

Large Synoptic Survey Telescope (LSST) Data Management

LDM-503-07 (Camera Data Processing) Test Plan and Report

John Swinbank

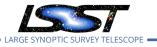
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DRAFT

Abstract

This is the test plan and report for LDM-503-07 (Camera Data Processing), an LSST level 2 milestone pertaining to the Data Management Subsystem.



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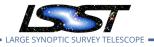
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LDM-503-07 (Camera Data Processing) Test Plan and Report

1 Introduction

1.1 Objectives

This test plan demonstrates that the LSST Science Pipelines can successfully be used to load and perform basic processing on data from the LSST Camera test systems.

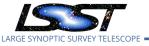
In particular, it will demonstrate that:

- Data from the Camera test systems has been made available at the LSST Data Facility;
- Data from the Camera test systems can be accessed using the "Data Butler" I/O abstraction, and loaded into the LSST Science Platform Notebook Aspect for processing and inspection;
- Basic LSST Science Pipelines Tasks can be used to process and manipulate Camera data;
- Camera data can be sent to the Firefly visualization tool for display.

Verification that the data processing is "correct" falls outside the scope of this test plan: both Camera data and DM code is evolving rapidly, and this exercise will not demonstrate that particular thresholds in terms of data processing fidelity have been reached. Rather, the focus here is on demonstrating successful integration and interface compatibility.

1.2 Scope

The overall strategy for testing and verification with LSST Data Management is described in LDM-503.



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Success in this test plan is intended to demonstrate completion of the milestone LDM-503-07 "Camera Data Processing".

1.3 System Overview

This test plan addresses primarily the integration between early data coming from the LSST Camera and the data access facilities provided by the LSST Data Management system.

In the process, it will exercise:

- The "Data Butler" I/O abstraction provided by Data Management;
- The Notebook Aspect of the LSST Science Platform;
- Algorithmic code provided by the LSST Science Pipelines;
- The Firefly image display tool provided by the Science User Interface and Tools group.

1.4 Applicable Documents

LDM-503 Data Management Test Plan LDM-151 Data Management Science Pipelines Design LDM-152 Data Management Middleware Design LDM-542 Science Platform Design

1.5 Document Overview

This document was generated from Jira, obtaining the relevant information from the LVV-P16 Jira Test Plan and related Test Cycles (LVV-C19).

Section 1 provides an overview of the test campaign, the system under test (Data Management), the applicable documentation, and explains how this document is organized. Section 2 describes the configuration used for this test. Section 3 lists all the individuals involved and describes their roles.

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



The current status of test plan LVV-P16 in Jira is Approved.

1.6 References

- [1] **[LDM-542]**, Dubois-Felsmann, G., Lim, K.T., Wu, X., et al., 2017, *LSST Science Platform Design*, LDM-542, URL https://ls.st/LDM-542
- [2] **[LDM-152]**, Lim, K.T., Dubois-Felsmann, G., Johnson, M., Jurić, M., Petravick, D., 2017, *Data Management Middleware Design*, LDM-152, URL https://ls.st/LDM-152
- [3] **[LDM-503]**, O'Mullane, W., Swinbank, J., Jurić, M., Economou, F., 2018, *Data Management Test Plan*, LDM-503, URL https://ls.st/LDM-503
- [4] **[LDM-151]**, Swinbank, J.D., et al., 2017, *Data Management Science Pipelines Design*, LDM-151, URL https://ls.st/LDM-151

2 Test Configuration

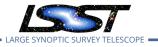
2.1 Data Collection

Observing is not required for this test campaign.

2.2 Verification Environment

Tests of the Data Butler, the Science Pipelines and the Firefly image display tool will take place within the Notebook Aspect of the LSST Science Platform, as deployed at https://lsst-lspdev.ncsa.illinois.edu/nb and documented at https://nb.lsst.io. This provides a flexible and configurable environment with access to large-capacity filesystems at the LSST Data Facility.

Individual tests will be based on specific machine images provided within the Notebook Aspect, as documented in the relevant test cases.



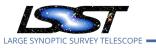
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3 Personnel

The following personnel are involved in this test activity:

- Test Plan (LVV-P16) owner: John Swinbank
- Test Cycles:
 - LVV-C19 owner: Undefined
 - * Test case LVV-T374 tester: John Swinbank
 - * Test case LVV-T368 tester: John Swinbank
- Additional Test Personnel involved: None



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4 Overview of the Test Results

4.1 Summary

Test Cycle LVV-C19: LDM-503-07: Camera Data Processing			
test case	status	comment	
LVV-T368	Pass		
LVV-T374	Pass		

Table 1: Test Results Summary

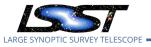
4.2 Overall Assessment

The test campaign has been successfully concluded.

All steps in the accompanying test scripts have been completed successfully. One minor typo was discovered in LVV-T368, but since it was a flaw in the test script rather than the system being tested, it is not regarded as germane to the success of this test campaign.

4.3 Recommended Improvements

The typo in LVV-T368 step 2 (a missing "~/") should be resolved.



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5 Detailed Test Results

5.1 Test Cycle LVV-C19

Open test cycle *LDM-503-07: Camera Data Processing* in Jira.

LDM-503-07: Camera Data Processing Status: Done

This test cycle defines tests to be performed in late 2018 to demonstrate the current state of integration between the Data Management System and current Camera test datasets.

5.1.1 Software Version/Baseline

This test will be carried out on whatever versions of the LSST Science Platform Notebook Aspect and Portal Aspect are installed on lsst-lspdev.ncsa.illinois.edu at the time of testing. No particular version requirements are specified on those tools.

Pipelines tests will be based on the weekly w_2018_45 version of the codebase.

5.1.2 Configuration

No specific configuration is required beyond the availability of the GPFS filesystem at the LSST Data Facility and access to the Notebook and Portal Aspects of the Science Platform as described above.

5.1.3 Test Cases in LVV-C19 Test Cycle

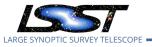
5.1.3.1 Test Case LVV-T368

Open *LVV-T368* test case in Jira.

This test will check:

• That Camera test data is available for processing in the LSST Data Facility, and accessible through the LSST Science Platform;





- Science Platform environment;
- That Data Management algorithmic "tasks" can be executed to process that data;
- That results can be displayed in the Firefly display tool.

Preconditions:

Appropriate data — to include a "raw" and a "bias" exposure — from the Camera test systems must be available in a Butler data repository on a filesystem accessible to the Notebook Aspect of the Science Platform.

For the purposes of the following discussion, we assume that:

- Visit 258334666 from RTM (Raft Tower Module) 007 will be used;
- The data is available in a repository at /project/bootcamp/repo_RTM-007/ on the Data Facility GPFS filesystem

In the test script, we refer to "258334666" as "\$VISIT_ID" and "/project/bootcamp/repo_RTM-007/" as "\$REPOSITORY_PATH"; other data may be substituted as appropriate.

Execution status: Pass

Final comment:

Detailed step results:

Step		Description, Results and Status
		Connect to the Notebook Aspect of the Science Platform following the instructions at https://nb.lsst.io/. Log in, and "spawn" a new machine with image "Weekly 2018_45" and size "small".
	Expected Result	The JupyterLab environment appears.

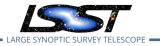


SURVEY TELESCOPE	LDM-503-07 Test Report	DMTR-112	Latest Revision 2018-12-16
Actual	• The test was carried out a	the University of Was	hington, which has a Data Facil-
Actual		at the Oniversity of was	nington, which has a Data Facil-

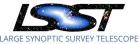
/ (ctuur	The test was carried out at the oniversity of washington, which has a Data rach
Result	ity firewall exemption, so instructions at https://nb.lsst.io/getting-started/logging-
	in.html describing installing, configuring and connecting with a VPN client were
	skipped.
	 The "Weekly 2018_45" image was not listed — only the two most recent weeklies
	are called out explicitly. However, "w201845" was chosen as a close analog.

• The JupyterLab environment appeared as expected.

Status	Pass
Description	Create a terminal session. Use it to set up the LSST tools, then download and build version 5c12b06e6 of obs_lsst:
	\$ source /opt/lsst/software/stack/loadLSST.bash
	\$ setup lsst_distrib
	\$ git clone https://github.com/lsst/obs_lsst.git \$ cd obs_lsst
	\$ git checkout 5c12b06e6
	\$ setup -k -r .
	\$ scons
	Arrange for obs_lsst to automatically be added to the environment when starting a ne
	notebook:
	\$ echo "setup -j -r ~/obs_lsst" >> notebooks/.user_setups
	Exit the terminal.
Expected	No errors are seen during execution of the provided commands.

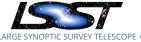


	SORVET TELESCOPE -	LDM-503-07 Test Report	DMTR-112	Latest Revision 2018-12-16
	Actual Result	No expected result is provided.		
		Executing the final command ret	turned:	
		bash: notebooks/.user_setups	: No such file or directory	
		This is an obvious typo in the tes	st script. Correcting the comman	id to
		echo "setup -j -r ~/obs_lsst" >> -	~/notebooks/.user_setups	
		caused it to execute successfully		
	Status	Pass		
3	Description	Create a new "LSST" notebook.		
		Import the standard libraries red import os import lsst.afw.display as afwE from lsst.daf.persistence impo from lsst.ip.isr import lsrTask from firefly_client import Firefl from IPython.display import IF	Display rt Butler yClient	
		and execute the cell.		
	Expected Result	Nothing is printed.		
	Actual Result	The imports completed successf	ully.	
	Status	Pass		

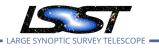


STNUF	PTIC SURVEY TELESCOPE	LDM-503-07 Test Report	DMTR-112	Latest Revision 2018-12-16
	Description	Create a Data Butler client, and	use it to retrieve the data	which will be used for this tes
		butler = Butler(\$REPOSITORY_		
		raw = butler.get("raw", visit=\$` bias = butler.get("bias", visit=\$		
	Expected	Nothing is printed.		
	Result	Nothing is printed.		
	Actual Result	The commands were executed	successfully.	
	Status	Pass		
	Description	Initialize the Firefly display syste	em:	
		my_channel = '{}_test_channel server = 'https://lsst-lspdev.nc ff='{}/firefly/slate.html?wsch IFrame(ff,800,600) afwDisplay.setDefaultBackenc afw_display = afwDisplay.getD name=my	sa.illinois.edu' ={}'.format(server, my_cha d('firefly')	
		Click on the link provided after o	executing the above.	
	Expected Result	A Firefly window is shown.		
	Actual Result	Firefly window appears.		
	Status	Pass		
5	Description	Display the raw image data in th		

afw_display.mtv(raw)



LARGE SYNOPTIC	SURVEY TELESCOPE -			
		LDM-503-07 Test Report	DMTR-112	Latest Revision 2018-12-16
	Expected Result	Raw image data is displayed.		
	Actual Result	Image data was seen in the Fire	efly window.	
	Status	Pass		
7	Description	_	ent Signature Removal (ISR) tag nplicity. but the bias frame is ap	
		<pre>isr_config = IsrTask.Confi isr_config.doDark=False isr_config.doFlat=False isr_config.doFringe=False isr_config.doDefect=False isr_config.doAddDistortion isr_config.doLinearize=Fal isr = IsrTask(config=isr_config=isr_config=isr_row, bias)</pre>	Model=False .se config)	
	Expected Result	Nothing is printed.		
	Actual Result	Commands successfully execut	ted.	
	Status	Pass		
8	Description	Display the corrected image da	ta in the Firefly window:	
		afw_display.mtv(result.expos	ure)	
	Expected Result	Processed (trimmed, bias-subt	racted) image data is displayed.	
	Actual Result	Processed data was displayed i	in the Firefly window.	



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Status Pass

5.1.3.2 Test Case LVV-T374

Open LVV-T374 test case in Jira.

This test will check:

- That raw Camera test data is available on a filesystem in the LSST Data Facility;
- That raw Camera test data can be ingested and made available through the Data Management I/O abstraction (the "Data Butler").

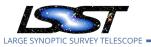
Preconditions:

Appropriate raw data from Camera test systems must be available on a filesystem within the LSST Data Facility. This test data is assumed to include visit 258334666 (hereafter referred to as \$VISIT_ID) from RTM (Raft Tower Module) 007 for the purposes of this test, but other, equivalent, may be substituted.

At time of writing, suitable data may be found on the GPFS filesystem at /project/bootcamp/data/LCA-11021_RTM-007/7086/fe55_raft_acq/v0/44981. In future, as data transport procedures to the Data Facility become more streamlined and formalised, this data may be moved elsewhere or made available through some other system. Throughout the test script, we use the string "\$IN-PUT_DATA_DIR" as an alias for "/project/bootcamp/data/LCA-11021_RTM-007/7086/fe55_raft_acq/v0/44981" or wherever this data has been moved to.

Execution status: **Pass**

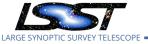
Final comment:



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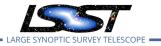
Detailed step results:

Step		Description, Results and Status
1	Description	Connect to the Notebook Aspect of the Science Platform following the instructions at https://nb.lsst.io/. Log in, and "spawn" a new machine with image "Weekly 2018_45" and size "large".
	Expected Result	The JupyterLab environment appears.
	Actual Result	 The test was carried out at the University of Washington, which has a Data Facility firewall exemption, so instructions at https://nb.lsst.io/getting-started/logging-in.html describing installing, configuring and connecting with a VPN client were skipped. The "Weekly 2018_45" image was not listed — only the two most recent weeklies are called out explicitly. However, "w201845" was chosen as a close analog. The JupyterLab environment appeared as expected.
	Status	Pass
2	Description	Create a terminal session. Use it to set up the LSST tools, then download and build version 5c12b06e6 of obs_lsst: \$ source /opt/lsst/software/stack/loadLSST.bash \$ setup lsst_distrib \$ git clone https://github.com/lsst/obs_lsst.git \$ cd obs_lsst \$ git checkout 5c12b06e6 \$ actual load
		\$ setup -k -r . \$ scons
	Expected Result	No errors are seen during execution of the provided commands.
	Actual Result	Commands were executed with no errors. Last line printed was "scons: done building targets".
	Status	Pass



3 Description Ingest RTM-007 test data by executing the following commands:

		OUTPUT_REPO_DIR=\$OUTPUT_DATA_DIR INPUT_DATA_DIR=\$INPUT_DATA_DIR mkdir -p \$OUTPUT_REPO_DIR echo "lsst.obs.lsst.ts8.Ts8Mapper" > \$OUTPUT_REPO_DIR/_mapper ingestImages.py \$OUTPUT_REPO_DIR \$INPUT_DATA_DIR/*/*.fits constructBias.py \$OUTPUT_REPO_DIR -rerun calibs -id imageType=BIAS -batch-type smp -cores 4 ingestCalibs.py \$OUTPUT_REPO_DIR -calibType bias \$OUT- PUT_REPO_DIR/rerun/calibs/bias/*/*.fits -validity 9999 -output \$OUT- PUT_REPO_DIR/CALIB -mode=link
		Where:
		\$OUTPUT_DATA_DIR is some location on shared storage to which the user has write permission; \$INPUT_DATA_DIR is defined in the test case description.
	Expected Result	Many status messages are logged to screen, and the command exits with status 0.
	Actual Result	 A number of "WARN" messages were logged during constructBias.py. These are not important for the correct execution of the test, but should be suppressed or included in the test description. All commands executed successfully.
	Status	Pass
4	Description	Demonstrate that raw and bias data for visit \$VISIT_ID have been made available in the repository. Load a Python interpreter (run "python") and execute the following:
		from lsst.daf.persistence import Butler visit_id = \$VISIT_ID b = Butler(\$OUTPUT_DATA_DIR) b.get("raw", visit=visit_id, detector=2) b.get("bias", visit=visit_id, detector=2)



Expected Result	Each call to b.get() returns an instance of an ExposureF object. Warnings about lack of dark-time or WCS information may be ignored.		
Actual	\$ python		
Result	Python 3.6.6 Anaconda, Inc. (default, Jun 28 2018, 17:14:51) [GCC 7.2.0] on linux		
	Type "help", "copyright", "credits" or "license" for more information.		
	>>> from lsst.daf.persistence import Butler		
	>>> visit_id = 258334666		
	>>> b = Butler('/scratch/swinbank/ldm50307')		
	CameraMapper INFO: Loading exposure registry from /scratch/swin-		
	bank/ldm50307/registry.sqlite3		
	CameraMapper INFO: Loading calib registry from /scratch/swin-		
	bank/ldm50307/CALIB/calibRegistry.sqlite3		
	>>> b.get("raw", visit=visit_id, detector=2)		
	CameraMapper WARN: Key="DARKTIME" not in metadata		
	CameraMapper INFO: darkTime is NaN/Inf; using exposureTime		
	LsstCamMapper WARN: Unable to set WCS for Datald(initialdata={'visit': 258334666,		
	'detector': 2}, tag=set()) from header as RATEL/DECTEL/ROTANGLE are unavailable		
	<lsst.afw.image.exposure.exposure.exposuref 0x7ff07235ea78="" at="" object=""> >>> b.get("bias", visit=visit_id, detector=2)</lsst.afw.image.exposure.exposure.exposuref>		
	<pre></pre> // b.get(blas , visit=visit_id, detector=2) // elsst.afw.image.exposure.exposure.ExposureF object at 0x7ff09a8b88f0>		

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Status

Pass