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Vera C. Rubin Observatory
Data Management

Data Management Releases for Verification/Integration

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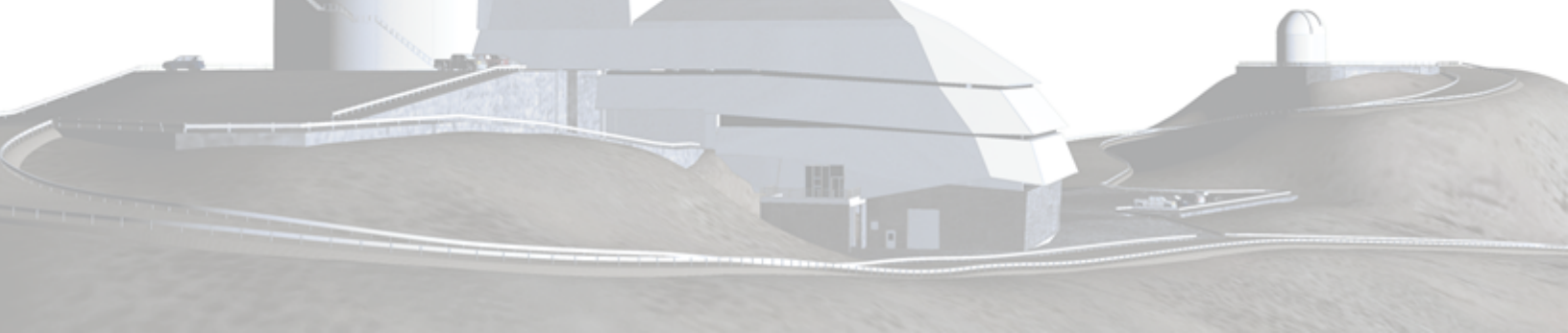
LDM-564

Latest Revision: 2021-05-20



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Abstract

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

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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
1.3	2019-07-12	Update schedule based on month end May 2019 data. Add LDM-503-10a release.	J.D. Swinbank
1.4	2020-08-19	Update schedule based on month end July 2020 data. Modernize description of release management.	J.D. Swinbank

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

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Contents

Rubin Observatory

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1 Introduction

1.1 Scope

This document describes the major DM functionality which is expected to be available at major[1] milestones during the construction project, as described in LDM-503. In doing so, it is intended to provide guidance to the system integration and verification teams.

2 Release Management

All software releases from the DM Subsystem are carried out following the Release Management Policy, LDM-672. Technical details of the application of this policy are described in DMTN-106.

2.1 Preparation of Releases

DM develops code in GitHub following its developer guidelines and coding standards [2]. This includes automated testing and continuous integration. Tested releases are tagged by SQuaRE weekly and major releases are made periodically.

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.

[1] "level 2"

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

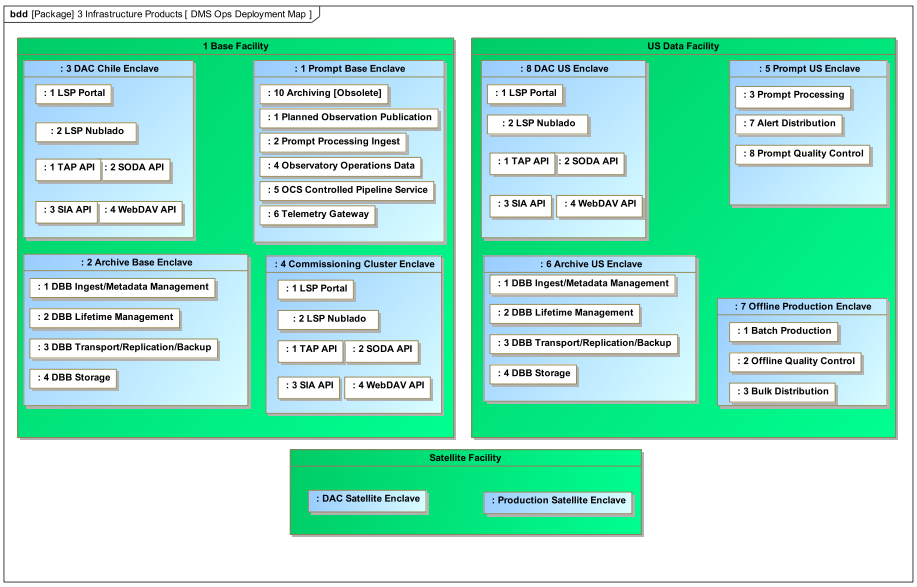

FIGURE 1: DM components as deployed during Operations. For details, refer to LDM-148.

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 testing before they are made available in the production environment. This will serve as an operational validation of the release.

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; currently incomplete.

- DM-SUIT-3: Time series analysis tool for WISE data *(Due: 2016-09-30; 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: 2017-07-31; completed 2017-11-30)*
- DM-SQRE-1: Project internal Jupyter notebook service *(Due: 2017-08-31; completed 2016-04-08)*
- DM-DAX-1: WISE data ingest to PDAC *(Due: 2017-11-30; completed 2016-12-19)*
- DM-SUIT-1: Search and display WISE sources (objects) in PDAC *(Due: 2017-11-30; currently incomplete)*
- DM-SUIT-4: Multiple data traces in chart space *(Due: 2017-11-30; completed 2017-11-30)*

3.2 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 2014-08-01)*
- 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)*

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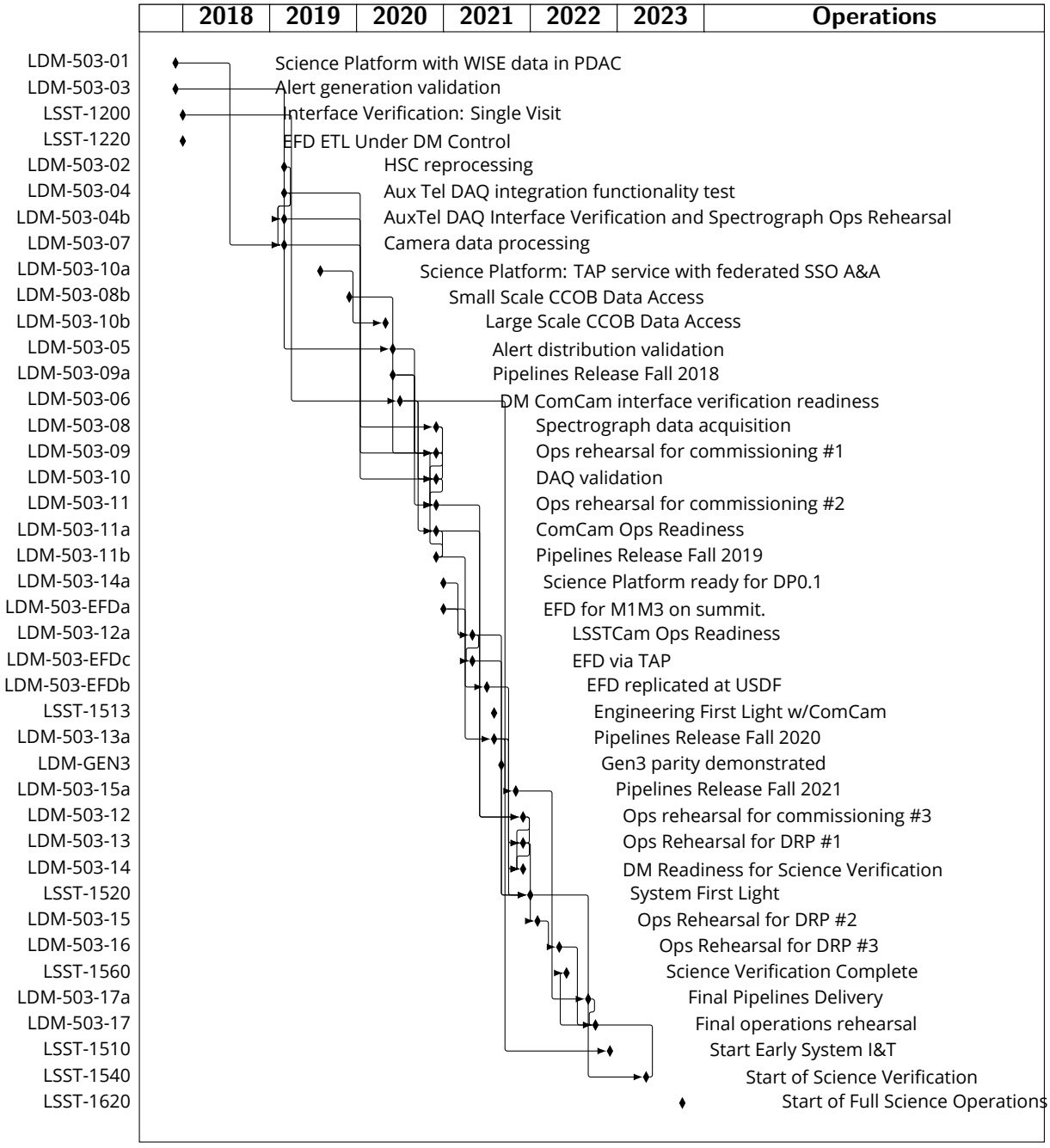

FIGURE 2: DM level 2 milestones (LDM-503-x) in the LSST schedule.

- 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 2019-02-28)*

3.3 HSC reprocessing: LDM-503-02

Due: 2019-02-28; completed 2018-05-30.

- 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 2014-08-13)*
- 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 2014-08-01)*
- DM-DRP-2: Basic visualization and quality assessment tools operational on HSC-scale data volumes. *(Due: 2019-02-28; completed 2017-11-01)*
- DM-NCSA-3: Provide database for metadata, provenance, location and demonstrate ingest at small scale *(Due: 2019-02-28; completed 2017-11-01)*

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

Due: 2019-02-28; completed 2017-12-01.

- DM-NCSA-4: Minimal support for the small operational schema including file metadata and provenance for every file, and record of in *(Due: 2019-02-28; completed 2018-03-31)*

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

Due: 2019-02-28; currently incomplete.

- DM-NCSA-27: Deliver header service code *(Due: 2017-12-29; completed 2017-12-29)*
- 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; completed 2018-05-31)*
- 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 2018-06-29)*
- DM-NCSA-7: Capability to paint displays for Tucson and NCSA *(Due: 2018-03-30; completed 2018-10-31)*

3.6 Camera data processing: LDM-503-07

Due: 2019-02-28; completed 2020-06-30.

- DM-DRP-4: Calibration product generation in support of basic ISR. *(Due: 2017-05-31; completed 2017-11-01)*

3.7 Science Platform: TAP service with federated SSO A&A: LDM-503-10a

Due: 2019-07-29; currently incomplete.

- DM-DAX-2: Query service supporting IVOA TAP protocol, w/ support for asynchronous queries *(Due: 2017-07-31; completed 2017-11-01)*

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

Due: 2019-11-08; completed 2019-11-29.

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

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

Due: 2020-04-22; completed 2019-07-15.

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

3.10 Alert distribution validation: LDM-503-05

Due: 2020-05-29; completed 2018-06-29.

- DM-NCSA-9: Test instance of alert distribution hosting service and L1 database in Development & Integration Enclave *(Due: 2018-08-31; currently incomplete)*
- DM-NCSA-8: Alert Filtering Service receives alert streams *(Due: 2020-05-29; completed 2018-06-29)*

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

Due: 2020-05-29; 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 2018-11-30)*
- DM-DRP-32: Object classification system available. *(Due: 2018-03-30; currently incomplete)*
- DM-AP-7: Basic instrument signature removal (ISR) capability. *(Due: 2018-06-29; completed 2018-07-31)*
- 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; currently incomplete)*
- DM-DRP-5: Camera package supporting the LSST Camera. *(Due: 2018-06-29; completed 2017-12-01)*
- DM-DRP-7: Coordinate transformation tool provided for use with the Collimated Beam Projector. *(Due: 2018-07-12; completed 2018-01-31)*
- DM-AP-9: JOINTCAL1: Jointcal at a functional level *(Due: 2018-07-20; completed 2019-01-17)*
- DM-DRP-17: Simultaneous photometric and astrometric fitting to multiple exposures. *(Due: 2018-07-20; completed 2018-05-31)*
- DM-AP-6: Alert format defined & queue system available. *(Due: 2020-05-29; completed 2017-11-01)*

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

Due: 2020-06-03; completed 2018-07-17.

- DM-NCSA-10: Sustained archiving service that is OCS commandable *(Due: 2018-09-25; completed 2019-05-31)*
- DM-NCSA-11: Verified acquisition of raw and crosstalk-corrected exposures at raft scale, incl. correct metadata *(Due: 2019-07-29; completed 2019-05-31)*

3.13 Spectrograph data acquisition: LDM-503-08

Due: 2020-11-30; completed 2019-01-17.

- DM-DRP-6: Camera package supporting the Auxiliary Telescope. *(Due: 2017-08-31; completed 2018-06-29)*
- DM-NET-2: Mountain - Base Network Functional 2 x 100 Gbps *(Due: 2018-03-27; completed 2020-11-30)*

- DM-NET-3: Initial Network Ready (Summit) *(Due: 2018-09-28; completed 2015-08-05)*
- DM-NET-6: Summit LAN installed *(Due: 2018-09-28; currently incomplete)*
- DM-NCSA-13: Header Writing Service for Spectrograph use case *(Due: 2019-05-14; completed 2020-06-30)*
- DM-NCSA-14: Data Backbone endpoints in Chile for ingestion and access, distribution over WAN, ingest at NCSA into custodial file sto *(Due: 2020-06-22; completed 2019-05-31)*
- DM-NCSA-15: Batch Processing Service for offline spectrograph data processing *(Due: 2020-11-30; completed 2020-05-29)*

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

Due: 2020-11-30; completed 2019-12-31.

- DM-DAX-2: Query service supporting IVOA TAP protocol, w/ support for asynchronous queries *(Due: 2017-07-31; completed 2017-11-01)*
- DM-SQRE-2: Notebook service capabilities are suitable for the commissioning team to develop notebooks for its needs *(Due: 2018-11-30; completed 2017-11-01)*
- DM-DAX-5: Database ingest in support of HSC reprocessing (ie, large catalog ingest) *(Due: 2019-02-28; completed 2019-11-29)*
- DM-SUIT-5: Search and display processed HSC data *(Due: 2019-02-28; completed 2017-11-30)*
- DM-NCSA-16: Perform ISR processing on ComCam-scale data. *(Due: 2019-03-29; completed 2020-05-29)*
- DM-DAX-9: Provenance system *(Due: 2020-11-30; completed 2020-06-30)*

3.15 DAQ validation: LDM-503-10

Due: 2020-11-30; completed 2019-10-07.

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

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

Due: 2020-11-30; completed 2020-06-22.

- DM-NCSA-16: Perform ISR processing on ComCam-scale data. *(Due: 2019-03-29; completed 2020-05-29)*
- DM-NET-4: Base LAN installed *(Due: 2019-07-15; completed 2018-03-05)*

3.17 ComCam Ops Readiness: LDM-503-11a

Due: 2020-11-30; currently incomplete.

- DM-NCSA-16: Perform ISR processing on ComCam-scale data. *(Due: 2019-03-29; completed 2020-05-29)*
- DM-SUIT-10: SUIT deployment procedure *(Due: 2019-05-31; completed 2020-05-29)*
- DM-NCSA-20: ComCam Archiving Service *(Due: 2019-09-06; completed 2019-06-13)*
- DM-NCSA-21: L1 Offline Processing Service, Raft Scale, ComCam *(Due: 2020-06-30; completed 2020-06-30)*
- DM-NCSA-22: Information in consolidated database available to QA portal *(Due: 2020-11-30; currently incomplete)*

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

Due: 2020-11-30; completed 2018-06-29.

- DM-DRP-14: Insertion of simulated sources into the data stream to check pipeline performance. *(Due: 2017-11-30; currently incomplete)*
- DM-DRP-18: Initial multi-band deblending algorithm available. *(Due: 2017-11-30; completed 2018-11-29)*

- DM-DRP-9: Data reduction pipeline for the Auxiliary Telescope. *(Due: 2018-10-15; currently incomplete)*
- DM-DRP-19: QA metrics are generated during pipeline execution. *(Due: 2018-11-29; completed 2017-12-01)*
- 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; completed 2018-06-29)*
- 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: 2020-11-30; completed 2017-12-01)*

3.19 Science Platform ready for DP0: LDM-503-14a

Due: 2020-12-01; currently incomplete.

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

3.20 Engineering Facility Database at the summit capturing and enabling access to all telemetry with M1/M3 active: LDM-503-EFDa

Due: 2020-12-09; currently incomplete.

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

3.21 LSSTCam Ops Readiness: LDM-503-12a

Due: 2021-04-02; completed 2020-12-31.

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

3.22 EFD data is queriable through TAP in the Science Platform: LDM-503-EFDc

Due: 2021-04-02; currently incomplete.

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

3.23 EFD/telemetry data replicated at the LDF, stored in InfluxDB. aggregated into parquet files: LDM-503-EFDb

Due: 2021-06-14; currently incomplete.

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

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

Due: 2021-07-27; completed 2019-04-12.

- DM-AP-11: Difference imaging includes noise decorrelation and correction for differential chromatic refraction. *(Due: 2019-11-27; currently incomplete)*
- DM-DRP-22: Template generation integrated with Data Release Production pipelines. *(Due: 2020-06-01; currently incomplete)*
- DM-DRP-25: Prototype multi-epoch fitting system available. *(Due: 2020-11-30; completed 2021-02-01)*
- DM-DRP-30: Forced photometry is now performed on individual processed visit images during data releases. *(Due: 2020-11-30; currently incomplete)*
- DM-DRP-34: Selection maps are generated during data releases. *(Due: 2020-11-30; completed 2018-10-31)*
- DM-AP-12: Difference imaging is now agnostic to the PSF of the template image. *(Due: 2021-07-09; completed 2019-10-01)*

- DM-AP-13: Trailed source measurement on difference images. *(Due: 2021-07-09; currently incomplete)*
- DM-DRP-26: Overlap resolution at tract & patch boundaries. *(Due: 2021-07-27; currently incomplete)*
- DM-DRP-27: Object generation: association and assembly of (DIA, coadd, etc) sources to form objects. *(Due: 2021-07-27; currently incomplete)*
- DM-DRP-28: Difference images are now a first-class data product during data release processing. *(Due: 2021-07-27; currently incomplete)*

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

Due: 2021-10-28; currently incomplete.

- DM-AP-15: Alert distribution system fully integrated. *(Due: 2020-11-30; currently incomplete)*
- DM-AP-17: Moving object processing system (MOPS) available. *(Due: 2021-08-09; currently incomplete)*
- DM-AP-16: Full integration of the Alert Production system within the operational environment. *(Due: 2021-10-28; currently incomplete)*

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

Due: 2021-11-30; currently incomplete.

- DM-SQRE-3: Notebook service stable for commissioning and other internal project users *(Due: 2020-02-27; completed 2020-01-30)*

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

Due: 2021-11-30; currently incomplete.

- DM-STAFF: Staffing Checkpoint *(Due: 2019-11-27; completed 2019-03-29)*
- DM-NCSA-23: Operational processes for preparing for & producing a data release defined and tested *(Due: 2020-10-23; completed 2020-08-31)*

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

Due: 2021-11-30; currently incomplete.

- DM-SQRE-4: Notebook service ready for verification & validation *(Due: 2021-06-16; completed 2020-01-30)*

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

Due: 2022-01-12; 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)*

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

Due: 2022-04-13; currently incomplete.

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

3.31 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.

3.32 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] **[DMTN-106]**, Comoretto, G., 2019, *DM Release Process*, DMTN-106, URL http://DMTN-106.lsst.io

[2] **[LDM-672]**, Comoretto, G., Guy, L., 2019, *LSST Software Release Management Policy*, LDM-672, URL http://LDM-672.lsst.io

[3] **[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

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

5 Acronyms

Acronym	Description
AP	Alert Production
CC	Change Control
CC-IN2P3	Centre de Calcul de l'IN2P3
CCOB	Camera Calibration Optical Bench
ComCam	The commissioning camera is a single-raft, 9-CCD camera that will be installed in LSST during commissioning, before the final camera is ready.
DAQ	Data Acquisition System
DAX	Data Access Services

DIA	Difference Image Analysis
DM	Data Management
DMTN	DM Technical Note
DP0	Data Preview 0
DRP	Data Release Production
EFD	Engineering and Facility Database
FITS	Flexible Image Transport System
HSC	Hyper Suprime-Cam
I&T	Integration and Test
IN2P3	Institut National de Physique Nucléaire et de Physique des Particules
IPAC	No longer an acronym; science and data center at Caltech
IRSA	Infrared Science Archive
ISR	Instrument Signal Removal
IVOA	International Virtual-Observatory Alliance
L1	Lens 1
L2	Lens 2
L3	Lens 3
LAN	Local Area Network
LDF	LSST Data Facility
LDM	LSST Data Management (Document Handle)
LSST	Legacy Survey of Space and Time (formerly Large Synoptic Survey Telescope)
M1M3	Primary Mirror Tertiary Mirror
MOPS	Moving Object Processing System (deprecated; see SSP)
NCSA	National Center for Supercomputing Applications
NET	Network Engineering Team
OCS	Observatory Control System
PDAC	Prototype Data Access Center
PMCS	Project Management Controls System
PSF	Point Spread Function
QA	Quality Assurance
RFC	Request For Comment
SQuaRE	Science Quality and Reliability Engineering

SUIT	Science User Interface and Tools (LSST Data Management WBS element and team, responsible for LSP Portal Aspect)
TAP	Table Access Protocol
USDF	United States Data Facility
WAN	Wide Area Network
WISE	Wide-field Survey Explorer