LARGE SYNOPTIC SURVEY TELESCOPE

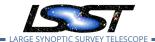**Large Synoptic Survey Telescope (LSST)**

Data Management and LSST Special Programs

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D R A F T

Abstract

WORKING DRAFT (contains rough notes and partial thoughts) but intended to be an overview of any and all potential requirements on data management (DM) from special programs (SP) such as the deep drilling fields (DDF) or mini-surveys (MS). We also summarize the plans for how the special programs data will be integrated into the wide-fast-deep (WFD) Main Survey (Levels 1 and 2). It is the intent that this document evolve to become an internal catalog of change requests to the DM Level 1 and 2 pipelines and products, and a community resource for future special program white papers and preparations for Level 3 pipelines. **Preliminary action items are listed in Section 1.1.**

MLG: The very high level requirements for Level 3 and Special Programs are written down in the DMSR, but they're broad. The next document down-flow, the LDM-151, is focused on the Level 1 and 2 algorithms; Section 7 mentions the DAX and SUIT, but says they detailed in a different document (?).
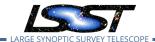
Change Record

Version	Date	Description	Owner name
1	2017-04-??	Internal working document.	Melissa Graham

Contents

Data Management and LSST Special Programs

1 Introduction

The current status of this work is that it is an internal, ongoing study with several interim preliminary action items or outstanding questions so far (Section 1.1).

The purpose of this study is to:
(1) summarize the current plans of the DM pipelines with respect to special programs,
(2) summarize the processing that is required to enable science for special programs,
(3) assess whether the DM pipelines meet the expected needs of special programs, and
(4) ensure any necessary changes get written into the requirements, designs, and plans.

This will be accomplished by:
(1) starting with the DPDD, whitepapers, etc., and compiling relevant information,
(2) discussing initial issues internally with DM (Mario, K-T, Tim), and then
(3) ensure the identified needs become specified requirements (i.e., action items Section 1.1).

Mario: "Examples include making sure there's a requirement that the system is able to use an arbitrary template for some (deep drilling) field and a plan to deliver that functionality; or that the requirements define how a user-supplied code will be able to run in the batch system to process the last-night's data with shift-and-stack code for KBOs."

1.1 Current Action Items and Open Questions

Action items for Data Management can be done internally as needed – some are just questions of things to investigate. Items that involve gather feedback from the Science Collaborations should probably wait and happen at the same time as the next calls for community input (see Section 1.2).

Data Management:
(1) Confirm whether processed single visits for Special Programs can stay on disk and accessible for Level 3 pipelines for a longer amount of time than the WFD images, by user request. (Section 2.2)

(2) Confirm whether the computational/storage budget requires more than 10% of the total resources for Special Programs and Level 3 processing. (Section 2.2)

(3) Confirm the expected thermal tolerances of the CCD and the associated minimum and maximum exposure times and exposure cadence that will keep the camera temperature within specifications. (Section 2.2)

(4) Find out whether we can expect a filter change time shorter than 120 seconds (the specified maximum), which would enable a DDF to sequence filters. (Section 2.2)

(5) Confirm whether alternative data products can contribute to the Alert Stream, or if only the Level 1 processing system will create alerts. (Section 3.1)

(6) Update the database schema for `DIASource` to add an element that contains information about which template was used to create the difference image (e.g., `tractId` or `patchId`). (Section 3.2)

(7) Clarify whether database schema key `Object.prv_inputID` will identify whether an object is an externally provided coordinate for forced photometry. (Section 3.2)

(8) Find out whether a SP visit with a single exposure (no snaps) disqualifies it from incorporation into Level 1. (Section 3.4)

(9) Confirm that the ISR algorithms will cover a range of exposure times and dither patterns. (Section 3.5)

(10) Implanting fake sources remains TBD; will DM provide a code base to do this in Level 3? (Section 3.5)

Science Collaborations:

(1) SC should be solicited to provide input about all special program science goals that require 60 second alert latency from non-standard exposure times. (Section 3.1)

(2) SC should be solicited to provide input on whether the space allotted for object characterization parameters in the database schema such as variability (e.g., `lcPeriodic = float[6 x 32]`) or morphology (e.g., `extendedness = float[1]`) are adequate to describe objects with Special Programs observations, which may include a wider range of cadences and depths than the WFD observations. Two examples include: (1) Does the variability parameter `lcPeriodic` have enough space to adequately characterize high and low cadence observations with a variable dynamic range from a Twilight Survey? (2) Do the morphology parameters have enough elements to adequately represent both bright spiral arms and ultra-low-surface brightness features like tidal tails? DM will first compile and provide a list of planned parameters from the schema. (Section 3.2)

(3) SC should be solicited to provide input on whether there are science use-cases for spe-

cialized, auto-generated template images e.g., with constant Δt, or image-image differencing (instead of image-template). DM should then assess whether this will require additional database elements. (Section 3.3)

1.2   Interacting with the Science Community

To resolve some open issues we will need to solicit input from the science collaborations (SC). However, it may be better and easier to wait until the next call for community input, and package these requests up in a broader request that a kind of "DM Requirements" section be included in all white papers. The document "Cadence Exploration and Improvement Plan" (by Zeljko, Lynne, Andy) proposes that the next call for DDF White Papers (proposed fields and cadences) be in December 2017, and the call for Mini-Survey White Papers be in October 2018.

Recall that there is already a community forum on this topic, so far minimally used but ready to be revised in the future when the next calls soliciting white papers are released. `http://community.lsst.org/t/deep-drilling-fields-and-data-management/1115`.

Remember also that the SC Coordinator for DDF: Neil Brandt.

The questions opened up on that forum are:
(1) What additional processing beyond that currently planned by the DM team (alerting relative to an annually created template) would greatly enhance the DDF science goals?
(2) Are there DDF or Mini-Surveys specific aspects of the Level 3 system that would add significant value if provided? "Level 3" is the LSST-provided capability that enables non-DM, user-driven, processing of LSST data at the LSST Archive center (or remotely).
(3) Are there aspects of the Science User Interface and Tools (SUIT) that need to be developed in order to enhance the usefulness of DDF data products.
(4) To what degree should the DDF or Mini-Survey imaging could/should be incorporated into the main survey's deep stacks and associated data products (as opposed to being processed as separate data products)?