LARGE SYNOPTIC SURVEY TELESCOPE

Large Synoptic Survey Telescope (LSST) Data Management

Proposed DM OPS Rehearsals
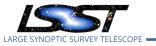
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LDM-643

Latest Revision: 2018-12-01

Abstract

For discussion about better specifying Operations Rehearsals.

Change Record

Version	Date	Description	Owner name
1	2018-07-16	Initial version.	Robert Gruendl

Contents

Proposed DM OPS Rehearsals

1 Introduction

As LSST DM moves from construction through commissioning and into operations a number of rehearsals have been proposed to help prepare for the execution of the survey. Specific rehearsals are outlined in [LDM-503] but in the larger cases, i.e., the OPS Rehearsals (LDM 503-09, LDM 503-11, and LDM 503-12) the contents of that document alone, does not sufficiently outline the scope, content, action and interaction that are being rehearsed. From the software side, [LDM-564] summarizes the DM software features that should be available and helpfully identifies those software releases in the context of the rehearsals. However, the OPS Rehearsals are not simply periods to test hardware and software systems, they are opportunities to understand/develop operations processes and to observe the interactions of those hardware/software systems and people.
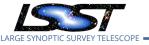
This document, attempts to outline the OPS Rehearsals in greater detail, first because missing/late software features and hardware systems may require mitigation (e.g., shims, fake data, etc...) or might be grounds for postponement, second because the purpose of an OPS Rehearsal is not to debug a freshly deployed system but rather to understand whether that system does what is needed, and third because the effort to carry out rehearsals will require coordination of persons/facilities.

Note: The current draft attempts to level set this process for one OPS rehearsal (the first one).

2 LDM 503-09: Operations Rehearsal #1 for Commissioning

Date: November 2018

Original Description: Choose TBD weeks during commissioning. Pick which parts of plan we could rehearse. Chuck suggests Instrument Signal Removal should be the focus of this (or the next rehearsal).
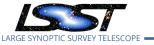
An Updated Goal:

Mimic sustained nightly "sampling" mode operations for one week of observing. Archiving and ingestion of raw data, offline processing of calibrations and basic image reduction.

- Sampling mode has been used to describe early LSST commissiong observations where observations occur based on the needs of the commissioning staff. Such observations would typically include some basic set of calibrations (e.g. bias/flat) followed by nightime observations that might be used to test system performance. Such observations would not necessarily be run with a scheduler and some might not even be appropriate for basic ISR processing.

- Based on the scheduled time for this exersise the only system that might produce a "realistic" data stream (something with expected headers, size, and instrumental signatures) would be the AuxTel spectrograph on the testbed in Tucson.

  Note: Some alternatives, the ComCam on the SLAC CCOB, might be feasible but the rehearsal dates preceed integration of ComCam with an LSST CCS, DAQ, and archiving service. A third alternative would be to use simulated/test-stand AuxTel/ComCam data (again something with expected headers, size, and signature) and feed these through a system that makes them available for archiving/ingestion at NCSA.
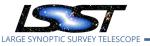
- The second element of this rehearsal would be to operate a batch production environment that would exercise: a pipeline payload, provenance, and production processing along with a formal file management system. These would operate on the data transfered to NCSA. The ouputs should also be archived. The actual pipeline payload could be as simple as one that reads data, makes some alteration and tenders an output product for archiving. More realistic processing would depend on both the data being sent to NCSA and the availability of working pipeline processing tasks.

- Roles include (at least) LDF Production Scientist and "Operator," ISci Ops Calibration and ISR Scientists. In addition an independent executor would plan/oversee the activities.

Pre-Requisites:

- NOTE: the size/scale of the data (i.e. for AuxTel Spectrograph this would mean CCD-sized) is important because it sets a scale for the resources (e.g., disk, CPUs, networking bandwidth) needed for the rehearsal. Depending on the data source, it is not clear that there would be systems (or pipelines) that function at an appropriate scale at the time of this rehearsal. Finally, it should be considered that any element that uses a fake process will in turn require effort to produce the "shim" to fake that action.

- Requires RAW images and calibrations to feed the system.

  - Minimum: Can be as simple as a single image for each data type (that can be replicated to feed the system).
  - Stretch: A simulated set of images and base calibrations (e.g. bias/flat).

- Requires a mechanism to feed RAW images into system.

- Requires an endpoint to receive files and messages (that activate processing).

- Requires a means to gather calibrations and initiate calibration processing when all have arrived.

- Requires a Calibration Pipeline to exercise.

  - Minimum: Read files and output a cal (can be as simple as a null... in DES-speak null calibrations were files with the right specs (e.g. header, size) to be considered a calibration by downstream processing but which contained constant values, typically 1 or 0 depending whether the calibration is multiplicative or additive).
  - Stretch: Capable of producing a calibration set (e.g. a rudimentary combined bias/flat).

- Requires a production pipeline to exercise:

  - Minimum: Read incoming files and cals and produce a new output product.
  - Stretch: Actually perform basic ISR on simulated images.

- Requires a service to receive pipeline outputs.

- Requires a base level ability to track/verify outputs are created. Depending on whether stretch goals are being attempted likely need ability to look at output images (and catalogs?).

Actions:

- Assemble proto-ops team; all components from DM into services, with payloads, data sets, configurations, etc. (assumes pre-integration work) – checklist

- Mock receive nightly cals and science images, ingest.

- Mock afternoon stand-up operations meeting.

- Generate nightly calibrations for 1 week of observations.

- Run nightly ISR (offline mode) for 1 week of observations.

- Set up, configure, select calibrations, ingest outputs.

- Generate feedback for discussion in stand-ups (as a stretch goal this could also include telemetry that would be returned to Observatory)?

- Monitor progress of nightly "campaigns," characterize and assess, make records of failures, diagnose issues, generate problem backlog.
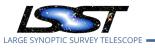
- Create mock nightly reports.

Software Products and Services Needed:

Based on the actions being undertaken in this rehearsal the following services are needed: Camera DAQ and Archiving Services, Data Backbone Services and Batch Production Services. These services are implemented within the following sofware products:

- Batch Production Software (Michelle Butler)

- Science Pipeline Software (Robert Lupton)

- Supporting Software (e.g., Data Butler): (Jim Bosch)

Since many of these are in a nascent state, often a shim (or some user-driven actions) may be needed to emulate some elements.

Assess:

- Was the rehearsal successful? How long did it take? What anomalies/failure modes were identified, and how did team cope?

- What fixes are needed, and on what timescale (e.g., next ops rehearsal, or we are go for commissioning)?

- What improvements in procedures, documentation, frameworks, systems, and algorithms were identified?

- Budget time and effort to plan and execute priority changes and improvements, and plan for next rehearsal.

References

[LDM-564], O'Mullane, W., Economou, F., Jenness, T., Loftus, A., 2018, *Data Management Software Releases for Verification/Integration*, LDM-564, URL https://ls.st/LDM-564

[LDM-503], O'Mullane, W., Swinbank, J., Jurić, M., Economou, F., 2018, *Data Management Test Plan*, LDM-503, URL https://ls.st/LDM-503