2. On a single user system: laptop, desktop, or notebook running in the Notebook aspect of the LSP. 3. Project workflow system. Test Data No data. Expected Result Description Using a template testing notebook in the Notebook aspect of the LSP, verify and log the following: 2 1. Individual pipeline steps (tasks) are importable and executable on their own. this is not comprehensive, but demonstrative. 2. Individual pipeline steps may be overridden by configuration. 3. Users can implement a custom pipeline step and insert i into the processing flow via configuration. Test Data No data. Expected Result Description The DM Stack shall be initialized using the loadLSST script (as described in DRP-00-00). 3-1 from Test Data LVV-T12 Expected Result Description A "Data Butler" will be initialized to access the repository. 3-2 from Test Data LVV-T12 Expected Result Description For each of the expected data products types (listed in Test Items section §4.3.2) and each of the 3-3 from expected units (PVIs, coadds, etc), the data product will be retrieved from the Butler and verified to be non-empty. LVV-T12 Test Data

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	Expected	
	Result	
Л	Description	Run subset of full DRP from previous step on an individual node. Was this organizationally easy? Did the performance scale appropriately?
4	Test Data	No data.
	Expected	
	Result	
	Description	Re-run aperture correction on subset. Verify that same results as DRP run are achieved.
5	Test Data	No data.
	Expected	
	Result	
C	Description	Re-run photometric redshift estimation algorithm on subset coadd catalogs. Verify that same results are achieved as from full DRP.
6	Test Data	No data.
	Expected	
	Result	

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4.102 LVV-T125 - Verify implementation of Simulated Data

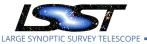
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton

4.102.1 Verification Elements

• LVV-6 - DMS-REQ-0009-V-01: Simulated Data

4.102.2 Test Items

Verify that the DMS can inject simulated data into data products for testing.



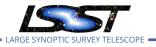
		Test Spec for LSST Data Manageme	nt LDM-639	Latest Revision 2019-07-29
4.102.3	Predecessors			
4.102.4	Environment No	eeds		
4.102.4.1	Software			
4.102.4.2	Hardware			
4.102.5	Input Specificat	ion		
4.102.6	Output Specific	ation		
4.102.7	Test Procedure			
Step	Description, Inpu	it Data and Expected F	Result	
	Description De	elegate to AP and DRP		
1	Test Data No	o data.		
	Expected			
	Result			

4.103 LVV-T126 - Verify implementation Image Differencing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.103.1 Verification Elements

• LVV-14 - DMS-REQ-0032-V-01: Image Differencing



4.103.2 Test Items

Verify that the DMS can performance image differencing from single exposures and coadds.

4.103.3 Predecessors

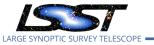
- 4.103.4 Environment Needs
- 4.103.4.1 Software
- 4.103.4.2 Hardware
- 4.103.5 Input Specification
- 4.103.6 Output Specification

4.103.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to AP and DRP	
1	Test Data	No data.	
	Expected		
	Result		

4.104 LVV-T127 - Verify implementation of Provide Source Detection Software

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton



4.104.1 Verification Elements

• LVV-15 - DMS-REQ-0033-V-01: Provide Source Detection Software

4.104.2 Test Items

Verify that the DMS provides source detection software that can be applied to calibrated images, including both difference images and coadds. This will be verified using simulated data, but could also be done by inserting artificial sources into existing datasets.

4.104.3 Predecessors

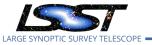
- 4.104.4 Environment Needs
- 4.104.4.1 Software
- 4.104.4.2 Hardware
- 4.104.5 Input Specification

4.104.6 Output Specification

4.104.7 Test Procedure

Step	Description, li	Description, Input Data and Expected Result				
		Run DRP and AP processing, including source detection and measurement algorithms, on a small portion of the data from a simulated dataset.				
	Test Data	No data.				
	Expected	Source catalogs containing measurements of all sources detected in the input images.				
	Result					
2	Description	Confirm that the output repos contain catalogs of source detections. Compare these out- put catalogs to the original simulated source catalogs, and confirm that a large fraction of the sources within a reasonable signal-to-noise range were recovered.				
	Test Data	No data.				

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Step	Description, Input Data and Expected Result		
	Expected Result	Most sources above a reasonable S/N threshold were detected, and their measured fluxes are reasonably close to the simulated inputs.	

4.105 LVV-T128 - Verify implementation Provide Astrometric Model

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.105.1 Verification Elements

• LVV-17 - DMS-REQ-0042-V-01: Provide Astrometric Model

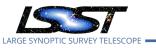
4.105.2 Test Items

Verify that an astrometric model is available for Objects and DIAObjects.

4.105.3 Predecessors

- 4.105.4 Environment Needs
- 4.105.4.1 Software
- 4.105.4.2 Hardware
- 4.105.5 Input Specification
- 4.105.6 Output Specification

4.105.7 Test Procedure



Step	Description, Input Data and Expected Result		
	Description	Delegate to AP and DRP	
1	Test Data	No data.	
	Expected		
	Result		

4.106 LVV-T129 - Verify implementation of Provide Calibrated Photometry

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton

4.106.1 Verification Elements

• LVV-18 - DMS-REQ-0043-V-01: Provide Calibrated Photometry

4.106.2 Test Items

Verify that the DMS provides photometry calibrated in AB mags and fluxes (in nJy) for all measured objects and sources. Must be tested for both DRP and AP products.

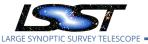
4.106.3 Predecessors

4.106.4 Environment Needs

4.106.4.1 Software

4.106.4.2 Hardware

4.106.5 Input Specification



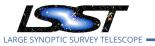
4.106.6 Output Specification

4.106.7 Test Procedure

Step	Description, Input Data and Expected Result					
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- lowing:				
LVV-T987	Test Data					
	Expected	Butler repo available for reading.				
	Result					

	Description	Ingest the data products from an appropriate DRP-processed dataset.
2	Test Data	No data.
	Expected	
	Result	
3	Description	Confirm that AB-calibrated magnitudes and fluxes are available for all measured Sources and Objects. [An enhanced verification could include matching the sources to an external source catalog and comparing the magnitudes to show that they are well-calibrated.]
	Test Data	No data.
	Expected	Calibrated fluxes and magnitudes are available for all sources, as well as tools to convert
	Result	measured fluxes to magnitudes (and vice-versa).
	Description	Ingest the data products from an appropriate AP processing dataset.
4	Test Data	No data.
	Expected	
	Result	
5	Description	Confirm that AB-calibrated magnitudes and fluxes are available for all measured Sources, DIASources, and Objects. [An enhanced verification could include matching the sources to an external source catalog and comparing the magnitudes to show that they are well- calibrated.]
	Test Data	No data.
	Expected	Calibrated fluxes and magnitudes are available for all Sources, DIASources, and Objects,
	Result	as well as tools to convert measured fluxes to magnitudes (and vice-versa).

4.107 LVV-T130 - Verify implementation of Enable a Range of Shape Measurement Approaches



Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.107.1 Verification Elements

• LVV-21 - DMS-REQ-0052-V-01: Enable a Range of Shape Measurement Approaches

4.107.2 Test Items

Verify that multiple shape measurement algorithms can be used.

- 4.107.3 Predecessors
- 4.107.4 Environment Needs
- 4.107.4.1 Software
- 4.107.4.2 Hardware
- 4.107.5 Input Specification
- 4.107.6 Output Specification

4.107.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to AP and DRP
1	Test Data	No data.
	Expected	
	Result	

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4.108.5 Input Specification

1. Testing this requirement relies on a set of data products meeting the data model implied by the DPDD existing in a deployment of the Science Platform and its underlying

4.108.4.2 Hardware As noted in Verification Configuration, the systems required to carry out the tests include both an "inside" test execution platform - the ability to execute test notebooks within the Science Platform Notebook Aspect - and an "outside" test execution platform with connectivity to the Science Platform instance under test that is comparable to that available to offsite science users.

4.108.3 Predecessors

4.108.4.1 Software

4.108.4 Environment Needs

4.108.1 Verification Elements

LVV-63 - DMS-REQ-0160-V-01: Provide User Interface Services

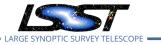
4.108.2 Test Items

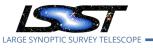
Verify the availability and functionality of the broad range of user interface services called for in the requirement, as applied to both Nightly and DRP data. This will primarily be done by verifications performed at the LSST Science Platform level, based on the requirements in LDM-554; however, a high-level set of tests corresponding to the DMS-REQ-0160 requirement are defined below.

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann

4.108 LVV-T131 - Verify implementation of Provide User Interface Services

Test Spec for LSST Data Management





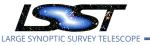
database and file services.

- (a) In particular, both image and catalog data products are required.
- (b) From the specific language of the underlying requirement, it appears clear that coadded data products are required, but in practice single-epoch data products should be included in the test as well.
- 2. Depending on when this requirement is tested, the tests may involve either or both of precursor data and LSST commissioning data. The use of the latter is ultimately essential to ensure that the tests are performed with as LSST-like a dataset as possible.

4.108.6 Output Specification

4.108.7 Test Procedure

Step	Description, l	nput Data and Expected Result
	Description	Establishment of test coordinates:
1		Establish sky positions and surrounding regions (e.g., cones or polygons), field sizes, filter bands, and temporal epochs for the tests that are consistent with the known content of the test dataset, whether precursor or LSST commissioning data. Establishing sky positions should include pre-determining the corresponding LSST "tract and patch" identifiers. If the plan to not keep all calibrated single-epoch images on disk is still in place at the time of the test, identify for use in the test both images that are, and are not, on disk.
		Establish target image boundaries, projections, and pixel scales to be used for resampling tests. Ensure that at least some of these test conditions include coadded image bound-aries that cross tract and patch boundaries, and single-epoch image boundaries that cross focal plane raft boundaries.
	Test Data	No data.
	Expected	
	Result	

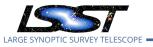


Step Description, Input Data and Expected Result

2	Description Test Data Expected Result	 Butler image access: From within the Notebook Aspect, verify that coadded images for the identified regions of sky and filter bands are accessible via the Butler. Verify that the same images are available whether obtained by direct reference to the previous established tract/patch identifiers or by the use of LSST stack code for retrieving images based on sky coordinates. From within the Notebook Aspect, verify that single-epoch raw images for the selected locations and times are available. Verify that calibrated images (PVIs) for the selected locations and times are available; depending on the details of the test dataset, verify that PVIs still on disk can be retrieved immediately. Verify that lists or tables of image metadata, not just individual images, can be retrieved. E.g., a list of all the single-epoch images covering a selected sky location. No data.
3	Description	Programmatic PVI re-creation: From within the Notebook Aspect, verify that the recreation on demand of a PVI can be performed. Ideally, this should be done as follows:
		• Verify that recreation of a PVI that <i>is</i> still available works and that it reproduces the original PVI exactly (except for provenance metadata that must be different) or within the reasonable ability of processing systems to do so (e.g., taking into account that the original calibration and the recreation may have run on different CPU architectures).
		 The test conditions should ensure the verification that a recreation was actually performed, i.e., that the still-available PVI was not returned instead. Note that it does not appear to be a requirement that <i>at Butler level</i> recreation
		on demand of PVIs is a completely transparent process. If this <i>is</i> decided to be a requirement, the test must also verify that it has been satisfied. If it is <i>not</i> a requirement, verify that adequate documentation on the PVI-recreation process (e.g., the SuperTasks and configuration to be used) is available.
	Test Data	No data.
	Expected	
	Result	
	Description	Butler catalog access:
4		From within the Notebook Aspect, verify that all the catalog data products described in

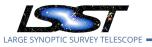
the DPDD can be retrieved for the coordinates selected above via the Butler. (This test should include access to SSObject data, but the details of how such a test would depend on the coordinate selections require additional thought.)

Test Data No data.



Step Description, Input Data and Expected Result

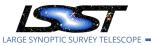
	Expected Result	
5	Description	LSST-stack-based resampling/reprojection: Verify the availability of software in the LSST stack, and associated documentation, that permits the resampling of LSST images to different pixel grids and projections. Exercise this capability for the test conditions selected in Step 1 above. Perform photometric and astrometric tests on the resulting resampled images to provide evidence that the transformations performed were correct to the accuracy supported by the data.
	Test Data	No data.
	Expected Result	
6	Description	Comment: The following API Aspect test steps should be carried out on the required "offsite-like" test platform, to ensure that their success does not reflect any privileged access given to processes inside the Data Access Center or other Science Platform instance. However, at least a small sampling of them should <i>also</i> be carried out <i>within</i> the Science Platform environment, i.e., in the Notebook Aspect, and the results compared.
	Test Data	No data.
	Expected Result	
7	Description	API Aspect image access: Using IVOA services such as the Registry and ObsTAP, from the "offsite-like" test platform, verify that the existence of the classes of image data products foreseen in the DPDD can be determined. Verify that ObsTAP and/or SIAv2 can be used to find the same images and lists of images for the established test coordinates that were retrieved via the Butler in Step 2 above. Verify that the selected images are retrievable from the Web services. Verify that the retrieved images are identical in their pixel content and metadata. The tests must include both coadded and single-epoch images.
	Test Data	No data.
	Expected Result	
8	Description	API Aspect image transformations: Verify that image cutouts and resamplings can be performed via the IVOA SODA service, and that the results are identical to those obtained for the same parameters from the LSST-stack-based tests in Step 5. (The requirements for supported reprojections, if any, in the SODA service have not been established at the time of writing.)



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Step Description, Input Data and Expected Result

	Test Data	No data.
	Expected	
	Result	
9	Description	API Aspect catalog data access: Verify that the IVOA Registry, RegTAP, TAP_SCHEMA, and other relevant mechanisms can be used to discover the existence of all the catalog data products foreseen in the DPDD. Using the IVOA TAP service, verify that all the catalog data products foreseen in the DPDD can be retrieved for the coordinates determined in Step 1. Verify that their scientific content is the same as when they are retrieved via the Butler.
	Test Data	No data.
	Expected Result	
10	Description	Comment: The Portal Aspect tests below should be carried out from a web browser on an "offsite- like" test platform, to ensure that no privileged access provided to intra-data-center clients is relied upon.
	Test Data	No data.
	Expected	
	Result	
11	Description	Portal Aspect data browsing: Verify that the Portal Aspect can be used to discover the existence of all the data products foreseen in the DPDD. Verify that the UI permits locating the data for the coordinates selected in Step 1 by visual means, e.g., by zooming and panning in from an all-sky view. Verify that the UI permits locating the data by typing in coordinates as well.
	Test Data	No data.
	Expected	
	Result	
12	Description	Portal Aspect image access: Verify that the Portal Aspect allows both the retrieval of "original" image data, i.e., in its native LSST pixel projection and with full metadata, as well as retrieval of on-demand UI cutouts of coadded image data for selected locations.
	Test Data	No data.
	Expected Result	



Step	Description, l	Description, Input Data and Expected Result		
13	Description	Portal Aspect catalog query and visualization: Verify that the Portal Aspect allows graphical querying of DPDD catalog data, both coad- ded and single-epoch, for selected regions of sky and/or with selected properties, and supports the visualization of the results (including histogramming, scatterplots, time se- ries, table manipulations, and overplotting on image data). (Note that the Science Platform requirements, LDM-554, lay out a detailed set of require- ments on the selection and visualization of catalog data.)		
	Test Data	No data.		
	Expected			
	Result			
14	Description	Portal Aspect data download: Verify that data identified and/or visualized in the Portal Aspect can be downloaded to the remote system running the web browser in which the Portal is displayed, as well as to the User Workspace.		
	Test Data	No data.		
	Expected			
	Result			

4.109 LVV-T132 - Verify implementation of Pre-cursor and Real Data

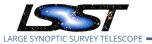
Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl

4.109.1 Verification Elements

• LVV-127 - DMS-REQ-0296-V-01: Pre-cursor, and Real Data

4.109.2 Test Items

Demonstrate that pixel-oriented data from astronomical imaging cameras (precursor or otherwise) can be processed using LSST Science Algorithms and organized for access through the Data Butler Access Client.

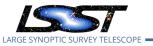


- 4.109.3 Predecessors
- 4.109.4 Environment Needs
- 4.109.4.1 Software
- 4.109.4.2 Hardware
- 4.109.5 Input Specification
- 4.109.6 Output Specification
- 4.109.7 Test Procedure
- Step Description, Input Data and Expected Result

1	Description	Confirm that the CI jobs used to test DRP and AP processing successfully run. These jobs use precursor datasets from cameras other than LSST.
•	Test Data	No data.
	Expected	
	Result	
2	Description	For each of these two datasets, instantiate the Butler, ingest the data products, and con- firm that they exist as expected.
		III II ulat they exist as expected.
2	Test Data	No data.
2	Test Data Expected	

4.110 LVV-T133 - Verify implementation of Provide Beam Projector Coordinate Calculation Software

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Lupton



4.110.1 Verification Elements

• LVV-182 - DMS-REQ-0351-V-01: Provide Beam Projector Coordinate Calculation Software

4.110.2 Test Items

Verify that the DMS provides software to calculate coordinates relating the collimated beam projector position and telescope pupil position to the illumination position on the telescope optical elements and focal plane.

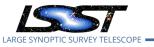
4.110.3 Predecessors

- 4.110.4 Environment Needs
- 4.110.4.1 Software
- 4.110.4.2 Hardware
- 4.110.5 Input Specification

4.110.6 Output Specification

4.110.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	On the LSST development cluster or notebook aspect, git clone the repo containing the CBP package: https://github.com/lsst/cbp	
•	Test Data	No data.	
	Expected		
	Result		
	Description	Follow the steps in the package README to install the package.	
2	Test Data	No data.	



Step	Description, Input Data and Expected Result		
	Expected Result		
3	Description Test Data	Confirm that the package can be loaded in python, and that some of the tests in the 'tests/' folder will execute. No data.	
	Expected Result	Successful execution of test scripts, which demonstrate the calculation of beam projector coordinates.	

4.111 LVV-T134 - Verify implementation of Provide Image Access Services

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Inspection	Gregory Dubois-Felsmann

4.111.1 Verification Elements

• LVV-27 - DMS-REQ-0065-V-01: Provide Image Access Services

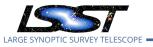
4.111.2 Test Items

Verify that images can be identified and that images and image cut-outs can be retrieved using the network interfaces - primarily IVOA standards-based - and Python APIs provided for image access by science users.

4.111.3 Predecessors

- 4.111.4 Environment Needs
- 4.111.4.1 Software

4.111.4.2 Hardware



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4.111.5 Input Specification

Testing requires the establishment of running services such as SIAv2 and SODA to which the tests can be applied.

4.111.6 Output Specification

4.111.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description Inspect that the following test cases have been executed and passed: LVV-T803, LVV-T8 LVV-T811, LVV-T812.		
		The requirement is fully satisfied by lower-level LSP test cases.	
	Test Data	ata No data.	
	Expected	Test cases LVV-T803, LVV-T810, LVV-T811, LVV-T812 passed without blocking issues.	
	Result		

4.112 LVV-T136 - Verify implementation of Data Product and Raw Data Access

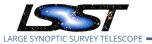
Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Colin Slater

4.112.1 Verification Elements

• LVV-129 - DMS-REQ-0298-V-01: Data Product and Raw Data Access

4.112.2 Test Items

Verify that available image, file, and catalog data products, and their metadata and provenance information, can be listed and retrieved.



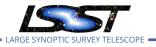
4.112.3	Predecessors	5		
4.112.4	Environment	Needs		
4.112.4.1	Software			
4.112.4.2	2 Hardware			
4.112.5	Input Specification			
4.112.6	Output Specification			
4.112.7	Test Procedu	re		
Step	Description, li	nput Data and Expected Result		
1	Description Details of the Gen3 Butler and ObsTAP tables are still being worked out. The general overview of this test will be to use some combination of the Gen3 Butler and TAP access to the ObsTAP tables to test that the required access is provided.			
	Test Data	No data.		
	Expected Result	Verification that the relevant data products and their related tables, metadata, and prove- nance information are available and readily accessible.		

4.113 LVV-T137 - Verify implementation of Data Product Ingest

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Colin Slater

4.113.1 Verification Elements

• LVV-130 - DMS-REQ-0299-V-01: Data Product Ingest



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4.113.2 Test Items

Verify that data products can be ingested.

4.113.3 Predecessors

- 4.113.4 Environment Needs
- 4.113.4.1 Software

4.113.4.2 Hardware

4.113.5 Input Specification

4.113.6 Output Specification

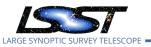
4.113.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Identify a suitable set of raw data to be run through "mini-DRP" processing.
1	Test Data	No data.
	Expected	
	Result	
2-1 from LVV- T1064	Description Test Data Expected Result	Process data with the Data Release Production payload, starting from raw science images and gen- _erating science data products, placing them in the Data Backbone.

3-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- _lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	

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Step Description, Input Data and Expected Result

1	Description	Confirm that the data products from the DRP processing have been ingested into the Data Backbone.
-	Test Data	No data.
	Expected	Processed images, catalogs, calibration information, and other related data products are
	Result	present and accessible via the Butler.

4.114 LVV-T138 - Verify implementation of Bulk Download Service

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.114.1 Verification Elements

• LVV-131 - DMS-REQ-0300-V-01: Bulk Download Service

4.114.2 Test Items

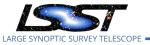
Bulk Download

4.114.3 Predecessors

4.114.4 Environment Needs

4.114.4.1 Software

4.114.4.2 Hardware



4.114.5 Input Specification

A large dataset (at least a few TB) must be available.

Requires identity management to confirm bulk download use.

While this can be tested and shown to work using LSST DAC, Chilean DAC, and IN2P3 endpoints, this should also be tested to demonstrate expected throughput for outside users (e.g. FNAL, NERSC sites could be tested).

4.114.6 Output Specification

4.114.7 Test Procedure

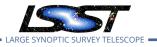
Step	Description, l	Description, Input Data and Expected Result			
	Description	Setup large transfer request and examine the data transfer rates achieved.			
1	Test Data	No data.			
	Expected				
	Result				
2	Description	Test should be repeated while observing in firehose mode (with LSSTCam) during science verification to ensure that bulk transfer does not compromise normal nightly operations.			
2	Test Data	No data.			
	Expected				
	Result				

4.115 LVV-T140 - Verify implementation of Production Orchestration

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl

4.115.1 Verification Elements

• LVV-133 - DMS-REQ-0302-V-01: Production Orchestration



4.115.2 Test Items

Demonstrate use to orchestration software to perform real-time and batch production on LSST compute platform(s).

- 4.115.3 Predecessors
- 4.115.4 Environment Needs
- 4.115.4.1 Software
- 4.115.4.2 Hardware
- 4.115.5 Input Specification
- 4.115.6 Output Specification

4.115.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Identify an appropriate precursor dataset.
1	Test Data	No data.
	Expected	
	Result	
	Description	Execute a batch processing job using the orchestration system, and confirm (manually
2		and/or via QA tools typically used for HSC reprocessing) that the pipeline executed and produced all expected products (or error logs in cases of failure).
	Test Data	No data.
	Expected	Calexp single-visit and coadd images, and associated catalogs, are present in a Butler
	Result	repository. Logs of the processing are available to be inspected for identification of prob- lems in the processing.

4.116 LVV-T141 - Verify implementation of Production Monitoring



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Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl

4.116.1 Verification Elements

• LVV-134 - DMS-REQ-0303-V-01: Production Monitoring

4.116.2 Test Items

Demonstrate monitoring capabilities that give real-time view of pipeline execution and production systems usage/load.

- 4.116.3 Predecessors
- 4.116.4 Environment Needs
- 4.116.4.1 Software

4.116.4.2 Hardware

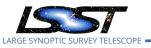
4.116.5 Input Specification

Data set and mechanism for Production Orchestration as outlined in LVV-T140.

4.116.6 Output Specification

4.116.7 Test Procedure

_	Step	Description, Input Data and Expected Result					
	1-1 from	Description	Identify an appropriate precursor dataset.				
	I-I from	Test Data					
	LVV-T140						



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Step Description, Input Data and Expected Result

	Expected	
	Result	
1-2 from	Description	Execute a batch processing job using the orchestration system, and confirm (manually and/or via QA tools typically used for HSC reprocessing) that the pipeline executed and produced all expected products (or error logs in cases of failure).
	Test Data	
	Expected	Calexp single-visit and coadd images, and associated catalogs, are present in a Butler repository.
	Result	Logs of the processing are available to be inspected for identification of problems in the processing.
2	Description	While DRP processing in step 1 is executing, monitor the progress and resource usage of processing.
2	Test Data	No data.
	Expected	Ability to monitor in real-time the orchestrated production processing, including resource
	Result	usage.

4.117 LVV-T142 - Verify implementation of Production Fault Tolerance

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

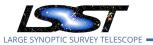
4.117.1 Verification Elements

• LVV-135 - DMS-REQ-0304-V-01: Production Fault Tolerance

4.117.2 Test Items

Demonstrate production systems report faults in pipeline executions and that system is able to recover. Where recovery can mean the ability to provide production artifacts for examination, return production elements ready for subsequent use, and/or reset and repeat production attempts.

4.117.3 Predecessors



4.117.4 Environment Needs

- 4.117.4.1 Software
- 4.117.4.2 Hardware
- 4.117.5 Input Specification
- 4.117.6 Output Specification

4.117.7 Test Procedure

 Step
 Description, Input Data and Expected Result

 1
 Description
 Execute AP and DRP, simulate failures, observe correct processing

 1
 Test Data
 No data.

 Expected
 Result

4.118 LVV-T144 - Verify implementation of Task Specification

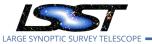
Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim

4.118.1 Verification Elements

• LVV-136 - DMS-REQ-0305-V-01: Task Specification

4.118.2 Test Items

Verify that the DMS provides the ability to define a new or modified pipeline task without recompilation.



4.118.3 Predecessors

4.118.4 Environment Needs

- 4.118.4.1 Software
- 4.118.4.2 Hardware
- 4.118.5 Input Specification
- 4.118.6 Output Specification

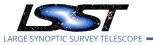
4.118.7 Test Procedure

Step Description, Input Data and Expected Result

1	Description	Inspect software architecture. Verify that there exist Tasks that can be run and configured without re-compilation.
	Test Data	No data.
	Expected	Confirmation that the software architecture has allowed for reconfiguring and running
	Result	Tasks without recompilation.
2	Description	Verify that an example science algorithm can be run through one of these Tasks. Three ex- amples from different areas: source measurement, image subtraction, and photometric- redshift estimation.
	Test Data	No data.
	Expected Result	Successful Task execution with different configurations, including confirmation that the outputs are different from tasks with altered configurations.

4.119 LVV-T145 - Verify implementation of Task Configuration

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton



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4.119.1 Verification Elements

• LVV-137 - DMS-REQ-0306-V-01: Task Configuration

4.119.2 Test Items

Verify that the DMS software provides configuration control to define, override, and verify the configuration for a DMS Task.

4.119.3 Predecessors

- 4.119.4 Environment Needs
- 4.119.4.1 Software
- 4.119.4.2 Hardware
- 4.119.5 Input Specification

4.119.6 Output Specification

4.119.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Inspect software design to verify that one can define the configuration for a Task.			
1	Test Data	No data.			
	Expected				
	Result				
2	Description	Run a Task with a known invalid configuration. Verify that the error is caught before the science algorithm executes.			
2	Test Data	No data.			
	Expected				
	Result				

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Step	Description, Input Data and Expected Result						
3	Description Run a simple task with two different configurations that make a material Task. E.g., specify a different source detection threshold. Verify that the different between the two runs through difference in recorded provenance.						
	Test Data No data.						
	Expected						
	Result	·					

4.120 LVV-T146 - Verify implementation of DMS Initialization Component

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl

4.120.1 Verification Elements

• LVV-128 - DMS-REQ-0297-V-01: DMS Initialization Component

4.120.2 Test Items

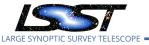
Demonstrate that the DMS can be initialized in a safe state that will not allow data corruption/loss.

4.120.3 Predecessors

- 4.120.4 Environment Needs
- 4.120.4.1 Software

4.120.4.2 Hardware

4.120.5 Input Specification



4.120.6 Output Specification

4.120.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Power-cycle all of the DM systems at each Facility.			
1	Test Data	No data.			
	Expected	Restart of all DM systems.			
	Result				
	Description	Observe each system and ensure that it has recovered in a properly initialized state.			
2	Test Data	No data.			
	Expected	Systems are all active and initialized for their designated purpose.			
	Result				

4.121 LVV-T147 - Verify implementation of Control of Level-1 Production

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.121.1 Verification Elements

• LVV-132 - DMS-REQ-0301-V-01: Control of Level-1 Production

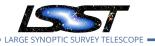
4.121.2 Test Items

Demonstrate that the DMS can control all Prompt Processing across DMS facilities.

4.121.3 Predecessors

4.121.4 Environment Needs

4.121.4.1 Software



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- 4.121.4.2 Hardware
- 4.121.5 Input Specification
- 4.121.6 Output Specification

4.121.7 Test Procedure

Step	Description, Input Data and Expected Result					
	Description	Observe existence and capability of Prompt DMCS				
1	Test Data	No data.				
	Expected					
	Result					

4.122 LVV-T148 - Verify implementation of Unique Processing Coverage

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

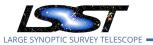
4.122.1 Verification Elements

• LVV-138 - DMS-REQ-0307-V-01: Unique Processing Coverage

4.122.2 Test Items

Verify that a user-specified criterion can be used to process each record in a table exactly once.

4.122.3 Predecessors



4.122.4 Environment Needs

- 4.122.4.1 Software
- 4.122.4.2 Hardware
- 4.122.5 Input Specification
- 4.122.6 Output Specification

4.122.7 Test Procedure

Step	Description, Input Data and Expected Result					
1	Description	Execute representative processing, observe lack of duplicates or missing rows even in the presence of failures				
·	Test Data	No data.				
	Expected					
	Result					

4.123 LVV-T149 - Verify implementation of Catalog Queries

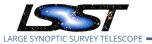
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.123.1 Verification Elements

• LVV-33 - DMS-REQ-0075-V-01: Catalog Queries

4.123.2 Test Items

Verify that SQL can be used to query catalogs.



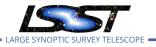
LARGE SYNOPTIC	SURVEY TELESCOPE	Test Succ for LCCT Data Management	LDM-639	Latest Devision 2010 07 20
		Test Spec for LSST Data Management	FDM-028	Latest Revision 2019-07-29
4,123,3	Predecessors			
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4.123.4	Environment	Needs		
4.123.4.1	Software			
4.123.4.2	2 Hardware			
4.123.5	Input Specifi	cation		
4.123.6	Output Speci	fication		
4.123.7	Test Procedu	re		
-				
Step	Description, li	nput Data and Expected Resu	ult	
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			

4.124 LVV-T150 - Verify implementation of Maintain Archive Publicly Accessible

Ve	ersion	Status	Priority	Verification Type	Owner
1		Draft	Normal	Test	Colin Slater

4.124.1 Verification Elements

• LVV-34 - DMS-REQ-0077-V-01: Maintain Archive Publicly Accessible



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4.124.2 Test Items

Verify that prior data releases remain accessible.

4.124.3 Predecessors

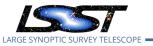
- 4.124.4 Environment Needs
- 4.124.4.1 Software
- 4.124.4.2 Hardware
- 4.124.5 Input Specification
- 4.124.6 Output Specification

4.124.7 Test Procedure

Step	Description, Input Data and Expected Result					
	Description	Observe access to prior DR on tape				
1	Test Data	No data.				
	Expected					
	Result					

4.125 LVV-T151 - Verify Implementation of Catalog Export Formats From the Notebook Aspect

Ve	ersion	Status	Priority	Verification Type	Owner
1		Defined	Normal	Test	Colin Slater



4.125.1 Verification Elements

• LVV-35 - DMS-REQ-0078-V-01: Catalog Export Formats

4.125.2 Test Items

Verify that catalog data is exportable from the notebook aspect in a variety of communitystandard formats.

4.125.3 Predecessors

- 4.125.4 Environment Needs
- 4.125.4.1 Software
- 4.125.4.2 Hardware
- 4.125.5 Input Specification

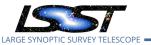
4.125.6 Output Specification

4.125.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at
LVV-T837	Test Data	
	Expected	Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version
	Result	and machine flavor.
1-2 from	Description	Spawn a container by: 1) choosing an appropriate stack version: e.g. the latest weekly.
LVV-T837		2) choosing an appropriate machine flavor: e.g. medium
211 1007		3) click "Spawn"
	Test Data	

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Step Description, Input Data and Expected Result

Expected Result	Redirection to the JupyterLab environment served from the chosen container containing the correct stack version.
Description Test Data	Open a new launcher by navigating in the top menu bar "File" -> "New Launcher"
Expected Result	A launcher window with several sections, potentially with several kernel versions for each.
Description Test Data	Select the option under "Notebook" labeled "LSST" by clicking on the icon.
Expected Result	An empty notebook with a single empty cell. The kernel show up as "LSST" in the top right of the notebook.
Description	Execute a query in a notebook to select a small number of stars. In the example code below, we query the WISE catalog, then extract the results to an Astropy table.
Test Data Expected Result	
	Result Description Test Data Expected Result Description Expected Result Description Test Data

Description Using the example code below, save the files to your storage space on the LSP Notebook Aspect.

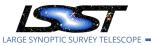
Confirm that non-empty output files appear on disk. Test Data No data. Example tab.write('test.csv', format='ascii.csv') Code tab.write('test.vot', format='votable') tab.write('test.fits', format='fits') Expected For the example given here, there should be the following files with the file size as listed: Result test.csv 5.7M test.vot 16M test.fits 4.5M Description Check that these files contain the same number of rows: Test Data

5

4

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No data.



Step

	Test Spec for LSST Data Management	LDM-639	Latest Revision 2019-07-29
Description,	Input Data and Expected Result		
Example Code	<pre>from astropy.table import Table dat_csv = Table.read('test.csv', fo dat_vot = Table.read('test.vot', fo dat_fits = Table.read('test.fits',</pre>	rmat='votable')	

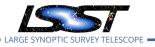
	Expected Result	<pre>import numpy as np print(np.size(dat_csv), np.size(dat_vot), np.size(dat_fits)) Print statement produces output "97058 97058 97058".</pre>
6-1 from LVV- T1208	Description	Under the 'File' menu at the top of your Jupyter notebook session, select one of the following:
		Save All, Exit, and Log Out Exit and Log Out Without Saving
	Test Data Expected Result	You will be returned to the LSP landing page: https://lsst-lsp-stable.ncsa.illinois.edu/ lt is now safe to close the browser window.

4.126 LVV-T152 - Verify implementation of Keep Historical Alert Archive

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

4.126.1 Verification Elements

• LVV-37 - DMS-REQ-0094-V-01: Keep Historical Alert Archive



4.126.2 Test Items

Verify that the DMS preserves and makes accessible an Alert Archive for reference and for false alert analyses

- 4.126.3 Predecessors
- 4.126.4 Environment Needs
- 4.126.4.1 Software
- 4.126.4.2 Hardware
- 4.126.5 Input Specification
- 4.126.6 Output Specification

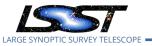
4.126.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Simulated alert stream, load Alert DB, observe access to Alert DB
1	Test Data	No data.
	Expected	
	Result	

4.127 LVV-T153 - Verify implementation of Provide Engineering and Facility Database Archive

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl



4.127.1 Verification Elements

• LVV-44 - DMS-REQ-0102-V-01: Provide Engineering & Facility Database Archive

4.127.2 Test Items

Demonstrate Engineering and Facilities Data (images, associated metadata, and observatory environment and control data) are archived and available for public access within **L1PublicT** (24 hours).

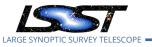
4.127.3	Predecessors

- 4.127.4 Environment Needs
- 4.127.4.1 Software
- 4.127.4.2 Hardware
- 4.127.5 Input Specification

4.127.6 Output Specification

4.127.7 Test Procedure

Step	Description, Input Data and Expected Result		
1	Description	Execute a single-day operations rehearsal, ingesting (simulated) OCS commands into the EFD.	
1	Test Data	No data.	
	Expected		
	Result		
2	Description	Wait at least L1PublicT=24 hours, then access the archived EFD. Confirm that the data products are present in the archived EFD after L1PublicT=24 hours have elapsed.	
	Test Data	No data.	



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Step	Description, Input Data and Expected Result		
	Expected Result	The EFD contains the simulated OCS commands, and they were ingested within L1PublicT=24 hours of the operations rehearsal.	
3	Description	From the public access portal to the EFD, execute a query and demonstrate that the data are publicly available.	
C	Test Data	No data.	
	Expected	A query at the public interface to the EFD successfully executes and returns EFD data.	
	Result		

4.128 LVV-T154 - Verify implementation of Raw Data Archiving Reliability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.128.1 Verification Elements

• LVV-140 - DMS-REQ-0309-V-01: Raw Data Archiving Reliability

4.128.2 Test Items

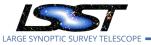
Verify that raw images are reliably archived.

4.128.3 Predecessors

- 4.128.4 Environment Needs
- 4.128.4.1 Software

4.128.4.2 Hardware

4.128.5 Input Specification



4.128.6 Output Specification

4.128.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Analyze sources of loss or corruption after mitigation to compute estimated reliability	
1	Test Data	No data.	
	Expected		
	Result		

4.129 LVV-T155 - Verify implementation of Un-Archived Data Product Cache

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.129.1 Verification Elements

• LVV-141 - DMS-REQ-0310-V-01: Un-Archived Data Product Cache

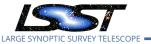
4.129.2 Test Items

Demonstrate that the DMS provides low-latency storage for at least I1CacheLifetime (30 days) to keep prompt processing pre-covery images on hand.

4.129.3 Predecessors

- 4.129.4 Environment Needs
- 4.129.4.1 Software

4.129.4.2 Hardware



4.129.5 Input Specification

4.129.6 Output Specification

4.129.7 Test Procedure

Step	Description,	Input Data and	d Expected Result
Brep	Description,	inpac baca an	a Expected Result

	Description	Delegate to DBB
1	Test Data	No data.
	Expected	
	Result	

4.130 LVV-T156 - Verify implementation of Regenerate Un-archived Data Products

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

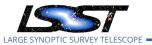
4.130.1 Verification Elements

• LVV-142 - DMS-REQ-0311-V-01: Regenerate Un-archived Data Products

4.130.2 Test Items

Not all of the ancillary data products produced by a data release will be archived permanently. These ancillary products have been promised as accessible to the community. Show that these products can be produced from an archived data release after the fact.

4.130.3 Predecessors



4.130.4 Environment Needs

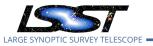
- 4.130.4.1 Software
- 4.130.4.2 Hardware
- 4.130.5 Input Specification
- 4.130.6 Output Specification

4.130.7 Test Procedure

Step Description, Input Data and Expected Result **Description** Run a small DRP processing job and download unarchived data products. 1 Test Data No data. Expected Result Description Wait for (or force) a processing stack change so that the subsequent re-processing will be forced to use an older software build. 2 Test Data No data. Expected Result Description Using provenance information from the products in Step 1, request a re-processing and compare results with previously unarchived products. 3 Test Data No data. Expected Result

4.131 LVV-T157 - Verify implementation Level 1 Data Product Access

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater



4.131.1 Verification Elements

• LVV-143 - DMS-REQ-0312-V-01: Level 1 Data Product Access

4.131.2 Test Items

Verify that Level 1 Data Products are accessible by science users.

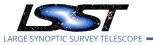
- 4.131.3 Predecessors
- 4.131.4 Environment Needs
- 4.131.4.1 Software
- 4.131.4.2 Hardware
- 4.131.5 Input Specification
- 4.131.6 Output Specification

4.131.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to LSP	
1	Test Data	No data.	
	Expected		
	Result		

4.132 LVV-T158 - Verify implementation Level 1 and 2 Catalog Access

Version Status Priority Verification Type Owner



1 Draft Normal Test Colin Slater

4.132.1 Verification Elements

• LVV-144 - DMS-REQ-0313-V-01: Level 1 & 2 Catalog Access

4.132.2 Test Items

Verify that Data Release Products are accessible by science users.

4.132.3 Predecessors

- 4.132.4 Environment Needs
- 4.132.4.1 Software
- 4.132.4.2 Hardware
- 4.132.5 Input Specification
- 4.132.6 Output Specification

4.132.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to LSP	
1	Test Data	No data.	
	Expected		
	Result		
	•		



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4.133 LVV-T159 - Verify implementation of Regenerating Data Products from Previous Data Releases

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

4.133.1 Verification Elements

• LVV-167 - DMS-REQ-0336-V-01: Regenerating Data Products from Previous Data Releases

4.133.2 Test Items

Show that un-archived data products from previous data releases can be generated using through the LSST Science Platform.

4.133.3 Predecessors

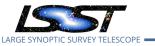
4.133.4 Environment Needs

- 4.133.4.1 Software
- 4.133.4.2 Hardware
- 4.133.5 Input Specification
- 4.133.6 Output Specification
- 4.133.7 Test Procedure

Step Description, Input Data and Expected Resul	tep Des	cription, Inpu	ut Data and E	xpected Result
-------------------------------------------------	---------	----------------	---------------	----------------

Description Delegate to LSP

1 Test Data No data.



Step	Description, Input Data and Expected Result
	Expected
	Result

4.134 LVV-T160 - Verify implementation of Providing a Precovery Service

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann

4.134.1 Verification Elements

• LVV-172 - DMS-REQ-0341-V-01: Max elapsed time for precovery results

4.134.2 Test Items

Verify that a technical capability to perform user-directed precovery analyses on difference images exists and that it is exposed through the LSST Science Platform. Verified by testing against precursor datasets.

(Involves: LSP Portal, MOPS and Forced Photometry)

4.134.3 Predecessors

4.134.4 Environment Needs

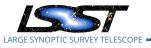
4.134.4.1 Software

4.134.4.2 Hardware

4.134.5 Input Specification

1. DECam HiTS data could be an appropriate set for this activity.

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- 3. Determine limitations over which general precovery is supported. I would suggest that precovery services be limited to current (or last two) DRP campaigns with the possible addition of including non-DRP products to encompass observations over the preceding year (does this then require means to re-generate PVIs from Alert Production in addition to DRP?)
- 4. Could re-use elements of LVV-T80 where quasars are used to test faint object detection.

4.134.6 Output Specification

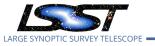
4.134.7 Test Procedure

Step Description, Input Data and Expected Result

1	Description Test Data	Run Precovery within follow-on Alert Production (i.e. daily post-processing on 30 day store).
	Expected	
	Result	
2	Description	Within Science Platform, initiate request to perform precovery for a list of sources over same period (and longer). Include among the sources for precovery quasars from LVV-T80.
	Test Data	No data.
	Expected	
	Result	
3	Description	Examine the results. Compare the results for the period where there is overlap with precovery run and quasar photometry with those from LVV-T80 to verify user service performs as production services.
	Test Data	No data.
	Expected	
	Result	

4.135 LVV-T161 - Verify implementation of Logging of catalog queries

Version Status Priority Verification Type Owner



1	Draft	Normal	Test	Robert Gruendl
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4.135.1 Verification Elements

• LVV-176 - DMS-REQ-0345-V-01: Logging of catalog queries

4.135.2 Test Items

Demonstrate logging of queries of LSST databases. Logged queries are globally available to DB administrators but otherwise private excepting the user that made the query.

4.135.3 Predecessors

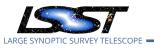
- 4.135.4 Environment Needs
- 4.135.4.1 Software
- 4.135.4.2 Hardware
- 4.135.5 Input Specification
- 4.135.6 Output Specification

4.135.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to LSP
1	Test Data	No data.
	Expected	
	Result	





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4.136 LVV-T162 - Verify implementation of Access to Previous Data Releases

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann

4.136.1 Verification Elements

• LVV-189 - DMS-REQ-0363-V-01: Access to Previous Data Releases

4.136.2 Test Items

Verify this high-level requirement, which states that the other data access requirements, for images and catalogs, all must be satisfied for multiple data releases. Verified by inspection, i.e., by determining that the data access system components, from middleware through APIs to user interfaces, are designed to support data from multiple releases, as well as by direct testing using a synthetic test environment containing multiple releases.

(Involves: Data Backbone, Managed Database, LSP Portal, LSP JupyterLab, LSP Web APIs, Parallel Distributed Database)

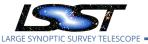
4.136.3 Predecessors

- 4.136.4 Environment Needs
- 4.136.4.1 Software

4.136.4.2 Hardware

4.136.5 Input Specification

Requires two or more (fake) releases within DAC (or PDAC) with common area/observations (preferably with some differing results but could use metadata identifying provenance).



4.136.6 Output Specification

4.136.7 Test Procedure

Step	Description, li	nput Data and Expected Result
1	Description	From Science Platform initiate request for image and catalog products from one of the two release sets.
I	Test Data	No data.
	Expected	
	Result	
2	Description	From Science Platform re-issue the same request but specifying the alternate/earlier re- lease set.
2	Test Data	No data.
	Expected	
	Result	
3	Description	Compare results and identify differences that are germaine to the relevant Data Release Sets are found.
5	Test Data	No data.
	Expected	
	Result	

4.137 LVV-T163 - Verify implementation of Data Access Services

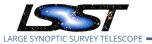
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.137.1 Verification Elements

• LVV-190 - DMS-REQ-0364-V-01: Total number of data releases

4.137.2 Test Items

Demonstrate that Data Access Services are capable of scaling to serve data from nDRTot (11) data releases over a surveyYears (10) year survey.



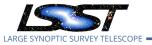
LARGE SYNOPTIC	SURVEY TELESCOPE	Test Spec for LSST Data Management	LDM-639	Latest Revision 2019-07-29
/ 127 2	Predecessors	-		
4.137.3	Fleuecessols	•		
4.137.4	Environment	Needs		
4.137.4. ⁻	1 Software			
4 4 7 7 4 1				
4.137.4.2	2 Hardware			
4.137.5	Input Specifi	cation		
4.137.6	Output Speci	ification		
	o acpac opec			
4 4 9 7 7	Test			
4.137.7	Test Procedu	ire		
Step	Description, l	nput Data and Expected Resu	lt	
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			

4.138 LVV-T164 - Verify implementation of Operations Subsets

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.138.1 Verification Elements

• LVV-191 - DMS-REQ-0365-V-01: Operations Subsets



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4.138.2 Test Items

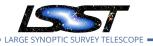
Demonstrate that Data Access Services are designed such that subsets of a Data Release may be retained and served (made available) after a Data Release has been superseded. (Data Backbone, Managed Database, LSP Portal, LSP JupyterLab, LSP Web APIs, Parallel Distributed Database)

- 4.138.3 Predecessors
- 4.138.4 Environment Needs
- 4.138.4.1 Software
- 4.138.4.2 Hardware
- 4.138.5 Input Specification
- 4.138.6 Output Specification
- 4.138.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			

4.139 LVV-T165 - Verify implementation of Subsets Support

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Lupton



4.139.1 Verification Elements

• LVV-192 - DMS-REQ-0366-V-01: Subsets Support

4.139.2 Test Items

Verify that the DMS can provide designated subsets of previous Data Releases.

 4.139.3
 Predecessors

 4.139.4
 Environment Needs

 4.139.4.1
 Software

 4.139.4.1
 Software

 4.139.4.2
 Hardware

 4.139.5
 Input Specification

 4.139.6
 Output Specification

 4.139.7
 Test Procedure

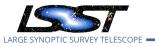
 Step
 Description, Input Data and Expected Result

 1
 Test Data
 No data.

 Expected
 Result

4.140 LVV-T166 - Verify implementation of Access Services Performance

Version Status Priority Verification Type Owner





4.140.1 Verification Elements

• LVV-193 - DMS-REQ-0367-V-01: Access Services Performance

4.140.2 Test Items

Demonstrate monitoring of Data Access Services that give real and long-time views of system performance and usage.

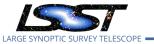
4.140.3 Predecessors

- 4.140.4 Environment Needs
- 4.140.4.1 Software
- 4.140.4.2 Hardware
- 4.140.5 Input Specification
- 4.140.6 Output Specification

4.140.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to LSP
1	Test Data	No data.
	Expected	
	Result	



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4.141 LVV-T167 - Verify Capability to serve older Data Releases at Full Performance

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.141.1 Verification Elements

• LVV-194 - DMS-REQ-0368-V-01: Implementation Provisions

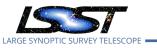
4.141.2 Test Items

Verify that implementation of the data access services do not preclude serving all older Data Releases with the same performance requirements as current Data Releases. Note that it is an operational consideration whether sufficient compute and storage resources would actually be provisioned to meet those requirements.

4.141.3 Predecessors

- 4.141.4 Environment Needs
- 4.141.4.1 Software
- 4.141.4.2 Hardware
- 4.141.5 Input Specification
- 4.141.6 Output Specification

4.141.7 Test Procedure



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Step	Description, Input Data and Expected Result			
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			

4.142 LVV-T168 - Verify design of Data Access Services allows Evolution of the LSST Data Model

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.142.1 Verification Elements

• LVV-195 - DMS-REQ-0369-V-01: Evolution

4.142.2 Test Items

Verify that the design of the Data Access Services are able to accommodate changes/evolution of the LSST data model from one release to another.

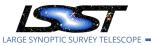
4.142.3 Predecessors

4.142.4 Environment Needs

4.142.4.1 Software

4.142.4.2 Hardware

4.142.5 Input Specification



4.142.6 Output Specification

4.142.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Delegate to LSP			
1	Test Data	No data.			
	Expected				
	Result				

4.143 LVV-T169 - Verify implementation of Older Release Behavior

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Gregory Dubois-Felsmann

4.143.1 Verification Elements

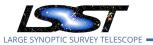
• LVV-196 - DMS-REQ-0370-V-01: Older Release Behavior

4.143.2 Test Items

Verify that the components of the data access system are technically capable of handling data releases beyond the two for which full services are required. DMS-REQ-0364 requires that up to 11 be supported. Verified by inspection, i.e., by determination that the system design and implementation contain the necessary features to support this number of releases, and by direct test in a synthetic test environment with multiple releases.

(Involves: Data Backbone, Managed Database, LSP Portal, LSP JupyterLab, LSP Web APIs, Parallel Distributed Database)

4.143.3 Predecessors



4.143.4 Environment Needs

- 4.143.4.1 Software
- 4.143.4.2 Hardware
- 4.143.5 Input Specification
- 4.143.6 Output Specification

. . .

4.143.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to LSP	
1	Test Data	No data.	
	Expected		
	Result		

4.144 LVV-T170 - Verify implementation of Query Availability

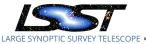
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.144.1 Verification Elements

• LVV-197 - DMS-REQ-0371-V-01: Query Availability

4.144.2 Test Items

Verify that queries continue to be successfully executable over time.



		Test Spec for LSST Data Management	LDM-639	Latest Revision 2019-07-29
4.144.3	Predecessors			
4.144.4	Environment	Needs		
4.144.4.1	l Software			
A 1 A A A *	2 Hardware			
4.144.4.4				
4.144.5	Input Specific	ation		
4.144.6	Output Speci	fication		
	To at Due on due			
4.144./	Test Procedu	re		
Step	Description, Ir	put Data and Expected Re	esult	
	Description	Delegate to LSP		
1	Test Data	No data.		
	Expected			
	Result			

4.145 LVV-T171 - Verify implementation of Pipeline Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.145.1 Verification Elements

• LVV-5 - DMS-REQ-0008-V-01: Pipeline Availability



4.145.2 Test Items

Demonstrate that Data Management System pipelines are available for use without disruptions of greater than productionMaxDowntime (24 hours). This requires a regimented change control process and testing infrastructure for all pipelines and their underlying software services, and regimented management and monitoring of compute and networking resources. The list of services covered by this test include: Image and EFD Archiving, Prompt Processing, OCS Driven Batch, Telemetry Gateway, Alert Distribution, Alert Filtering, Batch Production, Data Backbone, Compute/Storage/LAN, Inter-Site Networks, and Service Management and Monitoring.

4.145.3 Predecessors

- 4.145.4 Environment Needs
- 4.145.4.1 Software
- 4.145.4.2 Hardware
- 4.145.5 Input Specification
- 4.145.6 Output Specification

4.145.7 Test Procedure

Step	Description, Input Data and Expected Result						
	Analyze sources of downtime after mitigation to compute estimated reliability; observe						
1		unscheduled downtime of developer, integration, and pre-production systems					
	Test Data No data.						
	Expected						
	Result						



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4.146 LVV-T172 - Verify implementation of Optimization of Cost, Reliability and Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.146.1 Verification Elements

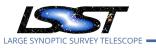
• LVV-64 - DMS-REQ-0161-V-01: Optimization of Cost, Reliability and Availability in Order

4.146.2 Test Items

In matters of cost, system reliability (functioning properly at a given time) has precedence over system availability (ability to use the system at a given time). The optimization may be outside the realm of direct testing as it is more of a system provisioning guideline but on its face it demands that the Data Management System include failure reporting, regimented change control, acceptance testing, maintenance and monitoring.

4.146.3 Predecessors

- 4.146.4 Environment Needs
- 4.146.4.1 Software
- 4.146.4.2 Hardware
- 4.146.5 Input Specification
- 4.146.6 Output Specification
- 4.146.7 Test Procedure



Step	Description, Input Data and Expected Result				
	Description	Analyze resource management policy			
1	Test Data No data.				
	Expected				
	Result				

4.147 LVV-T173 - Verify implementation of Pipeline Throughput

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.147.1 Verification Elements

• LVV-65 - DMS-REQ-0162-V-01: Pipeline Throughput

4.147.2 Test Items

Demonstrate that the Alert Production Pipeline is capable of processing nRawExpNightMax (2800) science exposures within a (24-nightDurationMax) 12 hour period and issue alerts in offline batch mode.

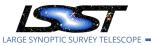
4.147.3 Predecessors

4.147.4 Environment Needs

4.147.4.1 Software

4.147.4.2 Hardware

4.147.5 Input Specification



4.147.6 Output Specification

4.147.7 Test Procedure

Step	Description, Input Data and Expected Result					
	Description	Execute single-day operations rehearsal, observe data products generated in time				
1	Test Data	No data.				
	Expected					
	Result					

4.148 LVV-T174 - Verify implementation of Re-processing Capacity

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.148.1 Verification Elements

• LVV-66 - DMS-REQ-0163-V-01: Re-processing Capacity

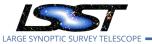
4.148.2 Test Items

Verify that the DMS has sufficient processing, storage, and network to reprocess all data within "drProcessingPeriod" (1 year) while maintaining full Prompt Processing capability.

4.148.3 Predecessors

- 4.148.4 Environment Needs
- 4.148.4.1 Software

4.148.4.2 Hardware



4.148.5 Input Specification

4.148.6 Output Specification

4.148.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Analyze sizing model; execute DRP, observe scaling			
1	Test Data	No data.			
	Expected				
	Result				

4.149 LVV-T175 - Verify implementation of Temporary Storage for Communications Links

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

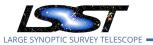
4.149.1 Verification Elements

• LVV-67 - DMS-REQ-0164-V-01: Temporary Storage for Communications Links

4.149.2 Test Items

Demonstrate that storage capacity is present and usable to prevent data loss if networking is interrupted between summit and base, base and archive, or archive and DAC. The requirement is to have storage necessary to hold tempStorageReIMTTR (200%) of the expected raw data that would arrive during the Mean Time to Repair (summToBaseNetMTTR = 24 hours, baseToArchNetMTTR = 48 hours, archToDacNetMTTR = 48 hours). This scale is further set by nCalibExpDay + nRawExpNightMax = 450 + 2800 = 3250 exposures/day.

4.149.3 Predecessors



4.149.4 Environment Needs

- 4.149.4.1 Software
- 4.149.4.2 Hardware
- 4.149.5 Input Specification
- 4.149.6 Output Specification

4.149.7 Test Procedure

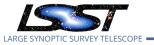
Step	Description, Input Data and Expected Result				
	Description	Analyze sizing model and network/storage design			
1	Test Data	No data.			
	Expected				
	Result				

4.150 LVV-T176 - Verify implementation of Infrastructure Sizing for "catching up"

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.150.1 Verification Elements

- LVV-68 DMS-REQ-0165-V-01: Infrastructure Sizing for "catching up"
- LVV-994 OSS-REQ-0051-V-01: Summit-Base Connectivity Loss



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4.150.2 Test Items

Demonstrate Data Management System has sufficient excess capacity (compute infrastructure) to process one night's data (2800 exposures) within 24 hours while also maintaining nightly Alert Production (note this is very similar to LVV-T173).

4.150.3 Predecessors

- 4.150.4 Environment Needs
- 4.150.4.1 Software
- 4.150.4.2 Hardware
- 4.150.5 Input Specification
- 4.150.6 Output Specification

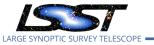
4.150.7 Test Procedure

Step Description, Input Data and Expected Result

Description	Execute single-day operations rehearsal including catch-up after failure, observe data products generated in time
Test Data	No data.
Expected	
Result	
	Test Data Expected

4.151 LVV-T177 - Verify implementation of Incorporate Fault-Tolerance

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl



4.151.1 Verification Elements

• LVV-69 - DMS-REQ-0166-V-01: Incorporate Fault-Tolerance

4.151.2 Test Items

Demonstrate that Data Management Systems have features that prevent data loss. Includes: MD5SUM/checksum verification for data transfer; RAID to eliminate single-point disk failures; multi-site and tape for disaster recovery of raw data; multiple site (and tape?) for backup/recovery of Data Release products; DB transaction logging and backup to maintain DB integrity. (Note: storage to prevent loss in case of networking failures is covered in LVV-T175).

4.151.3 Predecessors

- 4.151.4 Environment Needs
- 4.151.4.1 Software
- 4.151.4.2 Hardware
- 4.151.5 Input Specification
- 4.151.6 Output Specification

4.151.7 Test Procedure

Step	Description, Input Data and Expected Result				
1	Description	Analyze design; execute single-day operations rehearsal including failures, observe recov- ery without loss of data			
·	Test Data	No data.			
	Expected				
	Result				



DRAFT NOT YET APPROVED - The contents of this document are subject to configuration control by the LSST DM Change Control Board. - DRAFT NOT YET APPROVED



4.152 LVV-T178 - Verify implementation of Incorporate Autonomics

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

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4.152.1 Verification Elements

• LVV-70 - DMS-REQ-0167-V-01: Incorporate Autonomics

4.152.2 Test Items

Demonstrate that production systems monitor and report faults. Where possible fault mitigation can include re-start, re-submission, or return of partial products for triage.

4.152.3 Predecessors

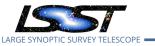
4.152.4 Environment Needs

- 4.152.4.1 Software
- 4.152.4.2 Hardware
- 4.152.5 Input Specification
- 4.152.6 Output Specification
- 4.152.7 Test Procedure

Step	Description, input Data and Expected Result							

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1	Description	Analyze design; execute single-day operations rehearsal including failures, observe auto- mated recovery and continuation of processing
·	Test Data	No data.



Step	Description, Input Data and Expected Result				
	Expected				
	Result				

4.153 LVV-T179 - Verify implementation of Compute Platform Heterogeneity

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.153.1 Verification Elements

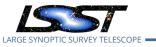
• LVV-145 - DMS-REQ-0314-V-01: Compute Platform Heterogeneity

4.153.2 Test Items

Demonstrate that production results are the same (within machine accuracy) when production occurs on different platforms (OS, kernel, hardware provisioning).

4.153.3 Predecessors

- 4.153.4 Environment Needs
- 4.153.4.1 Software
- 4.153.4.2 Hardware
- 4.153.5 Input Specification
- 4.153.6 Output Specification
- 4.153.7 Test Procedure



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Step	Description, Input Data and Expected Result						
	Description Configure heterogeneous cluster, execute AP+DRP+LSP, observe correct functioning						
1	Test Data No data.						
	Expected						
	Result						

4.154 LVV-T180 - Verify implementation of Data Management Unscheduled Downtime

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.154.1 Verification Elements

• LVV-149 - DMS-REQ-0318-V-01: Data Management Unscheduled Downtime

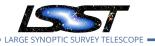
4.154.2 Test Items

This applies only to downtime that would prevent the collection of survey data. Verification means that analysis has occurred to identify likely hardware failures that would prevent survey operations and that mitigations that minimize the downtime to less than DMDowntime (1 day/year) are in place. Known systems that fall in this category include: Image and EFD Archiving, Observatory Operations Data, Telemetry Gateway, Data Backbone, Managed Database, Inter-Site Networks, and Service Management and Monitoring.

4.154.3 Predecessors

4.154.4 Environment Needs

4.154.4.1 Software



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- 4.154.4.2 Hardware
- 4.154.5 Input Specification
- 4.154.6 Output Specification

4.154.7 Test Procedure

Step	Description, Input Data and Expected Result					
	Analyze likely hardware failures with mitigations to compute estimated unplanned down-					
1		time				
•	Test Data	No data.				
	Expected					
	Result					

4.155 LVV-T181 - Verify integration of Summit Facility Data Communications

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

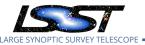
4.155.1 Verification Elements

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

4.155.2 Test Items

This verifies that the Summit Network is integrated properly with the Summit - Base Network. (The former is a TS deliverable, the latter a DM deliverable). Demonstrate data is transferred over the summit instrument data fibers, from the DAQ to the Summit - Base DWDM, along with monitoring network performance. This requirement does not include testing the DAQ buffering of the data, nor the transfer from summit to base which are covered elsewhere.

4.155.3 Predecessors



		Test Spec for LSST Data Management	LDM-639	Latest Revision 2019-07-29
4.155.4	Environment N	eeds		
4.155.4.1	Software			
4.155.4.2	2 Hardware			
4.155.5	Input Specifica	tion		
4.155.6	Output Specific	ation		
4.155.7	Test Procedure			
Step	Description, Inp	ut Data and Expected Re	sult	
	Description D	elegate to Networks		
1	Test Data N	o data.		
	Expected			
	Result			

4.156 LVV-T182 - Verify implementation of Prefer Computing and Storage Down

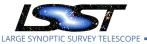
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.156.1 Verification Elements

• LVV-72 - DMS-REQ-0170-V-01: Prefer Computing and Storage Down

4.156.2 Test Items

Only build compute or storage facilities at the summit that are justified by operational need or to prevent loss of data during networking downtimes.



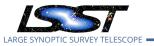
		Test Spec for LSST Data Managemen	t LDM-639	Latest Revision 2019-07-29
4.156.3	Predecessors			
4.156.4	Environment N	leeds		
4.156.4.1	Software			
4.156.4.2	Hardware			
4.156.5	Input Specifica	ition		
4.156.6	Output Specifi	cation		
4.156.7	Test Procedure	2		
Step	Description, Inp	out Data and Expected R	esult	
	Description	Analyze design		
1	Test Data	No data.		
	Expected			
	Result			

4.157 LVV-T183 - Verify implementation of DMS Communication with OCS

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Gregory Dubois-Felsmann

4.157.1 Verification Elements

• LVV-146 - DMS-REQ-0315-V-01: DMS Communication with OCS



4.157.2 Test Items

Verify that the DMS at the Base Facility can receive commands from the OCS and send command responses, events, and telemetry back. Verified by Early Integration activities and during AuxTel commissioning.

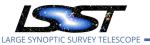
4.157.3 Predecessors

- 4.157.4 Environment Needs
- 4.157.4.1 Software
- 4.157.4.2 Hardware
- 4.157.5 Input Specification
- 4.157.6 Output Specification

4.157.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	From the Base Site, connect to the (simulated) OCS telemetry stream.
1	Test Data	No data.
	Expected	
	Result	
	Description	Send a command to the OCS, and observe that the command has been executed.
2	Test Data	No data.
	Expected	Confirmation that the OCS command successfully executed.
	Result	
3	Description	Extract information from the telemetry being broadcast by the OCS, and ensure that these data are readable.
J	Test Data	No data.
	Expected	A readable extract from the OCS telemetry stream.
	Result	



Step Description, Input Data and Expected Result

4.158 LVV-T185 - Verify implementation of Summit to Base Network Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.158.1 Verification Elements

• LVV-74 - DMS-REQ-0172-V-01: Summit to Base Network Availability

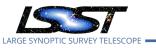
4.158.2 Test Items

Monitor summit to base networking and verify that the mean time between failures is less than summToBaseNetMTBF (90 days) over 1 year.

4.158.3 Predecessors

- 4.158.4 Environment Needs
- 4.158.4.1 Software
- 4.158.4.2 Hardware
- 4.158.5 Input Specification
- 4.158.6 Output Specification

4.158.7 Test Procedure



Step	Description, Input Data and Expected Result				
	Description	Delegate to Networks			
1	Test Data	No data.			
	Expected				
	Result				

4.159 LVV-T186 - Verify implementation of Summit to Base Network Reliability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.159.1 Verification Elements

• LVV-75 - DMS-REQ-0173-V-01: Summit to Base Network Reliability

4.159.2 Test Items

Monitor Summit to Base networking and verify that the mean time to repair is less than summ-ToBaseNetMTTR (24 hours) over a 1-year period.

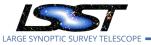
4.159.3 Predecessors

4.159.4 Environment Needs

4.159.4.1 Software

4.159.4.2 Hardware

4.159.5 Input Specification



4.159.6 Output Specification

4.159.7 Test Procedure

Step	Description, li	nput Data and Expected Result
	Description	Delegate to Networks
1	Test Data	No data.
	Expected	
	Result	

4.160 LVV-T187 - Verify implementation of Summit to Base Network Secondary Link

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.160.1 Verification Elements

• LVV-76 - DMS-REQ-0174-V-01: Summit to Base Network Secondary Link

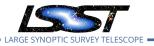
4.160.2 Test Items

A secondary transfer method (redundant fiber network, microwave link, or transportable medium) between Summit and Base capable of transferring 1 night of raw data (nCalibExp-Day + nRawExpNightMax = 450 + 2800 = 3250 exposures) within summToBaseNet2TransMax (72 hours).

4.160.3 Predecessors

4.160.4 Environment Needs

4.160.4.1 Software



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- 4.160.4.2 Hardware
- 4.160.5 Input Specification
- 4.160.6 Output Specification

4.160.7 Test Procedure

Step	Description, li	nput Data and Expected Result	
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.161 LVV-T188 - Verify implementation of Summit to Base Network Ownership and Operation

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

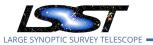
4.161.1 Verification Elements

• LVV-77 - DMS-REQ-0175-V-01: Summit to Base Network Ownership and Operation

4.161.2 Test Items

Verify that the Summit to Base communications link is owned and operated by LSST and/or the operations entity.

4.161.3 Predecessors



4.161.4	Environment Needs
4.161.4. ⁻	Software
4.161.4.2	2 Hardware
4.161.5	Input Specification
4.161.6	Output Specification
4.161.7	Test Procedure
Step	Description, Input Data and Expected Result
	Description Delegate to Networks
1	Test Data No data.
	Expected
	Result

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4.162 LVV-T189 - Verify implementation of Base Facility Infrastructure

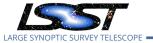
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.162.1 Verification Elements

• LVV-78 - DMS-REQ-0176-V-01: Base Facility Infrastructure

4.162.2 Test Items

Verify that the (a) planned infrastructure and (b) as-built infrastructure for the Base Facility satisfies the needs for data transfer and buffering, a copy of the Archive Facility, and support



for Comr	nissioning.
4.162.3	Predecessors
4.162.4	Environment Needs
4.162.4.1	Software
4.162.4.2	Hardware
4.162.5	Input Specification
4.162.6	Output Specification
4.162.7	Test Procedure
Step	Description, Input Data and Expected Result
	Description Analyze design and sizing model
1	Test Data No data.
	Expected
	Result

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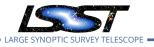
Latest Revision 2019-07-29

4.163 LVV-T190 - Verify implementation of Base Facility Co-Location with Existing Facility

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.163.1 Verification Elements

• LVV-80 - DMS-REQ-0178-V-01: Base Facility Co-Location with Existing Facility



4.163.2 Test Items

Verify that the Base Facility is located at an existing known supported facility.

4.163.3 Predecessors

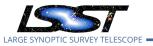
- 4.163.4 Environment Needs
- 4.163.4.1 Software
- 4.163.4.2 Hardware
- 4.163.5 Input Specification
- 4.163.6 Output Specification

4.163.7 Test Procedure

Step	Description, li	nput Data and Expected Result
	Description	Analyze design
1	Test Data	No data.
	Expected	
	Result	

4.164 LVV-T191 - Verify implementation of Commissioning Cluster

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl



4.164.1 Verification Elements

• LVV-147 - DMS-REQ-0316-V-01: Commissioning Cluster

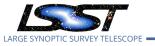
4.164.2 Test Items

Verify that the Commissioning Cluster has sufficient Compute/Storage/LAN at the Base Facility to support Commissioning.

4.164.3	Predecessors	
4.164.4	Environment	Needs
4.164.4.1	Software	
4.164.4.2	2 Hardware	
4.164.5	Input Specifi	cation
4.164.6	Output Speci	fication
4.164.7	Test Procedu	re
Step	Description, Ir	nput Data and Expected Result
	Description	Analyze design and budget
1	Test Data	No data.
	Expected	
	Result	

4.165 LVV-T192 - Verify implementation of Base Wireless LAN (WiFi)

Version Status Priority Verification Type Owner



1 Draft Normal Test Robert Gruendl

4.165.1 Verification Elements

• LVV-183 - DMS-REQ-0352-V-01: Base Wireless LAN (WiFi)

4.165.2 Test Items

Verify (a) planned and (b) as-built wireless network at the Base Facility supports minBaseWiFi bandwidth.

4.165.3 Predecessors

- 4.165.4 Environment Needs
- 4.165.4.1 Software
- 4.165.4.2 Hardware
- 4.165.5 Input Specification
- 4.165.6 Output Specification

4.165.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Delegate to Networks
1	Test Data	No data.
-	Expected	
	Result	



4.166 LVV-T193 - Verify implementation of Base to Archive Network

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.166.1 Verification Elements

• LVV-81 - DMS-REQ-0180-V-01: Base to Archive Network

4.166.2 Test Items

Verify that the Base Facility can transfer a full image+metadata to the Archive Center in base-ToArchiveMaxTransferTime.

4.166.3 Predecessors

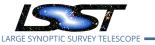
4.166.4 Environment Needs

- 4.166.4.1 Software
- 4.166.4.2 Hardware
- 4.166.5 Input Specification
- 4.166.6 Output Specification
- 4.166.7 Test Procedure

Step Description, Input Data and Expected Result

Description Delegate to Networks

1 Test Data No data.



Step Description, Input Data and Expected Result Expected Result

4.167 LVV-T194 - Verify implementation of Base to Archive Network Availability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.167.1 Verification Elements

• LVV-82 - DMS-REQ-0181-V-01: Base to Archive Network Availability

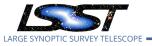
4.167.2 Test Items

Verify Network uptime between Base Facility and Archive Facility.

4.167.3 Predecessors

- 4.167.4 Environment Needs
- 4.167.4.1 Software
- 4.167.4.2 Hardware
- 4.167.5 Input Specification

4.167.6 Output Specification



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4.167.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Delegate to Networks			
1	Test Data	No data.			
	Expected				
	Result				

4.168 LVV-T195 - Verify implementation of Base to Archive Network Reliability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.168.1 Verification Elements

• LVV-83 - DMS-REQ-0182-V-01: Base to Archive Network Reliability

4.168.2 Test Items

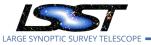
Verify uptime of the Base Facility to Archive Facility network.

4.168.3 Predecessors

- 4.168.4 Environment Needs
- 4.168.4.1 Software

4.168.4.2 Hardware

4.168.5 Input Specification



4.168.6 Output Specification

4.168.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Delegate to Networks			
1	Test Data	No data.			
	Expected				
	Result				

4.169 LVV-T196 - Verify implementation of Base to Archive Network Secondary Link

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.169.1 Verification Elements

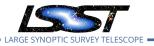
• LVV-84 - DMS-REQ-0183-V-01: Base to Archive Network Secondary Link

4.169.2 Test Items

Verify the performance of a secondary network link meets needs for operations support and catching up after outages.

4.169.3 Predecessors

- 4.169.4 Environment Needs
- 4.169.4.1 Software



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- 4.169.4.2 Hardware
- 4.169.5 Input Specification
- 4.169.6 Output Specification

4.169.7 Test Procedure

Step	Description, li	nput Data and Expected Result	
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.170 LVV-T197 - Verify implementation of Archive Center

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

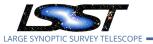
4.170.1 Verification Elements

• LVV-85 - DMS-REQ-0185-V-01: Archive Center

4.170.2 Test Items

Verify that the Archive Center is sufficiently provisioned to support prompt processing, DRP, and data access needs.

4.170.3 Predecessors



4.170.4 Environment Needs

- 4.170.4.1 Software
- 4.170.4.2 Hardware
- 4.170.5 Input Specification
- 4.170.6 Output Specification

4.170.7 Test Procedure

 Step
 Description, Input Data and Expected Result

 1
 Description
 Analyze design and sizing model

 1
 Test Data
 No data.

 Expected
 Result

4.171 LVV-T198 - Verify implementation of Archive Center Disaster Recovery

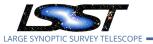
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.171.1 Verification Elements

• LVV-86 - DMS-REQ-0186-V-01: Archive Center Disaster Recovery

4.171.2 Test Items

Verify disaster recovery plan for Archive Center.



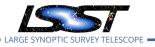
4.171.3	Predecessors
4.171.4	Environment Needs
4.171.4.1	Software
4.171.4.2	2 Hardware
4.171.5	Input Specification
4.171.6	Output Specification
4.171.7	Test Procedure
Step	Description, Input Data and Expected Result
	Description Analyze design; simulate storage failure, observe restore from disaster recovery
1	Test Data No data.
	Expected
	Result

4.172 LVV-T199 - Verify implementation of Archive Center Co-Location with Existing Facility

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.172.1 Verification Elements

• LVV-87 - DMS-REQ-0187-V-01: Archive Center Co-Location with Existing Facility



4.172.2 Test Items

Verify the Archive Center is located at an existing supported facility.

4.172.3 Predecessors

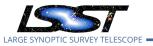
- 4.172.4 Environment Needs
- 4.172.4.1 Software
- 4.172.4.2 Hardware
- 4.172.5 Input Specification
- 4.172.6 Output Specification

4.172.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Analyze design	
1	Test Data	No data.	
	Expected		
	Result		

4.173 LVV-T200 - Verify implementation of Archive to Data Access Center Network

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl



4.173.1 Verification Elements

• LVV-88 - DMS-REQ-0188-V-01: Archive to Data Access Center Network

4.173.2 Test Items

Verify sufficient bandwidth between Archive Center and Data Access Centers of at least arch-ToDacBandwidth.

4.173.3 Predecessors

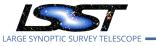
- 4.173.4 Environment Needs
- 4.173.4.1 Software
- 4.173.4.2 Hardware
- 4.173.5 Input Specification

4.173.6 Output Specification

4.173.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Delegate to Networks	
1	Test Data	No data.	
	Expected		
	Result		

4.174 LVV-T201 - Verify implementation of Archive to Data Access Center Network Availability



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Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

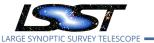
4.174.1 Verification Elements

• LVV-89 - DMS-REQ-0189-V-01: Archive to Data Access Center Network Availability

- 4.174.2 Test Items
- 4.174.3 Predecessors
- 4.174.4 Environment Needs
- 4.174.4.1 Software
- 4.174.4.2 Hardware
- 4.174.5 Input Specification
- 4.174.6 Output Specification

4.174.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description	Delegate to Networks			
1	Test Data No data.				
	Expected				
	Result				



4.175 LVV-T202 - Verify implementation of Archive to Data Access Center Network Reliability

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.175.1 Verification Elements

• LVV-90 - DMS-REQ-0190-V-01: Archive to Data Access Center Network Reliability

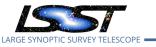
4.175.2 Test Items

Verify the reliability of the Archive to Data Access Center communications.

- 4.175.3 Predecessors
- 4.175.4 Environment Needs
- 4.175.4.1 Software
- 4.175.4.2 Hardware
- 4.175.5 Input Specification
- 4.175.6 Output Specification
- 4.175.7 Test Procedure
- Step Description, Input Data and Expected Result

Description Delegate to Networks

1 Test Data No data.



Step	Description, Input Data and Expected Result
	Expected
	Result

4.176 LVV-T203 - Verify implementation of Archive to Data Access Center Network Secondary Link

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.176.1 Verification Elements

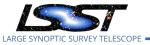
• LVV-91 - DMS-REQ-0191-V-01: Archive to Data Access Center Network Secondary Link

4.176.2 Test Items

Inter-Site Networks

4.176.3 Predecessors

- 4.176.4 Environment Needs
- 4.176.4.1 Software
- 4.176.4.2 Hardware
- 4.176.5 Input Specification
- 4.176.6 Output Specification



4.176.7 Test Procedure

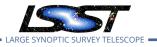
Step	Description, li	nput Data and Expected Result
	Description	Take primary network link down
1	Test Data	No data.
	Expected	
	Result	
	Description	Observe operations support over secondary link
2	Test Data	No data.
	Expected	
	Result	
	Description	Bring primary network link back up
3	Test Data	No data.
	Expected	
	Result	
	Description	Observe catch-up capability over secondary link
4	Test Data	No data.
	Expected	
	Result	

4.177 LVV-T204 - Verify implementation of Access to catalogs for external Level 3 processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.177.1 Verification Elements

• LVV-50 - DMS-REQ-0122-V-01: Access to catalogs for external Level 3 processing



4.177.2 Test Items

Verify that catalog export, and maintenance/validation tools for Level 3 products to outside of the Data Access Centers.

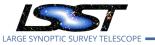
- 4.177.3 Predecessors
- 4.177.4 Environment Needs
- 4.177.4.1 Software
- 4.177.4.2 Hardware
- 4.177.5 Input Specification
- 4.177.6 Output Specification

4.177.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Execute bulk distribution of DRP catalogs
1	Test Data	No data.
	Expected	
	Result	
	Description	Observe correct transfer and use of maintenance/validation tools
2	Description Test Data	Observe correct transfer and use of maintenance/validation tools No data.
2	-	

4.178 LVV-T205 - Verify implementation of Access to input catalogs for DACbased Level 3 processing



Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Robert Gruendl

4.178.1 Verification Elements

• LVV-51 - DMS-REQ-0123-V-01: Access to input catalogs for DAC-based Level 3 processing

4.178.2 Test Items

Verify that data products are available at the Data Access Centers for use in Level 3 processing.

- 4.178.3 Predecessors
- 4.178.4 Environment Needs
- 4.178.4.1 Software
- 4.178.4.2 Hardware
- 4.178.5 Input Specification
- 4.178.6 Output Specification

4.178.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Load Prompt and DR catalogs into PDAC, observe access via LSP
1	Test Data	No data.
	Expected	
	Result	



4.179 LVV-T206 - Verify implementation of Federation with external catalogs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.179.1 Verification Elements

• LVV-52 - DMS-REQ-0124-V-01: Federation with external catalogs

4.179.2 Test Items

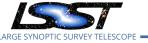
Verify that LSST-produced data can be combined with external datasets.

- 4.179.3 Predecessors
- 4.179.4 Environment Needs
- 4.179.4.1 Software
- 4.179.4.2 Hardware
- 4.179.5 Input Specification
- 4.179.6 Output Specification

4.179.7 Test Procedure

Description, Input Data and Expected Result Step

Description Load external catalog into PDAC (using VO if possible), observe federation with other catalogs via LSP 1 Test Data No data. Expected Result



Step Description, Input Data and Expected Result

4.180 LVV-T207 - Verify implementation of Access to images for external Level 3 processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.180.1 Verification Elements

• LVV-54 - DMS-REQ-0126-V-01: Access to images for external Level 3 processing

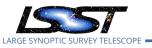
4.180.2 Test Items

Verify that bulk distribution of images, and accompanying maintenance/validation tools for Level 3 image products to outside of the Data Access Centers.

4.180.3 Predecessors

- 4.180.4 Environment Needs
- 4.180.4.1 Software
- 4.180.4.2 Hardware
- 4.180.5 Input Specification
- 4.180.6 Output Specification

4.180.7 Test Procedure



Step	Description, Input Data and Expected Result			
	Description	Execute bulk distribution of DRP images		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Observe correct transfer and use of maintenance/validation tools		
2	Test Data	No data.		
	Expected			
	Result			

4.181 LVV-T208 - Verify implementation of Access to input images for DAC-based Level 3 processing

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.181.1 Verification Elements

• LVV-55 - DMS-REQ-0127-V-01: Access to input images for DAC-based Level 3 processing

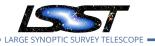
4.181.2 Test Items

Verify that prompt processing and DRP products are available at the DACs for Level 3 processing at the DACs.

4.181.3 Predecessors

4.181.4 Environment Needs

4.181.4.1 Software



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- 4.181.4.2 Hardware
- 4.181.5 Input Specification
- 4.181.6 Output Specification

4.181.7 Test Procedure

Step	Description, Input Data and Expected Result				
	Description Load Prompt and DR images into PDAC				
1	Test Data No data.				
	Expected				
	Result				
	Description Observe access via LSP				
2	Test Data No data.				
	Expected				
	Result				

4.182 LVV-T209 - Verify implementation of Data Access Centers

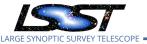
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Analysis	Kian-Tat Lim

4.182.1 Verification Elements

• LVV-92 - DMS-REQ-0193-V-01: Data Access Centers

4.182.2 Test Items

Verify that the Data Access Centers are provisioned with computing resources necessary to support end-user access to LSST Data Products.



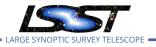
LARGE SYNOPTIC S	SURVEY TELESCOPE			
		Test Spec for LSST Data Management	LDM-639	Latest Revision 2019-07-29
4.182.3	Predecessors	5		
4,182,4	Environment	Needs		
4.182.4.1	l Software			
4.182.4.2	2 Hardware			
1 100 E	Innut Specifi	antion		
4.182.5	Input Specifi	cation		
4.182.6	Output Speci	fication		
4.182.7	Test Procedu	re		
Step	Description, li	nput Data and Expected Resu	llt	
	Description	Analyze design		
1	Test Data	No data.		
•	Expected			
	•			
	Result			

4.183 LVV-T210 - Verify implementation of Data Access Center Simultaneous Connections

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Kian-Tat Lim

4.183.1 Verification Elements

• LVV-93 - DMS-REQ-0194-V-01: Data Access Center Simultaneous Connections



4.183.2 Test Items

Verify that the each DAC can support at least dacMinConnections simultaneously

4.183.3 Predecessors

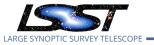
- 4.183.4 Environment Needs
- 4.183.4.1 Software
- 4.183.4.2 Hardware
- 4.183.5 Input Specification
- 4.183.6 Output Specification

4.183.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Simulate data access to PDAC		
1	Test Data	No data.		
	Expected			
	Result			
	Description	Observe scaling		
2	Test Data	No data.		
	Expected			
	Result			

4.184 LVV-T211 - Verify implementation of Data Access Center Geographical Distribution

Version Status Priority Verification Type Owner



1 Draft Normal Analysis Kian-Tat Lim

4.184.1 Verification Elements

• LVV-94 - DMS-REQ-0196-V-01: Data Access Center Geographical Distribution

4.184.2 Test Items

Verify that the DACs are geographically distributed to provide low-latency access to data-rights community.

4.184.3 Predecessors

- 4.184.4 Environment Needs
- 4.184.4.1 Software
- 4.184.4.2 Hardware
- 4.184.5 Input Specification
- 4.184.6 Output Specification

4.184.7 Test Procedure

Step Description, Input Data and Expected Result

	Description	Analyze design
1	Test Data	No data.
	Expected	
	Result	

4.185 LVV-T212 - Verify implementation of No Limit on Data Access Centers

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Colin Slater

4.185.1 Verification Elements

• LVV-95 - DMS-REQ-0197-V-01: No Limit on Data Access Centers

4.185.2 Test Items

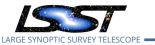
Verify that additional Data Access Centers can be set up.

- 4.185.3 Predecessors
- 4.185.4 Environment Needs
- 4.185.4.1 Software
- 4.185.4.2 Hardware
- 4.185.5 Input Specification
- 4.185.6 Output Specification

4.185.7 Test Procedure

Step	Description, I	nput Data and Expected Result

	Description	Analyze design; instantiate and load simulated DAC, observe correct functioning
1	Test Data	No data.
_	Expected	
	Result	



4.186 LVV-T376 - Verify the Calculation of Ellipticity Correlations

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Leanne Guy

4.186.1 Verification Elements

- LVV-3404 DMS-REQ-0362-V-01: Median residual PSF ellipticity correlations on 5 arcmin scales
- 4.186.2 Test Items
- 4.186.3 Predecessors
- 4.186.4 Environment Needs
- 4.186.4.1 Software
- 4.186.4.2 Hardware
- 4.186.5 Input Specification
- 4.186.6 Output Specification
- 4.186.7 Test Procedure
- Step Description, Input Data and Expected Result

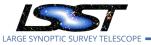
	Description	
1	Test Data	No data.
	Expected	
	Result	

4.187 LVV-T377 - Verify Calculation of Photometric Performance Metrics

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Leanne Guy

4.187.1 Verification Elements

- LVV-3401 DMS-REQ-0359-V-01: RMS photometric repeatability in uzy
- LVV-9751 DMS-REQ-0359-V-02: Max fraction of sensors with excess unusable pixels
- LVV-9757 DMS-REQ-0359-V-08: Max cross-talk imperfections
- LVV-9755 DMS-REQ-0359-V-06: Accuracy of photometric transformation
- LVV-9754 DMS-REQ-0359-V-05: Repeatability outlier limit in gri
- LVV-9752 DMS-REQ-0359-V-03: Max fraction of outliers among non-saturated sources
- LVV-9756 DMS-REQ-0359-V-07: RMS width of zero point in u-band
- LVV-9753 DMS-REQ-0359-V-04: Accuracy of zero point for colors with u-band
- LVV-9762 DMS-REQ-0359-V-13: Max sky brightness error
- LVV-9760 DMS-REQ-0359-V-11: Fraction of zero point outliers
- LVV-9759 DMS-REQ-0359-V-10: RMS photometric repeatability in gri
- LVV-9758 DMS-REQ-0359-V-09: Repeatability outlier limit in uzy
- LVV-9761 DMS-REQ-0359-V-12: Max fraction of unusable pixels per sensor
- LVV-9764 DMS-REQ-0359-V-15: Percentage of image area with ghosts
- LVV-9766 DMS-REQ-0359-V-17: Max RMS of resolved/unresolved flux ratio
- LVV-9763 DMS-REQ-0359-V-14: RMS width of zero point in all bands except u
- LVV-9765 DMS-REQ-0359-V-16: Accuracy of zero point for colors without u-band



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4.187.2 Test Items

Verify that the DMS system provides software to calculate photometric performance metrics, and that the algorithms are properly calculating the desired quantities. Note that because the DMS requirement is that the software shall be provided (and not on the actual measured values of the metrics), we verify all of the requirements via a single test case.

4.187.3 Predecessors

- 4.187.4 Environment Needs
- 4.187.4.1 Software
- 4.187.4.2 Hardware
- 4.187.5 Input Specification

4.187.6 Output Specification

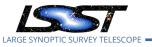
4.187.7 Test Procedure

3

Step	Description, li	nput Data and Expected Result
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- _lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	
2	Description	Point the butler to a simulated dataset containing data in all filters, that is sufficient for the purposes of measuring photometric performance metrics.
2	Test Data	No data.
	Expected	
	Result	
	Description	Execute the LSST Stack package 'validate_drp' (or an alternate package that is relevant) on

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this dataset to perform the measurements of the metrics.



Step Description, Input Data and Expected Result

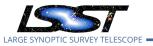
	Test Data	No data.
	Expected Result	Measurements of validation metrics and the presence of QA plots resulting from the val- idation pipeline.
4	Description	Compare measured photometry to known values from input simulated data, and confirm that the output values for all of the photometric performance metrics are as expected.
-	Test Data	No data.
	Expected Result	Measured astrometry metrics that are within reasonable values given the (known) input dataset.

4.188 LVV-T378 - Verify Calculation of Astrometric Performance Metrics

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Leanne Guy

4.188.1 Verification Elements

- LVV-3402 DMS-REQ-0360-V-01: Median astrometric error on 20 arcmin scales
- LVV-9778 DMS-REQ-0360-V-12: RMS difference between r-band and other filter separation
- LVV-9777 DMS-REQ-0360-V-11: Max fraction of r-band color difference outliers
- LVV-9779 DMS-REQ-0360-V-13: Max fraction exceeding limit on 200 arcmin scales
- LVV-9773 DMS-REQ-0360-V-07: Outlier limit on 5 arcmin scales
- LVV-9770 DMS-REQ-0360-V-05: Outlier limit on 20 arcmin scales
- LVV-9775 DMS-REQ-0360-V-09: Outlier limit on 200 arcmin scales
- LVV-9769 DMS-REQ-0360-V-04: Median absolute error in RA, Dec
- LVV-9774 DMS-REQ-0360-V-08: Median astrometric error on 200 arcmin scales
- LVV-9768 DMS-REQ-0360-V-03: Median astrometric error on 5 arcmin scales



- LVV-9771 DMS-REQ-0360-V-06: Color difference outlier limit relative to r-band
- LVV-9776 DMS-REQ-0360-V-10: Max fraction exceeding limit on 20 arcmin scales
- LVV-9767 DMS-REQ-0360-V-02: Max fraction exceeding limit on 5 arcmin scales

4.188.2 Test Items

Verify that the DMS system provides software to calculate astrometric performance metrics, and that the algorithms are properly calculating the desired quantities. Note that because the DMS requirement is that the software shall be provided (and not on the actual measured values of the metrics), we verify all of the requirements via a single test case.

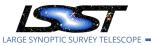
4.188.3 Predecessors

- 4.188.4 Environment Needs
- 4.188.4.1 Software
- 4.188.4.2 Hardware
- 4.188.5 Input Specification
- 4.188.6 Output Specification

4.188.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- _lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	



Step Description, Input Data and Expected Result Description Point the butler to a simulated dataset containing data in all filters, that is sufficient for the purposes of measuring astrometric performance metrics. 2 Test Data No data. Expected Result Description Execute the LSST Stack package 'validate_drp' (or an alternate package that is relevant) on this dataset to perform the measurements of the metrics. 3 Test Data No data. Expected Measurements of validation metrics and the presence of QA plots resulting from the validation pipeline. Result Description Compare measured astrometry to known values from input simulated data, and confirm that the output values for all of the astrometric performance metrics are as expected. 4 Test Data No data. Expected Measured astrometry metrics that are within reasonable values given the (known) input dataset. Result

4.189 LVV-T385 - Verify Retrieval of a CCD-sized image from a coadd

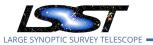
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Leanne Guy

4.189.1 Verification Elements

• LVV-3394 - DMS-REQ-0377-V-01: Min number of simultaneous single-CCD coadd cutout image users

4.189.2 Test Items

4.189.3 Predecessors



4.189.4	Environment Needs			
4.189.4.	1 Software			
4.189.4.2	4.189.4.2 Hardware			
4.189.5	Input Specification			
4.189.6	Output Specification			
4.189.7	Test Procedure			
Step	Description, Input Data and Expected Result			
	Description			
1	Test Data No data.			
	Expected			
	Result			

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4.190 LVV-T1097 - Verify Summit to Base Network Implementation

Test Spec for LSST Data Management

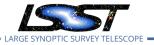
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeff Kantor

4.190.1 Verification Elements

- LVV-73 DMS-REQ-0171-V-01: Summit to Base Network
- LVV-71 DMS-REQ-0168-V-01: Summit Facility Data Communications

4.190.2 Test Items

Verify that:



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- 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

4.190.3 Predecessors

None.

4.190.4 Environment Needs

4.190.4.1 Software OCS/DMCS test harness
Simulated images and meta-data
EFD
DAQ client
Archiver/forwarder (Data Backbone)

4.190.4.2 Hardware DAQ

Base servers with archiver

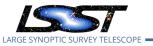
4.190.5 Input Specification

- 1. Summit Control Network and Camera Data Backbone installed and operating properly.
- 2. Summit Base Network installed and operating properly.
- 3. Simulated or real DAQ installed on summit and pre-loaded with image data.
- 4. EFD installed on summit and pre-loaded with image meta-data.
- 5. Archiver/forwarders installed in Base and operating properly.
- 6. OCS/DMCS test harness installed and pre-configured to trigger read-out and transfer.

4.190.6 Output Specification

Image and meta-data transferred to Base Archiver/Forwarders.

4.190.7 Test Procedure



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Step	Description, Input Data and Expected Result			
Description Verify the available documentation in order to ensure that the Summit to Bas				
1		has been set-up and is working.		
Test Data No data.		No data.		
	Expected	List of documents that demonstrate the network implementation		
	Result			

4.191 LVV-T1168 - Test Summit - Base Network Integration

,	Version	Status	Priority	Verification Type	Owner
	1	Draft	Normal	Inspection	Jeff Kantor

4.191.1 Verification Elements

• LVV-73 - DMS-REQ-0171-V-01: Summit to Base Network

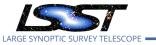
4.191.2 Test Items

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)

4.191.3 Predecessors

See pre-conditions by phase above.



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4.191.4 Environment Needs

4.191.4.1 Software perfsonar on DTN.

4.191.4.2 Hardware OTDR, DTN.

4.191.5 Input Specification

By phase:

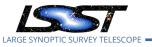
- 1. Posts from Cerro Pachon to AURA Gatehouse repaired/improved. Fiber installed on posts from Cerro Pachon to AURA Gatehouse. Fiber installed from AURA Gatehouse to AURA compound in La Serena. OTDR purchased.
- 2. AURA DWDM installed in caseta on Cerro Pachon and in existing computer room in La Serena. 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.

4.191.6 Output Specification

Fiber tested to within acceptable Db. Bandwidth, latency within specifications.

4.191.7 Test Procedure

Step	Description, l	Description, Input Data and Expected Result		
	Description	Test optical fiber with OTDR		
1	Test Data	OTDR generated optical data		
	Expected	Fiber tested to within acceptable Db.		
	Result			
	Description	Test AURA DWDM		
2	Test Data	DTN perfSonar generated data		



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Step	Description, Input Data and Expected Result				
	Expected Result	Summit - Base bandwidth and latency within specifications			
	Description	Test LSST DWDM			
3 Test Data BERT generated data		BERT generated data			
	Expected	Summit - Base bandwidth, latency, bit error rate within specifications			
	Result				

4.192 LVV-T1232 - Verify Implementation of Catalog Export Formats From the Portal Aspect

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin

4.192.1 Verification Elements

• LVV-35 - DMS-REQ-0078-V-01: Catalog Export Formats

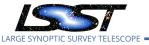
4.192.2 Test Items

Verify that catalog data is exportable from the portal aspect in a variety of community-standard formats.

4.192.3 Predecessors

- 4.192.4 Environment Needs
- 4.192.4.1 Software

4.192.4.2 Hardware



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4.192.5 Input Specification

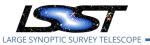
4.192.6 Output Specification

4.192.7 Test Procedure

Step Description, Input Data and Expected Result

1-1 from	Description	Navigate to the portal endpoint. The stable version should be used for this test and is currently
LVV-T849	Test Data	
	Expected	Currently this drops the user into an active portal environment.
	Result	
1-2 from	Description	Though the current stable system does not authenticate currently, this step and the previous one should be updated as the system evolves.
LVV-T849	Test Data	
	Expected	No-op.
	Result	

	Description	Select query type "ADQL".
2	Test Data	No data.
	Expected	
	Result	
3	Description	Execute the example query given in the example code below by entering the text in the ADQL Query box, then clicking "Search" at the lower left corner of the page.
5	Test Data	No data.
	Example	SELECT cntr, ra, decl, w1mpro_ep, w2mpro_ep, w3mpro_ep FROM
	Code	<pre>wise_00.allwise_p3as_mep WHERE CONTAINS(POINT('ICRS', ra, decl), CIRCLE('ICRS',</pre>
		192.85, 27.13, .2)) = 1
	Expected	A new page will load with the search results as a table, with some plots as well.
	Result	
4	Description	Click the icon that looks like a floppy disk (it says "Save the content as an IPAC, CSV, or TSV table" when you mouse over it).
·	Test Data	No data.
	Expected	
	Result	



Step	Description, lr	nput Data and Expected Result		
5	Description	 Select "CSV", then specify a destination to save the file on your local computer. Select "VOTable", then specify a destination to save the file on your local computer. Select "FITS", then specify a destination to save the file on your local computer. 		
	Test Data	No data.		
	Expected			
	Result			
6	Description	Open each of the files (either in TOPCAT, or using Astropy io tools). Confirm that the data tables are well-formed, and that each table contains the same columns and the same number of rows.		
	Test Data	No data.		
	Expected			
	Result			
	Description			
7	Test Data	No data.		
	Expected			
	Result			

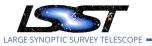
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8-1 from	Description	Currently, there is no logout mechanism on the portal. This should be updated as the system matures.
LVV-T850		
		Simply close the browser window.
	Test Data	
	Expected	Closed browser window. When navigating to the portal endpoint, expect to execute the steps in
	Result	LVV-T849.

4.193 LVV-T1240 - Verify implementation of minimum astrometric standards per CCD

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Jim Bosch



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4.193.1 Verification Elements

• LVV-9741 - DMS-REQ-0030-V-02: Minimum astrometric standards per CCD

4.193.2 Test Items

Verify that each CCD in a processed dataset had its astrometric solution determined by at least **astrometricMinStandards = 5** astrometric standards.

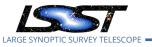
4.193.3 Predecessors

- 4.193.4 Environment Needs
- 4.193.4.1 Software
- 4.193.4.2 Hardware
- 4.193.5 Input Specification

4.193.6 Output Specification

4.193.7 Test Procedure

Step	Description, l	nput Data and Expected Result
1-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- _lowing:
LVV-T987	Test Data	
	Expected	Butler repo available for reading.
	Result	
	Description	Ingest data from an appropriate processed dataset.
2	Test Data	No data.
	Expected	
	Result	



Step	Description, l	nput Data and Expected Result
3	Description	Select a single visit from the dataset, and extract its calibration data. For a subset of CCDs, check how many astrometric standards contributed to the solution. Confirm that this number is at least astrometricMinStandards = 5.
	Test Data	No data.
	Expected Result	At least astrometricMinStandards from each CCD were used in determining the WCS solution.

4.194 LVV-T1250 - Verify implementation of minimum number of simultaneous DM EFD query users

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin

4.194.1 Verification Elements

• LVV-3400 - DMS-REQ-0358-V-01: Min number of simultaneous DM EFD query users

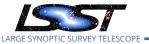
4.194.2 Test Items

Verify that the DM EFD can support **dmEfdQueryUsers = 5** simultaneous queries. The additional requirement that each query must last no more than **dmEfdQueryTime = 10 seconds** will be verified separately in LVV-T1251, but these must be satisfied together.

4.194.3 Predecessors

- 4.194.4 Environment Needs
- 4.194.4.1 Software

4.194.4.2 Hardware



4.194.5 Input Specification

4.194.6 Output Specification

4.194.7 Test Procedure

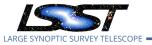
Step	Description, I	nput Data and Expected Result
	Description	Send multiple (at least 5) simultaneous queries to the DM EFD.
1	Test Data	No data.
	Expected	
	Result	
2	Description	Confirm that (a) the queries executed successfully, and that (b) they return reasonable results.
2	Test Data	No data.
	Expected	
	Result	
3	Description	Repeat the above steps for different queries, and different numbers of simultaneous queries, to confirm that the expected performance is met regardless of the query being executed.
	Test Data	No data.
	Expected	
	Result	

4.195 LVV-T1251 - Verify implementation of maximum time to retrieve DM EFD query results

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin

4.195.1 Verification Elements

• LVV-9788 - DMS-REQ-0358-V-02: Max time to retrieve DM EFD query results



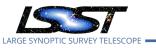
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4.195.2 Test Items

Verify that the DM EFD can support **dmEfdQueryUsers = 5** simultaneous queries, with each query must executing in no more than **dmEfdQueryTime = 10 seconds.** The requirement on at least 5 simultaneous queries will be verified separately in LVV-T1250, but these must be satisfied together.

- 4.195.3 Predecessors
- 4.195.4 Environment Needs
- 4.195.4.1 Software
- 4.195.4.2 Hardware
- 4.195.5 Input Specification
- 4.195.6 Output Specification
- 4.195.7 Test Procedure

Step	Description, Input Data and Expected Result			
	Description	Send multiple (at least 5) simultaneous queries to the DM EFD.		
1	Test Data	No data.		
	Expected			
	Result			
2	Description	Confirm that (a) the queries executed successfully, and that (b) they return reasonable results. Check that the time of execution for all queries was less than 10 seconds.		
2	Test Data	No data.		
	Expected			
	Result			
3	Description	Repeat the above steps for different queries, and different numbers of simultaneous queries, to confirm that the expected performance is met regardless of the query being executed.		



Step	Description, Input Data and Expected Result		
	Test Data	No data.	
	Expected		
	Result		

4.196 LVV-T1252 - Verify number of simultaneous alert filter users

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Eric Bellm

4.196.1 Verification Elements

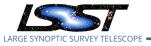
• LVV-9748 - DMS-REQ-0343-V-02: Number of simultaneous users

4.196.2 Test Items

Verify that the DMS alert filter service supports **numBrokerUsers = 100** simultaneous brokers.

- 4.196.3 Predecessors
- 4.196.4 Environment Needs
- 4.196.4.1 Software
- 4.196.4.2 Hardware
- 4.196.5 Input Specification

4.196.6 Output Specification



4.196.7 Test Procedure

Step	Description, Input Data and Expected Result		
	Description	Create a simulated alert stream.	
1	Test Data	No data.	
	Expected		
	Result		
2	Description	Simultaneously execute user-defined alert filters for at least numBrokerUsers = 100 users, and confirm that the system successfully filters the stream as requested. Confirm that the bandwidth requirement of numBrokerAlerts = 20 per user was	
-		met.Simultaneously execute user-defined alert filters for at least 100 users, and confirm that the system successfully filters the stream as requested.	
	Test Data	No data.	
	Expected	All of the (simulated) numBrokerUsers = 100 users successfully receive their requested	
	Result	filtered alerts.	

4.197 LVV-T1264 - Verify implementation of archiving camera test data

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl

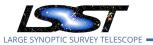
4.197.1 Verification Elements

• LVV-9637 - DMS-REQ-0372-V-01: Archiving Camera Test Data

4.197.2 Test Items

Verify that a subset of camera test data has been ingested into Butler repos and is available through standard data access tools.

4.197.3 Predecessors



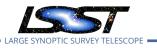
4.197.4 Environment Needs

- 4.197.4.1 Software
- 4.197.4.2 Hardware
- 4.197.5 Input Specification
- 4.197.6 Output Specification

4.197.7 Test Procedure

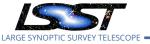
Step Description, Input Data and Expected Result

	Description	Obtain some data on a camera test stand.
1	Test Data	No data.
	Expected	
	Result	
	Description	Wait a sufficient amount of time, then confirm that automatic transfer/ingest of the data
2		has occurred, and a repo is available at NCSA.
	Test Data	No data.
	Expected	The data is present at NCSA in non-empty repos.
	Result	
	Description	Identify the relevant Butler repo of ingested camera test stand data.
3	Test Data	No data.
	Expected	
	Result	
4-1 from	Description	Identify the path to the data repository, which we will refer to as 'DATA/path', then execute the fol- _lowing:
LVV-T987	Test Data	
	Expected	
	Result	
5	Description	Read various repo data products with the Butler, and confirm that they contain the expected data.



Step	Description, Input Data and Expected Result		
	Test Data	No data.	
	Expected	Camera test stand data that is well-formed.	
	Result		





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5 Reusable Test Cases

Test cases in this section are made up of commonly encountered steps that have been factored out into modular, reusable scripts. These test cases are meant solely for the building of actual tests used for verification, to be inserted in test scripts via the "Call to Test" functionality in Jira/ATM. They streamline the process of writing test scripts by providing pre-designed steps, while also ensuring homogeneity throughout the test suite. These reusable modules are not themselves verifying requirements. Also, these test cases shall not call other reusable test cases in their script.

5.1 LVV-T12 - DRP-00-10: Data Release Includes Required Data Products

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jim Bosch

5.1.1 Test Items

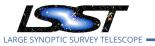
This test will check that the basic data products which should be in an data release are generated by execution of the science payload.

These products will include:

- Source catalogs, derived from PVIs and coadded images (DMS-REQ-0267 & DMS-REQ-0277);
- Forced source catalogs (DMS-REQ-0268);
- Object catalogs (DMS-REQ-0275);
- Processed visit images (PVIs; DMS-REQ-0069);
- Coadded images (DMS-REQ-0279);

5.2 LVV-T18 - AG-00-05: Alert Generation Produces Required Data Products

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Eric Bellm



5.2.1 Test Items

This test will check that the basic data products produced by Alert Generation are generated by execution of the science payload.

These products will include:

- Processed visit images (PVIs; DMS-REQ-0069);
- Difference Exposures (DMS-REQ-0010);
- DIASource catalogs (DMS-REQ-0269);
- DIAObject catalogs (DMS-REQ-0271);

5.3 LVV-T29 - Verify implementation of Raw Science Image Data Acquisition

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim

5.3.1 Test Items

Verify acquisition of raw data from L1 Test Stand DAQ while simulating all modes

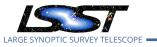
5.4 LVV-T32 - Verify implementation of Raw Image Assembly

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Kian-Tat Lim

5.4.1 Test Items

Verify that the raw exposure data from all readout channels in a sensor can be assembled into a single image, and that all required/relevant metadata are associated with the image data.

5.5 LVV-T216 - Installation of the Alert Distribution payloads.



Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Eric Bellm

5.5.1 Test Items

This test will check:

- That the Alert Distribution payloads are available from documented channels.
- That the Alert Distribution payloads can be installed on LSST Data Facility-managed systems.
- That the Alert Distribution payloads can be executed by LSST Data Facility-managed systems.

5.6 LVV-T217 - Full Stream Alert Distribution

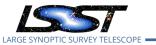
Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Eric Bellm

5.6.1 Test Items

This test will check that the full stream of LSST alerts can be distributed to end users.

Specifically, this will demonstrate that:

- Serialized alert packets can be loaded into the alert distribution system at LSST-relevant scales (10,000 alerts every 39 seconds);
- Alert packets can be retrieved from the queue system at LSST-relevant scales.



5.7 LVV-T987 - Instantiate the Butler for reading data

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin

5.7.1 Test Items

Create a Butler client to read data from an input repository.

5.8 LVV-T866 - Run Alert Production Payload

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin

5.8.1 Test Items

Execute Alert Production payload on a dataset. Generate all (or a subset of) Prompt science data products including Alerts (with the exception of Solar System object orbits) and load them into the Data Backbone and Prompt Products Database.

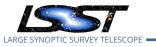
5.9 LVV-T1059 - Run Daily Calibration Products Update Payload

	Version	Status	Priority	Verification Type	Owner
_	1	Draft	Normal	Test	Jeffrey Carlin

5.9.1 Test Items

Execute the Daily Calibration Products Update payload to create a subset of Master Calibration images and Calibration Database entries.

5.10 LVV-T21 - AG-00-20: Scientific Verification of DIASource Catalog



Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Eric Bellm

5.10.1 Test Items

This test will check that the difference image source catalogs delivered by the Alert Generation science payload meet the requirements laid down by LSE-61.

- Specifically, this will demonstrate that:
- Measurements in the catalog are presented in flux units (DMS-REQ-0347);
- Each DIASource record contains an appropriate subset of the attributes required by DMS-REQ-0269. In particular, the LDM-503-3-era pipeline is expected to provide DIA-Source positions (sky and focal plane), fluxes, and flags indicative of issues encountered during processing.
- Faint DIASources satisfying additional criteria are stored (DMS-REQ-0270).
- Derived quantities are provided in pre-computed columns (DMS-REQ-0331);

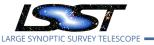
This test does not include quantitative targets for the science quality criteria.

5.11 LVV-T22 - AG-00-25: Scientific Verification of DIAObject Catalog

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Eric Bellm

5.11.1 Test Items

This test will check that the DIAObject catalogs delivered by the Alert Generation science payload meet the requirements laid down by LSE-61.



Specifically, this will demonstrate that:

- DIAObjects are recorded with unique identifiers (DMS-REQ-0271);
- Measurements in the catalog are presented in flux units (DMS-REQ-0347);
- EachDIAObjectrecordcontainscontainsanappropriatesetofsummaryattributes(DMS-REQ-0271 and DMS-REQ-0272). Note:
 - This test is executed independently of the Data Release Production system. Hence, DIAObjects are not associated to Objects, and the association metadata specified by DMS-REQ-0271 is not expected to be available.
 - TheLDM-503-3erapipelineisnotexpectedtocalculateorpersistallattributesspec- ified by DMS-REQ-0272 requirement.
- Relevant derived quantities are provided in pre-computed columns (DMS-REQ-0331);

This test does not include quantitative targets for the science quality criteria.

5.12 LVV-T53 - Verify implementation of SSObject Catalog

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

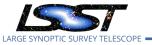
5.12.1 Test Items

Verify that the DMS produces a catalog of Solar System Objects identify from Moving Object Processing.

Verify that the SSObject catalog includes orbital elements and additional related quanitites.

5.13 LVV-T16 - DRP-00-35: Scientific Verification of Coadd Images

Version	Status	Priority	Verification Type	Owner
1	Approved	Normal	Test	Jim Bosch



5.13.1 Test Items

This test will check that the coadded images delivered by the DRP science payload meet the requirements laid down by LSE-61.

Specifically, this will demonstrate that:

- Coadds have been generated and persisted during payload execution;
- Each coadd provides a spatially varying PSF model (DMS-REQ-0047).
- Saturated pixels are correctly masked.
- Pixels affected by satellite trails and ghosts are rejected from the coadd.
- The background is not oversubtracted around bright objects.

This test does not include quantitative targets for the science quality criteria; we instead require for each test that we be able to quickly construct a plot or display summary images that allow such a target can be visualized.

5.14 LVV-T1064 - Run Data Release Production Payload

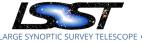
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin

5.14.1 Test Items

Execute the Data Release Production payload, starting from raw images and producing science data products.

5.15 LVV-T1060 - Run Periodic Calibration Products Production Payload

Version Status Priority Verification Type Owner



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	1	Draft	Normal Test	Jeffrey Carlin	
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5.15.1 Test Items

Execute the Calibration Products Production payload to create a subset of Master Calibration images and Calibration Database entries.

5.16 LVV-T35 - Verify implementation of Nightly Data Accessible Within 24 hrs

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Eric Bellm

5.16.1 Test Items

Test Items

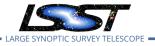
Verify that

- 1. Alerts are available within OTT1
- 2. Level 1 Data Products are available within L1PublicT

3. Solar System Object orbits are available within L1PublicT of the updated calculations completion on the following night.

5.17 LVV-T140 - Verify implementation of Production Orchestration

Version	Status	Priority	Verification Type	Owner
1	Defined	Normal	Test	Robert Gruendl



5.17.1 Test Items

Demonstrate use to orchestration software to perform real-time and batch production on LSST compute platform(s).

5.18 LVV-T837 - Authenticate to Notebook Aspect

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin

5.18.1 Test Items

Not specifically a test – modular script to be used in multiple other Test Scripts.

5.19 LVV-T838 - Access an empty notebook in the Notebook Aspect

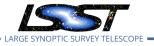
Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

5.19.1 Test Items

The steps here cover just those necessary to gain access to an empty notebook after authentication is complete.

5.20 LVV-T1207 - Execute a simple ADQL query using the TAP service in the notebook aspect

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Jeffrey Carlin



5.20.1 Test Items

Extract a small amount of data from a catalog via the LSST TAP service.

5.21 LVV-T1208 - Log out of the notebook aspect of the LSP

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

5.21.1 Test Items

Leave the notebook aspect of the LSST Science Platform in a clean state

5.22 LVV-T849 - Authenticate to the portal aspect of the LSP

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

5.22.1 Test Items

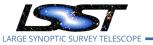
Obtain an authenticated session in the portal aspect of the LSST Science Platform

5.23 LVV-T850 - Log out of the portal aspect of the LSP

Version	Status	Priority	Verification Type	Owner
1	Draft	Normal	Test	Simon Krughoff

5.23.1 Test Items

Leave the portal aspect of the LSST Science Platform in a clean state



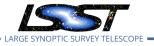
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6 Deprecated Test Cases

This section includes all test cases that have been marked as deprecated. These test cases will never be executed again, but have been in the past. For this reason it is important to keep them in the baseline as a reference.

No deprecated test cases found.



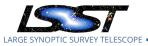


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A Traceability

Verification Elements	Test Cases
LVV-157 - DMS-REQ-0326-V-01: Storing Approximations of Per-pixel Metadata	LVV-T23
LVV-162 - DMS-REQ-0331-V-01: Computing Derived Quantities	LVV-T24 LVV-T21 LVV-
	T22
LVV-163 - DMS-REQ-0332-V-01: Denormalizing Database Tables	LVV-T25
LVV-164 - DMS-REQ-0333-V-01: Maximum Likelihood Values and Covariances	LVV-T26
LVV-177 - DMS-REQ-0346-V-01: Data Availability	LVV-T27
LVV-178 - DMS-REQ-0347-V-01: Measurements in catalogs	LVV-T28 LVV-T21 LVV- T22
LVV-8 - DMS-REQ-0018-V-01: Raw Science Image Data Acquisition	LVV-T29 LVV-T29
LVV-9 - DMS-REQ-0020-V-01: Wavefront Sensor Data Acquisition	LVV-T30
LVV-10 - DMS-REQ-0022-V-01: Crosstalk Corrected Science Image Data Acquisition	LVV-T31
LVV-11 - DMS-REQ-0024-V-01: Raw Image Assembly	LVV-T32 LVV-T32
LVV-28 - DMS-REQ-0068-V-01: Raw Science Image Metadata	LVV-T33
LVV-1234 - OSS-REQ-0122-V-01: Provenance	LVV-T33 LVV-T37 LVV-
·	T64 LVV-T89 LVV-T119
LVV-96 - DMS-REQ-0265-V-01: Guider Calibration Data Acquisition	LVV-T34
LVV-4 - DMS-REQ-0004-V-01: Time to L1 public release_1	LVV-T35 LVV-T35
LVV-7 - DMS-REQ-0010-V-01: Difference Exposures	LVV-T18 LVV-T36
LVV-32 - DMS-REQ-0074-V-01: Difference Exposure Attributes	LVV-T37
LVV-29 - DMS-REQ-0069-V-01: Processed Visit Images	LVV-T18 LVV-T38
LVV-12 - DMS-REQ-0029-V-01: Generate Photometric Zeropoint for Visit Image	LVV-T39
LVV-13 - DMS-REQ-0030-V-01: Absolute accuracy of WCS	LVV-T40
LVV-30 - DMS-REQ-0070-V-01: Generate PSF for Visit Images	LVV-T41
LVV-31 - DMS-REQ-0072-V-01: Processed Visit Image Content	LVV-T42
LVV-158 - DMS-REQ-0327-V-01: Background Model Calculation	LVV-T43
LVV-159 - DMS-REQ-0328-V-01: Documenting Image Characterization	LVV-T44
LVV-39 - DMS-REQ-0097-V-01: Level 1 Data Quality Report Definition	LVV-T45
LVV-41 - DMS-REQ-0099-V-01: Level 1 Performance Report Definition	LVV-T46
LVV-43 - DMS-REQ-0101-V-01: Level 1 Calibration Report Definition	LVV-T47
LVV-97 - DMS-REQ-0266-V-01: Exposure Catalog	LVV-T48
LVV-100 - DMS-REQ-0269-V-01: DIASource Catalog	LVV-T18 LVV-T49 LVV-
	T21
LVV-101 - DMS-REQ-0270-V-01: Faint DIASource Measurements	LVV-T50 LVV-T21
LVV-102 - DMS-REQ-0271-V-01: Max nearby galaxies associated with DIASource	LVV-T18 LVV-T22 LVV-
	T51
LVV-103 - DMS-REQ-0272-V-01: DIAObject Attributes	LVV-T22 LVV-T52
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LVV-104 - DMS-REQ-0273-V-01: SSObject Catalog LVV-105 - DMS-REQ-0274-V-01: Alert Content LVV-148 - DMS-REQ-0317-V-01: DIAForcedSource Catalog LVV-150 - DMS-REQ-0319-V-01: Characterizing Variability LVV-154 - DMS-REQ-0323-V-01: Calculating SSObject Parameters LVV-155 - DMS-REQ-0324-V-01: Matching DIASources to Objects LVV-156 - DMS-REQ-0325-V-01: Regenerating L1 Data Products During Data Release Processing LVV-184 - DMS-REQ-0353-V-01: Publishing predicted visit schedule LVV-16 - DMS-REQ-0034-V-01: Associate Sources to Objects LVV-20 - DMS-REQ-0047-V-01: Provide PSF for Coadded Images LVV-45 - DMS-REQ-0103-V-01: Produce Images for EPO	LVV-T53 LVV-T53 LVV-T54 LVV-T55 LVV-T56 LVV-T57 LVV-T57 LVV-T58 LVV-T59 LVV-T60 LVV-T61 LVV-T61 LVV-T16 LVV-T62 LVV-T63

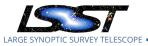


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/erification Elements	Test Cases
VV-46 - DMS-REQ-0106-V-01: Coadded Image Provenance	LVV-T64
.VV-98 - DMS-REQ-0267-V-01: Source Catalog	LVV-T12 LVV-T65
.VV-99 - DMS-REQ-0268-V-01: Forced-Source Catalog	LVV-T12 LVV-T66
.VV-106 - DMS-REQ-0275-V-01: Object Catalog	LVV-T12 LVV-T67
.VV-19 - DMS-REQ-0046-V-01: Provide Photometric Redshifts of Galaxies	LVV-T68
.VV-107 - DMS-REQ-0276-V-01: Object Characterization	LVV-T69
.VV-180 - DMS-REQ-0349-V-01: Detecting extended low surface brightness objects	LVV-T71
.VV-109 - DMS-REQ-0278-V-01: Coadd Image Method Constraints	LVV-T16 LVV-T72
VV-110 - DMS-REQ-0279-V-01: Deep Detection Coadds	LVV-T12 LVV-T16 LV
	T73
.VV-111 - DMS-REQ-0280-V-01: Template Coadds	LVV-T74
VV-112 - DMS-REQ-0281-V-01: Multi-band Coadds	LVV-T75
VV-160 - DMS-REQ-0329-V-01: All-Sky Visualization of Data Releases	LVV-T76
VV-161 - DMS-REQ-0330-V-01: Best Seeing Coadds	LVV-T77
VV-165 - DMS-REQ-0334-V-01: Persisting Data Products	LVV-T12 LVV-T16 LV
	T78
.VV-166 - DMS-REQ-0335-V-01: PSF-Matched Coadds	LVV-T79
VV-168 - DMS-REQ-0337-V-01: Detecting faint variable objects	LVV-T80
VV-169 - DMS-REQ-0338-V-01: Targeted Coadds	LVV-T81
VV-170 - DMS-REQ-0339-V-01: Tracking Characterization Changes Between Data Releases	LVV-T82
VV-22 - DMS-REQ-0059-V-01: Bad Pixel Map	LVV-T83
VV-23 - DMS-REQ-0060-V-01: Bias Residual Image	LVV-T84
VV-24 - DMS-REQ-0061-V-01: Crosstalk Correction Matrix	LVV-T85
VV-25 - DMS-REQ-0062-V-01: Illumination Correction Frame	LVV-T86
VV-26 - DMS-REQ-0063-V-01: Monochromatic Flatfield Data Cube	LVV-T87
VV-57 - DMS-REQ-0130-V-01: Calibration Data Products	LVV-T88
VV-59 - DMS-REQ-0132-V-01: Calibration Image Provenance	LVV-T89
.VV-113 - DMS-REQ-0282-V-01: Dark Current Correction Frame	LVV-T90
VV-114 - DMS-REQ-0283-V-01: Fringe Correction Frame	LVV-T91
.VV-151 - DMS-REQ-0320-V-01: Processing of Data From Special Programs	LVV-T92
VV-152 - DMS-REQ-0321-V-01: Level 1 Processing of Special Programs Data	LVV-T93
VV-153 - DMS-REQ-0322-V-01: Special Programs Database	LVV-T94
VV-175 - DMS-REQ-0004-V-01: Time to L1 public release	LVV-T95
VV-1276 - OSS-REQ-0127-V-01: Level 1 Data Product Availability	LVV-T95 LVV-T102
.VV-122 - DMS-REQ-0291-V-01: Query Repeatability	LVV-T96
.VV-122 - DMS-REQ-0291-V-01. Query Repeatability .VV-123 - DMS-REQ-0292-V-01: Uniqueness of IDs Across Data Releases	LVV-T97
VV-123 - DMS-REQ-0292-V-01. Oniqueness of DS Across Data Releases	LVV-T98
VV-124 - DMS-REQ-0295-V-01. Selection of Datasets VV-125 - DMS-REQ-0294-V-01: Processing of Datasets	LVV-T98 LVV-T12 LVV-T99
VV-126 - DMS-REQ-0295-V-01: Transparent Data Access	LVV-T100
VV-3 - DMS-REQ-0002-V-01: Transparent Data Access	LVV-T217 LVV-T101
VV-36 - DMS-REQ-0089-V-01: Maissient Alert Distribution VV-36 - DMS-REQ-0089-V-01: Solar System Objects Available Within Specified Time	LVV-T102
VV-9803 - DMS-REQ-0009-V-01. Solar System Objects Available Within Specified Time	LVV-T102 LVV-T102
VV-3805 - DMS-REQ-0004-V-05. Time to availability of Solar System Object of bits.	
	LVV-T103
.VV-40 - DMS-REQ-0098-V-01: Generate DMS Performance Report Within Specified Time .VV-42 - DMS-REQ-0100-V-01: Generate Calibration Report Within Specified Time	LVV-T104
	LVV-T105
VV-58 - DMS-REQ-0131-V-01: Time allowed to process calibs	LVV-T106
VV-115 - DMS-REQ-0284-V-01: Level-1 Production Completeness	LVV-T107
VV-116 - DMS-REQ-0285-V-01: Level 1 Source Association	LVV-T22 LVV-T108
.VV-117 - DMS-REQ-0286-V-01: SSObject Precovery	LVV-T109

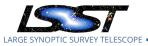
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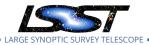
erification Elements	Test Cases
VV-119 - DMS-REQ-0288-V-01: Use of External Orbit Catalogs	LVV-T111
VV-173 - DMS-REQ-0342-V-01: Alert Filtering Service	LVV-T112
VV-174 - DMS-REQ-0343-V-01: Number of full-size alerts	LVV-T113
VV-179 - DMS-REQ-0348-V-01: Pre-defined alert filters	LVV-T114
VV-120 - DMS-REQ-0289-V-01: Calibration Production Processing	LVV-T115
VV-181 - DMS-REQ-0350-V-01: Associating Objects across data releases	LVV-T116
VV-47 - DMS-REQ-0119-V-01: DAC resource allocation for Level 3 processing	LVV-T117
VV-48 - DMS-REQ-0120-V-01: Level 3 Data Product Self Consistency	LVV-T118
VV-49 - DMS-REQ-0121-V-01: Provenance for Level 3 processing at DACs	LVV-T119
VV-53 - DMS-REQ-0125-V-01: Software framework for Level 3 catalog processing	LVV-T120
VV-56 - DMS-REQ-0128-V-01: Software framework for Level 3 image processing	LVV-T121
VV-121 - DMS-REQ-0290-V-01: Level 3 Data Import	LVV-T122
VV-171 - DMS-REQ-0340-V-01: Access Controls of Level 3 Data Products	LVV-T123
VV-139 - DMS-REQ-0308-V-01: Software Architecture to Enable Community Re-Use	LVV-T216 LVV-T124
VV-6 - DMS-REQ-0009-V-01: Simulated Data	LVV-T125
VV-14 - DMS-REQ-0032-V-01: Image Differencing	LVV-T126
VV-15 - DMS-REQ-0033-V-01: Provide Source Detection Software	LVV-T127
VV-17 - DMS-REQ-0042-V-01: Provide Astrometric Model	LVV-T128
VV-18 - DMS-REQ-0043-V-01: Provide Calibrated Photometry	LVV-T21 LVV-T22 LV
	T129
VV-21 - DMS-REQ-0052-V-01: Enable a Range of Shape Measurement Approaches	LVV-T130
VV-63 - DMS-REQ-0160-V-01: Provide User Interface Services	LVV-T131
VV-127 - DMS-REQ-0296-V-01: Pre-cursor, and Real Data	LVV-T132
VV-182 - DMS-REQ-0351-V-01: Provide Beam Projector Coordinate Calculation Software	LVV-T133
VV-27 - DMS-REQ-0065-V-01: Provide Image Access Services	LVV-T134
VV-129 - DMS-REQ-0298-V-01: Data Product and Raw Data Access	LVV-T136
VV-130 - DMS-REQ-0299-V-01: Data Product Ingest	LVV-T137
VV-131 - DMS-REQ-0300-V-01: Bulk Download Service	LVV-T138
VV-133 - DMS-REQ-0302-V-01: Production Orchestration	LVV-T140 LVV-T140
VV-134 - DMS-REQ-0303-V-01: Production Monitoring	LVV-T141
VV-135 - DMS-REQ-0304-V-01: Production Fault Tolerance	LVV-T142
VV-136 - DMS-REQ-0305-V-01: Task Specification	LVV-T144
VV-137 - DMS-REQ-0306-V-01: Task Configuration	LVV-T145
VV-128 - DMS-REQ-0297-V-01: DMS Initialization Component	LVV-T145
VV-122 - DMS-REQ-0297-V-01: DMS initialization Component VV-132 - DMS-REQ-0301-V-01: Control of Level-1 Production	LVV-T140 LVV-T147
VV-132 - DMS-REQ-0301-V-01. Control of Level-1 Production VV-138 - DMS-REQ-0307-V-01: Unique Processing Coverage	LVV-T147 LVV-T148
	LVV-T148 LVV-T149
VV-33 - DMS-REQ-0075-V-01: Catalog Queries	
VV-34 - DMS-REQ-0077-V-01: Maintain Archive Publicly Accessible	LVV-T150
VV-35 - DMS-REQ-0078-V-01: Catalog Export Formats	LVV-T151 LVV-T1232
VV-37 - DMS-REQ-0094-V-01: Keep Historical Alert Archive	LVV-T152
VV-44 - DMS-REQ-0102-V-01: Provide Engineering & Facility Database Archive	LVV-T153
VV-140 - DMS-REQ-0309-V-01: Raw Data Archiving Reliability	LVV-T154
VV-141 - DMS-REQ-0310-V-01: Un-Archived Data Product Cache	LVV-T155
VV-142 - DMS-REQ-0311-V-01: Regenerate Un-archived Data Products	LVV-T156
VV-143 - DMS-REQ-0312-V-01: Level 1 Data Product Access	LVV-T157
VV-144 - DMS-REQ-0313-V-01: Level 1 & 2 Catalog Access	LVV-T158
VV-167 - DMS-REQ-0336-V-01: Regenerating Data Products from Previous Data Releases	LVV-T159
VV-172 - DMS-REQ-0341-V-01: Max elapsed time for precovery results VV-176 - DMS-REQ-0345-V-01: Logging of catalog queries	LVV-T160
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LVV-190 - DMS-REQ-0364-V-01: Total number of data releases	LVV-T163
LVV-191 - DMS-REQ-0365-V-01: Operations Subsets	LVV-T164
LVV-192 - DMS-REQ-0366-V-01: Subsets Support	LVV-T165
LVV-193 - DMS-REQ-0367-V-01: Access Services Performance	LVV-T166
LVV-194 - DMS-REQ-0368-V-01: Implementation Provisions	LVV-T167
LVV-195 - DMS-REQ-0369-V-01: Evolution	LVV-T168
LVV-196 - DMS-REQ-0370-V-01: Older Release Behavior	LVV-T169
LVV-197 - DMS-REQ-0371-V-01: Query Availability	LVV-T170
LVV-5 - DMS-REQ-0008-V-01: Pipeline Availability	LVV-T171
LVV-64 - DMS-REQ-0161-V-01: Optimization of Cost, Reliability and Availability in Order	LVV-T172
_VV-65 - DMS-REQ-0162-V-01: Pipeline Throughput	LVV-T173
LVV-66 - DMS-REQ-0163-V-01: Re-processing Capacity	LVV-T174
LVV-67 - DMS-REQ-0164-V-01: Temporary Storage for Communications Links	LVV-T175
LVV-68 - DMS-REQ-0165-V-01: Infrastructure Sizing for "catching up"	LVV-T176
LVV-994 - OSS-REQ-0051-V-01: Summit-Base Connectivity Loss	LVV-T176
LVV-69 - DMS-REQ-0166-V-01: Incorporate Fault-Tolerance	LVV-T177
LVV-70 - DMS-REQ-0167-V-01: Incorporate Autonomics	LVV-T178
LVV-145 - DMS-REQ-0314-V-01: Compute Platform Heterogeneity	LVV-T179
LVV-149 - DMS-REQ-0318-V-01: Data Management Unscheduled Downtime	LVV-T180
LVV-71 - DMS-REQ-0168-V-01: Summit Facility Data Communications	LVV-T181 LVV-T1097
LVV-72 - DMS-REQ-0170-V-01: Prefer Computing and Storage Down	LVV-T182
LVV-146 - DMS-REQ-0315-V-01: DMS Communication with OCS	LVV-T183
LVV-74 - DMS-REQ-0172-V-01: Summit to Base Network Availability	LVV-T185
LVV-75 - DMS-REQ-0173-V-01: Summit to Base Network Reliability	LVV-T186
LVV-76 - DMS-REQ-0174-V-01: Summit to Base Network Secondary Link	LVV-T187
LVV-77 - DMS-REQ-0175-V-01: Summit to Base Network Ownership and Operation	LVV-T188
LVV-78 - DMS-REQ-0176-V-01: Base Facility Infrastructure	LVV-T189
LVV-80 - DMS-REQ-0178-V-01: Base Facility Co-Location with Existing Facility	LVV-T190
LVV-147 - DMS-REQ-0316-V-01: Commissioning Cluster	LVV-T191
LVV-183 - DMS-REQ-0352-V-01: Base Wireless LAN (WiFi)	LVV-T192
LVV-81 - DMS-REQ-0180-V-01: Base to Archive Network	LVV-T193
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LVV-9754 - DMS-REQ-0359-V-05: Repeatability outlier limit in gri	LVV-T377
LVV-9752 - DMS-REQ-0359-V-03: Max fraction of outliers among non-saturated sources	LVV-T377
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LVV-9760 - DMS-REQ-0359-V-11: Fraction of zero point outliers	LVV-T377
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LVV-9761 - DMS-REQ-0359-V-12: Max fraction of unusable pixels per sensor	LVV-T377
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LVV-9766 - DMS-REQ-0359-V-17: Max RMS of resolved/unresolved flux ratio	LVV-T377
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LVV-9777 - DMS-REQ-0360-V-11: Max fraction of r-band color difference outliers	LVV-T378
LVV-9779 - DMS-REQ-0360-V-13: Max fraction exceeding limit on 200 arcmin scales	LVV-T378
LVV-9773 - DMS-REQ-0360-V-07: Outlier limit on 5 arcmin scales	LVV-T378
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LVV-9769 - DMS-REQ-0360-V-04: Median absolute error in RA, Dec	LVV-T378
LVV-9774 - DMS-REQ-0360-V-08: Median astrometric error on 200 arcmin scales	LVV-T378
LVV-9768 - DMS-REQ-0360-V-03: Median astrometric error on 5 arcmin scales	LVV-T378
LVV-9771 - DMS-REQ-0360-V-06: Color difference outlier limit relative to r-band	LVV-T378
LVV-9776 - DMS-REQ-0360-V-10: Max fraction exceeding limit on 20 arcmin scales	LVV-T378
LVV-9767 - DMS-REQ-0360-V-02: Max fraction exceeding limit on 5 arcmin scales	LVV-T378
LVV-3394 - DMS-REQ-0377-V-01: Min number of simultaneous single-CCD coadd cutout image users	LVV-T385
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