LARGE SYNOPTIC SURVEY TELESCOPE

Large Synoptic Survey Telescope (LSST)

Data Management Releases for Verification/Integration

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LDM-564

Latest Revision: 2018-08-06

Abstract

This document describes release management at a high level and specific features for upcoming releases.

Change Record

Version	Date	Description	Owner name
1.0	2017-08-18	Initial version. Approved in RFC-373.	W. O'Mullane
	2018-03-16	Synchronize milestones with PMCS.	J.D. Swinbank
1.1	2018-06-18	Update release plan with baseline. Approved in RFC-497	J.D. Swinbank
1.2	2018-07-17	Provide text for L2 milestones which do not contain L3 milestones. Approved in RFC-501.	J.D. Swinbank
TBD	2018-XX-XX	Update milestones for month end June 2018.	J.D. Swinbank

Document source location: `https://github.com/lsst/LDM-564`

Contents

Data Management Releases for Verification/Integration

1 Introduction

1.1 Scope

This document covers releases of software from the Data Management Subsystem of LSST for verification/integration tests. It discusses the delineation between the Data Facility as an operational entity and DM producing and testing software. It does not cover the normal releases to the community of the software stack - see `https://developer.lsst.io/` for that.

2 Release Management

This section outlines the current understanding of the release management process. Complete definition is pending the appointment of the DM Release Manager.

2.1 Preparation of Releases

DM develops code in GitHub following its developer guidelines and coding standards [1]. This includes automated testing and continuous integration. Tested releases are tagged by SQuaRE weekly and major releases are made each cycle (six months).

There are specific packages and systems deployed together to form the high level components of DM as depicted in Figure 1. The orchestration of deployments on multiple machines is facilitated by the use of containers and machine readable configurations. DM prepares Docker containers and Puppet configurations for deploying these systems on Kubernetes enabled clusters. These artifacts are tagged as part of the release.

In addition, specific releases with features required to support the LDM-503 test milestones will be tagged and released in advanced of each verification test. The preliminary feature lists for these releases are defined in Section 3.

[1] `https://developer.lsst.io/`

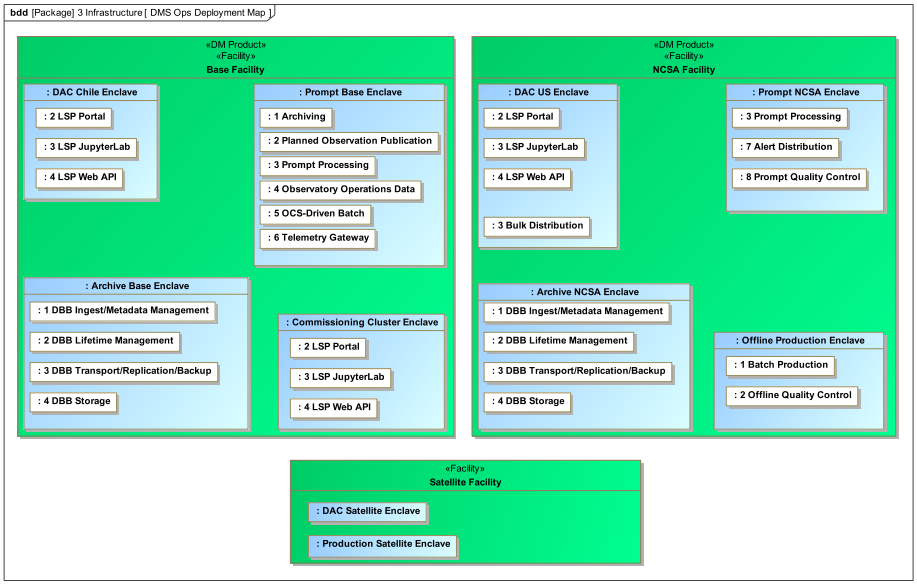

FIGURE 1: DM components as deployed during Operations. For details, refer to LDM-148.

2.2 Deployment of Releases

Although DM will provide ready-to-install products, these will be further tested before being deployed. Hence, releases will initially be installed on test systems at NCSA and will undergo smoke testing before they are made available in the production environment. This will serve as an operational validation of the release.

Once smoke tested, the Docker containers will be made available in the NCSA Docker repository. Using this secure internal repository, operators may deploy containers for specific releases in the operational environment.

2.2.1 Levels of Operational Validation

Certain containers will be used to provide kernels and supporting libraries for the JupyterLab environment. Multiple versions of these containers can be made available simultaneously — for example, providing a series of minor releases of the software stack — with the user selecting which to deploy for their particular use case. Since they will not be deployed as part of the core operational system, acceptance testing can be relatively minimal.

Some containers will be made available on development systems in support of ongoing development of the code. Again, these should be made available rapidly, with security checking and validation testing kept to a minimum.

Similarly, during Commissioning, availability of containers on the Commissioning Cluster should be on the order of hours (not days). The level of smoke testing and the time to availability of a container may need to be compressed in Commissioning.

Containers to be used for prompt or batch processing on operational systems, on the other hand, must be rigorously validated.

3 Functionality in DM releases

This is currently not an exhaustive feature list, but rather gives an indication at a high level of the features in each release which will be verified by the corresponding verification test campaign. As the test plans are written this will become a list of requirements to be tested for that release and thus begin to fill out the verification control database (currently to be in Jira).

In the feature lists below, the corresponding internal milestone is given in parenthesis.

Each section here is a test milestone from LDM-503 — the same labels are used. The timeline is in the DM schedule using the same labels and depicted in Figure 2

3.1 Science Platform with WISE data in PDAC: LDM-503-01

Due: 2017-11-30; completed 2018-05-30.

- DM-SUIT-3: Time series analysis tool for WISE data *(Due: 2016-09-30; completed 2017-11-30)*
- DM-DAX-2: Query service supporting IVOA TAP protocol, w/ support for asynchronous queries *(Due: 2017-07-31; currently incomplete)*
- DM-SQRE-1: Project internal Jupyter notebook service *(Due: 2017-08-31; completed 2017-11-01)*

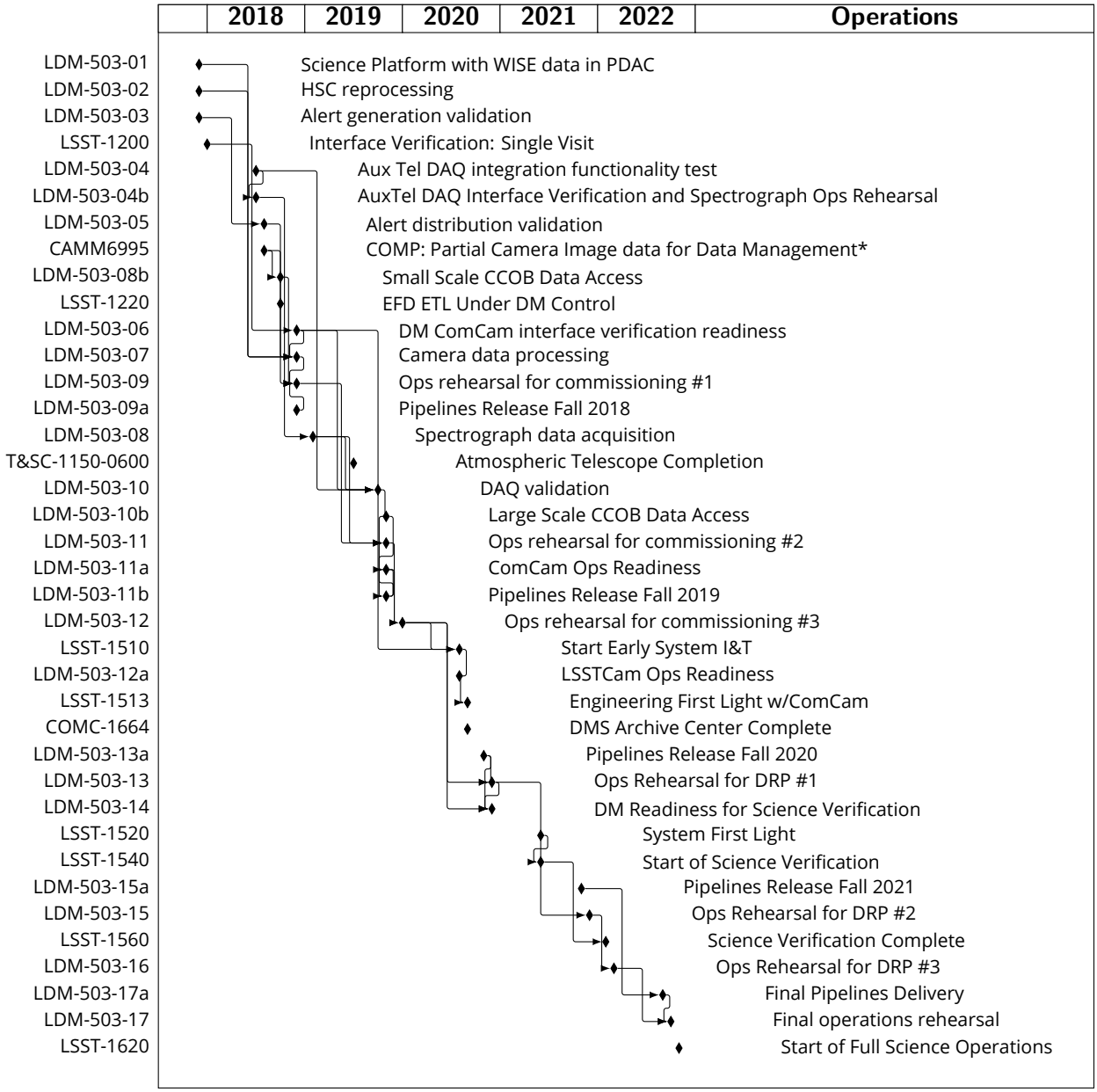

FIGURE 2: DM level 2 milestones (LDM-503-x) in the LSST schedule.

- DM-DAX-4: Metadata service supporting IVOA SIAv2 protocol *(Due: 2017-09-29; currently incomplete)*
- DM-DAX-1: WISE data ingest to PDAC *(Due: 2017-11-30; completed 2017-11-01)*
- DM-DAX-3: Image cutout service supporting IVOA SODA protocol *(Due: 2017-11-30; currently incomplete)*
- DM-SUIT-1: Search and display WISE sources (objects) in PDAC *(Due: 2017-11-30; completed 2017-11-30)*
- DM-SUIT-2: Search WISE coaded data single exposure images in PDAC (the images are from IRSA at IPAC, not NCSA) *(Due: 2017-11-30; completed 2017-11-30)*
- DM-SUIT-4: Multiple data traces in chart space *(Due: 2017-11-30; completed 2017-11-30)*

3.2 HSC reprocessing: LDM-503-02

Due: 2017-11-30; completed 2017-12-01.

- DM-DRP-1: HSC merger complete: all functionality deployed for the most recent HSC data release processing is now available within the LSST stack. *(Due: 2017-05-31; completed 2017-11-01)*
- DM-NCSA-1: Provide regular reprocessing service for HSC data *(Due: 2017-05-31; completed 2017-11-01)*
- DM-NCSA-2: Provide access to results of regular reprocessing (NB the form this takes depends upon available DAX functionality) *(Due: 2017-05-31; completed 2017-11-01)*
- DM-AP-1: Basic single frame measurement pipeline. *(Due: 2017-08-31; completed 2017-11-01)*
- DM-DAX-5: Database ingest in support of HSC reprocessing (ie, large catalog ingest) *(Due: 2017-11-30; currently incomplete)*
- DM-DRP-2: Basic visualization and quality assessment tools operational on HSC-scale data volumes. *(Due: 2017-11-30; completed 2017-11-01)*
- DM-NCSA-3: Provide database for metadata, provenance, location and demonstrate ingest at small scale *(Due: 2017-11-30; completed 2017-11-01)*

- DM-SUIT-5: Search and display processed HSC data *(Due: 2017-11-30; currently incomplete)*

3.3 Alert generation validation: LDM-503-03

Due: 2017-11-30; completed 2017-12-01.

- DM-AP-1: Basic single frame measurement pipeline. *(Due: 2017-08-31; completed 2017-11-01)*
- DM-AP-2: Alard & Lupton-style image differencing. *(Due: 2017-08-31; completed 2017-11-01)*
- DM-AP-3: Point source & dipole measurement on difference images. *(Due: 2017-08-31; completed 2017-11-01)*
- DM-AP-4: DIASource association *(Due: 2017-08-31; completed 2017-11-01)*
- DM-AP-5: DIAObject generation *(Due: 2017-08-31; completed 2017-11-01)*
- DM-DAX-6: Prototype level 1 database *(Due: 2017-11-30; completed 2017-11-01)*

3.4 Aux Tel DAQ integration functionality test: LDM-503-04

Due: 2018-06-01; completed 2018-06-29.

- DM-NCSA-4: Minimal support for the small operational schema including file metadata and provenance for every file, and record of in *(Due: 2017-11-30; completed 2018-06-29)*
- DM-DAX-7: Butler interface to retrieve images from data backbone *(Due: 2018-06-01; currently incomplete)*

3.5 Aux Tel DAQ interface Integration Verification and Spectrograph Operations Rehearsal: LDM-503-04b

Due: 2018-06-01; completed 2018-06-29.

- DM-NCSA-27: Deliver header service code *(Due: 2017-12-29; completed 2017-12-01)*

- DM-NCSA-6: Ability to transfer files originating from Tucson to NCSA and ingest files at NCSA, including metadata and provenance *(Due: 2018-03-05; currently incomplete)*
- DM-NCSA-5: Level 1 archiving system able to acquire pixel data from the Aux Tel DAQ, header metadata via OCS, assemble FITS image, *(Due: 2018-03-30; completed 2018-05-31)*
- DM-NCSA-7: Capability to paint displays for Tucson and NCSA *(Due: 2018-03-30; completed 2018-06-29)*

3.6 Alert distribution validation: LDM-503-05

Due: 2018-07-02; currently incomplete.

- DM-NCSA-8: Test instance of feeds to LSST mini broker in online (live stream) and offline (replaying from files) modes *(Due: 2018-06-01; currently incomplete)*
- DM-NCSA-9: Test instance of alert distribution hosting service and L1 database in Development & Integration Enclave *(Due: 2018-06-01; currently incomplete)*

3.7 Small Scale CCOB Data Access: LDM-503-08b

Due: 2018-09-06; currently incomplete.

No new functionality is associated with this milestone, which represents a refined or improved version of earlier deliveries.

3.8 DM ComCam interface verification readiness: LDM-503-06

Due: 2018-11-30; currently incomplete.

- DM-NCSA-10: Sustained archiving service that is OCS commandable *(Due: 2018-06-22; currently incomplete)*
- DM-NCSA-11: Verified acquisition of raw and crosstalk-corrected exposures at raft scale, incl. correct metadata *(Due: 2018-11-30; currently incomplete)*

3.9 Camera data processing: LDM-503-07

Due: 2018-11-30; currently incomplete.

- DM-DRP-4: Calibration product generation in support of basic ISR. *(Due: 2017-05-31; completed 2017-12-01)*
- DM-SUIT-6: LSSTCam data display and visualization *(Due: 2018-11-30; currently incomplete)*
- DM-SUIT-7: Mapping between SUIT systems & NCSA auth system *(Due: 2018-11-30; currently incomplete)*
- DM-SUIT-8: SUIT portal integrated with workspace *(Due: 2018-11-30; currently incomplete)*

3.10 Ops rehearsal for commissioning #1: LDM-503-09

Due: 2018-11-30; currently incomplete.

- DM-DAX-9: Provenance system, details TBD. *(Due: 2018-11-30; currently incomplete)*
- DM-NCSA-16: Perform ISR processing on ComCam-scale data. *(Due: 2018-11-30; currently incomplete)*
- DM-NCSA-17: QA on WCS, PSF, etc returned to Observatory using JupyterLab *(Due: 2018-11-30; currently incomplete)*
- DM-NCSA-18: Validated disaster repsonse recovery for data and calibration products *(Due: 2018-11-30; currently incomplete)*
- DM-NCSA-19: 8x7 incident response system *(Due: 2018-11-30; currently incomplete)*
- DM-SQRE-2: Commissioning notebooks running on the commissioning cluster *(Due: 2018-11-30; currently incomplete)*

3.11 Pipelines Release Fall 2018: LDM-503-09a

Due: 2018-11-30; currently incomplete.

- DM-AP-2: Alard & Lupton-style image differencing. *(Due: 2017-08-31; completed 2017-11-01)*
- DM-AP-3: Point source & dipole measurement on difference images. *(Due: 2017-08-31; completed 2017-11-01)*

- DM-DRP-16: Global photometric fitting (e.g. Burke et al. Forward Global Calibration Method). *(Due: 2018-01-31; completed 2018-05-31)*
- DM-DRP-32: Object classification system available. *(Due: 2018-03-30; currently incomplete)*
- DM-DRP-11: Pipelines code provides supports for database ingestion of results. *(Due: 2018-05-31; currently incomplete)*
- DM-AP-7: Basic instrument signature removal (ISR) capability. *(Due: 2018-06-29; completed 2018-06-29)*
- DM-DRP-3: PSF-homogenized coadd construction. *(Due: 2018-06-29; completed 2017-11-01)*
- DM-DRP-38: Camera package supporting the Commissioning Camera. *(Due: 2018-06-29; completed 2018-06-29)*
- DM-DRP-5: Camera package supporting the LSST Camera. *(Due: 2018-06-29; completed 2018-06-29)*
- DM-AP-6: Alert format defined & queue system available. *(Due: 2018-07-02; currently incomplete)*
- DM-DRP-7: Coordinate transformation tool provided for use with the Collimated Beam Projector. *(Due: 2018-07-12; currently incomplete)*
- DM-AP-9: JOINTCAL1: Jointcal at a functional level *(Due: 2018-07-20; currently incomplete)*
- DM-DRP-17: Simultaneous photometric and astrometric fitting to multiple exposures. *(Due: 2018-07-20; currently incomplete)*
- DM-DAX-8: Supertask-based system capable of efficient processing across a full focal plane. *(Due: 2018-11-30; currently incomplete)*

3.12 Spectrograph data acquisition: LDM-503-08

Due: 2019-01-04; currently incomplete.

- DM-DRP-6: Camera package supporting the Auxiliary Telescope. *(Due: 2017-08-31; completed 2018-01-31)*

- DM-NET-3: Initial Network Ready (Summit) *(Due: 2018-03-05; currently incomplete)*
- DM-NET-6: Summit LAN installed *(Due: 2018-03-05; completed 2018-04-02)*
- DM-NET-2: Mountain - Base Network Functional 2 x 100 Gbps *(Due: 2018-03-27; completed 2018-04-02)*
- DM-NCSA-12: EFD ETL Service *(Due: 2018-10-15; currently incomplete)*
- DM-NCSA-13: Header Writing Service for Spectrograph use case *(Due: 2018-10-15; currently incomplete)*
- DM-NCSA-14: Data Backbone endpoints in Chile for ingestion and access, distribution over WAN, ingest at NCSA into custodial file sto *(Due: 2018-10-15; currently incomplete)*
- DM-NCSA-15: Batch Processing Service for offline spectrograph data processing *(Due: 2018-10-15; currently incomplete)*
- DM-SUIT-9: Spectral data display *(Due: 2019-01-04; currently incomplete)*

3.13 DAQ validation: LDM-503-10

Due: 2019-09-25; currently incomplete.

No new functionality is associated with this milestone, which represents a refined or improved version of earlier deliveries.

3.14 Large Scale CCOB Data Access: LDM-503-10b

Due: 2019-10-02; currently incomplete.

No new functionality is associated with this milestone, which represents a refined or improved version of earlier deliveries.

3.15 Ops rehearsal for commissioning #2: LDM-503-11

Due: 2019-10-02; currently incomplete.

- DM-DAX-10: Middleware support for multifit *(Due: 2018-11-30; currently incomplete)*
- DM-NET-4: Base LAN installed *(Due: 2019-03-29; currently incomplete)*

3.16 ComCam Ops Readiness: LDM-503-11a

Due: 2019-10-02; currently incomplete.

- DM-NCSA-20: ComCam Archiving Service *(Due: 2019-09-30; currently incomplete)*
- DM-NCSA-21: L1 Offline Processing Service, Raft Scale, ComCam *(Due: 2019-09-30; currently incomplete)*
- DM-NCSA-22: Information in consolidated database available to QA portal *(Due: 2019-09-30; currently incomplete)*
- DM-SUIT-10: SUIT deployment procedure *(Due: 2019-09-30; currently incomplete)*

3.17 Pipelines Release Fall 2019: LDM-503-11b

Due: 2019-10-02; currently incomplete.

- DM-DRP-8: Calibration product generation for the Auxiliary Telescope. *(Due: 2018-10-15; currently incomplete)*
- DM-DRP-9: Data reduction pipeline for the Auxiliary Telescope. *(Due: 2018-10-15; currently incomplete)*
- DM-DRP-10: Calibration products include an optical ghost model. *(Due: 2018-11-29; currently incomplete)*
- DM-DRP-19: QA metrics are generated during pipeline execution. *(Due: 2018-11-29; currently incomplete)*
- DM-DRP-33: Generation of coadded images suitable for use in EPO activities. *(Due: 2018-11-29; currently incomplete)*
- DM-DRP-12: Background estimation over the full visit. *(Due: 2018-11-30; currently incomplete)*
- DM-DRP-13: PSF estimation over the full visit. *(Due: 2018-11-30; currently incomplete)*
- DM-DRP-15: All varieties of coadd required for object detection and characterization are now produced during normal pipeline operation (although not necessarily at the ultimately required level of fidelity). *(Due: 2018-11-30; currently incomplete)*

- DM-DRP-29: Moving point source model fitting now available. *(Due: 2018-11-30; currently incomplete)*
- DM-DRP-37: Artifact rejection and background matching during coadd construction. *(Due: 2018-11-30; currently incomplete)*
- DM-AP-8: Advanced ISR, including ghost and linear feature masking, correction for the Brighter-Fatter effect and compensation for pixel response non-uniformity. *(Due: 2019-01-04; currently incomplete)*
- DM-DRP-20: Refined set of LSST calibration products. *(Due: 2019-05-31; currently incomplete)*
- DM-DRP-21: Integrated image characterization pipeline for Data Release Production. *(Due: 2019-05-31; currently incomplete)*
- DM-DRP-23: Atmospheric characterization based on data from the Auxiliary Telescope now available. *(Due: 2019-05-31; currently incomplete)*
- DM-AP-10: Advanced single frame measurement pipeline for Alert Production. *(Due: 2019-08-20; currently incomplete)*

3.18 Ops rehearsal for commissioning #3: LDM-503-12

Due: 2019-12-05; currently incomplete.

- DM-SQRE-3: Hardened Jupyter deployment on Commissioning Cluster *(Due: 2019-08-05; currently incomplete)*

3.19 LSSTCam Ops Readiness: LDM-503-12a

Due: 2020-07-27; currently incomplete.

No new functionality is associated with this milestone, which represents a refined or improved version of earlier deliveries.

3.20 Pipelines Release Fall 2020: LDM-503-13a

Due: 2020-10-30; currently incomplete.

- DM-AP-11: Difference imaging includes noise decorrelation and correction for differential chromatic refraction. *(Due: 2019-10-21; currently incomplete)*
- DM-DRP-22: Template generation integrated with Data Release Production pipelines. *(Due: 2019-10-21; currently incomplete)*
- DM-DRP-26: Overlap resolution at tract & patch boundaries. *(Due: 2019-10-31; currently incomplete)*
- DM-DRP-24: Physically motivated PSF model, including separate characterization of contributions from the atmosphere and the telescope system. *(Due: 2019-11-27; currently incomplete)*
- DM-DRP-27: Object generation: association and assembly of (DIA, coadd, etc) sources to form objects. *(Due: 2019-11-27; currently incomplete)*
- DM-DRP-28: Difference images are now a first-class data product during data release processing. *(Due: 2020-01-31; currently incomplete)*
- DM-DRP-30: Forced photometry is now performed on individual processed visit images during data releases. *(Due: 2020-01-31; currently incomplete)*
- DM-DRP-25: Prototype multi-epoch fitting system available. *(Due: 2020-02-06; currently incomplete)*
- DM-DRP-34: Selection maps are generated during data releases. *(Due: 2020-02-20; currently incomplete)*
- DM-AP-14: Alert filtering system available. *(Due: 2020-10-23; currently incomplete)*
- DM-AP-12: Difference imaging is now agnostic to the PSF of the template image. *(Due: 2020-10-30; currently incomplete)*
- DM-AP-13: Trailed source measurement on difference images. *(Due: 2020-10-30; currently incomplete)*

3.21 Ops rehearsal for data release processing #1 (ComCam data): LDM-503-13

Due: 2020-11-30; currently incomplete.

- DM-STAFF: Staffing Checkpoint *(Due: 2019-12-02; currently incomplete)*

- DM-NCSA-23: Operational processes for preparing for & producing a data release defined and tested *(Due: 2020-10-23; currently incomplete)*
- DM-SUIT-15: Alert subscription *(Due: 2020-11-30; currently incomplete)*

3.22 DM Readiness for Science Verification: LDM-503-14

Due: 2020-11-30; currently incomplete.

- DM-SQRE-4: Notebook service ready for verification & validation *(Due: 2020-02-10; currently incomplete)*
- DM-SUIT-16: Commissioning DAC *(Due: 2020-11-30; currently incomplete)*

3.23 Pipelines Release Fall 2021: LDM-503-15a

Due: 2021-10-28; currently incomplete.

- DM-AP-15: Alert distribution system fully integrated. *(Due: 2021-06-02; currently incomplete)*
- DM-AP-17: Moving object processing system (MOPS) available. *(Due: 2021-09-20; currently incomplete)*
- DM-AP-16: Full integration of the Alert Production system within the operational environment. *(Due: 2021-10-28; currently incomplete)*

3.24 Ops rehearsal for data release processing #2: LDM-503-15

Due: 2021-11-29; currently incomplete.

- DM-SQRE-5: Notebook service ready for general science users *(Due: 2020-08-07; currently incomplete)*
- DM-NCSA-25: Demonstrate operational coordination with and processing at satellite CC-IN2P3 satellite computing facility *(Due: 2021-11-02; currently incomplete)*
- DM-NCSA-24: Production batch service for data release processing *(Due: 2021-11-29; currently incomplete)*

3.25 Ops rehearsal for data release processing #3: LDM-503-16

Due: 2022-02-28; currently incomplete.

- DM-NCSA-26: Demonstrate full delivery of Data Facility ConOps *(Due: 2022-02-28; currently incomplete)*

3.26 Final Pipelines Delivery: LDM-503-17a

Due: 2022-08-31; currently incomplete.

No new functionality is associated with this milestone, which represents a refined or improved version of earlier deliveries.

3.27 Final operations rehearsal: LDM-503-17

Due: 2022-09-30; currently incomplete.

No new functionality is associated with this milestone, which represents a refined or improved version of earlier deliveries.

4 References

[1] **[LDM-148]**, Lim, K.T., Bosch, J., Dubois-Felsmann, G., et al., 2017, *Data Management System Design*, LDM-148, URL `https://ls.st/LDM-148`

[2] **[LDM-503]**, O'Mullane, W., Jurić, M., Economou, F., 2017, *Data Management Test Plan*, LDM-503, URL `https://ls.st/LDM-503`

5 Acronyms

Acronym	Description
DAC	Data Access Center

DAQ	Data AcQuisition (system)
DAX	Data access services
DM	Data Management
DRP	Data Release Production
EFD	Engineering Facilities Database
FITS	Flexible Image Transport System
IPAC	No longer an acronym
ISR	Instrument Signal Removal
IVOA	International Virtual-Observatory Alliance
LAN	Local Area Network
LSST	Large Synoptic Survey Telescope
MOPS	Moving Object Pipelines
NCSA	National Center for Supercomputing Applications
OCS	Observatory Control System
PDAC	Prototype Data Access Center
PMCS	Project Management Control System
PSF	Point Spread Function
QA	Quality Assurance
SODA	SCOS ORATOS Distributed Access
SQuaRE	Science Quality and Reliability Engineering
SUIT	Science User Interface and Tools
TAP	Table Access Protocol
TBD	To Be Defined (Determined)
WCS	World Coordinate System
WISE	Wide-field Survey Explorer