

Vera C. Rubin Observatory Data Management

Data Management Releases for Verification/Integration

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LDM-564

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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	J.D. Swinbank
		in RFC-497	
1.2	2018-07-17	Provide text for L2 milestones which do not	J.D. Swinbank
		contain L3 milestones. Approved in RFC-501.	
1.3	2019-07-12	Update schedule based on month end May	J.D. Swinbank
		2019 data. Add LDM-503-10a release.	
1.4	2020-08-19	Update schedule based on month end July	J.D. Swinbank
		2020 data. Modernize description of release	
		management.	
1.5	2021-06-03	Update schedule for 2021 reviews approved	W. O'Mullane
		in RFC-781	
1.6	2023-08-13	Update schedule, reomve rebaseline, June	W. O'Mullane
		data approved in RFC-940	

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Data Management Releases for Verification/Integration

1 Introduction

The dates in this document are the forecast dates for the proposed rebaseline - as in Figure ??.

1.1 Scope

This document describes the major DM functionality which is expected to be available at major¹ 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"

²https://developer.lsst.io/

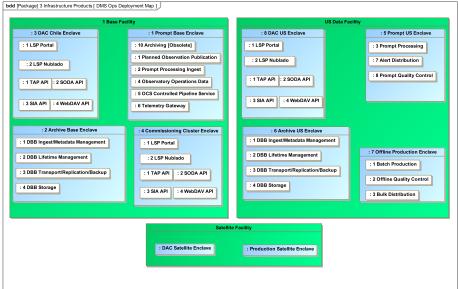


FIGURE 1: DM components as deployed during Operations. For details, refer to LDM-148.





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: 2023-06-01; completed 2018-05-30.

- DM-DAX-1: WISE data ingest to PDAC (Due: 2023-06-01; completed 2017-11-01)
- DM-SQRE-1: Project internal Jupyter notebook service (*Due: 2023-06-01; completed 2017-11-01*)
- DM-SUIT-1: Search and display WISE sources (objects) in PDAC (*Due: 2023-06-01; 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: 2023-06-01; completed 2017-11-30*)
- DM-SUIT-3: Time series analysis tool for WISE data (*Due: 2023-06-01; completed 2017-11-30*)
- DM-SUIT-4: Multiple data traces in chart space (*Due: 2023-06-01; completed 2017-11-30*)

3.2 HSC reprocessing: LDM-503-02

Due: 2023-06-01; completed 2017-12-01.

- DM-AP-1: Basic single frame measurement pipeline. (*Due: 2023-06-01; completed 2017-11-01*)
- 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: 2023-06-01; completed 2017-11-01*)
- DM-DRP-2: Basic visualization and quality assessment tools operational on HSC-scale data volumes. (*Due: 2023-06-01; completed 2017-11-01*)





	2018 2019 2020 2021 2022 2023 2024 2025 Operations
LDM-503-01	h Science Platform with WISE data in PDAC
LDM-503-02	HSC reprocessing
LDM-503-03	Alert generation validation
LDM-503-04	Aux Tel DAQ integration functionality test
LDM-503-04b	AuxTel DAQ Interface Verification and Spectrograph Ops Rehearsal
LDM-503-06	DM ComCam interface verification readiness
LDM-503-07	Camera data processing
LDM-503-08b	Small Scale CCOB Data Access
LDM-503-10a	Science Platform: TAP service with federated SSO A&A
LSST-1200	Interface Verification: Single Visit
LSST-1220	EFD ETL Under DM Control
LDM-503-EFDa	EFD for M1M3 on summit.
LDM-503-15	Ops Rehearsal for DRP #2
LDM-503-05	Alert distribution validation
LDM-503-08	Spectrograph data acquisition
LDM-503-09	Ops rehearsal for commissioning #1
LDM-503-09a	Pipelines Release Fall 2018
LDM-503-10	DAQ validation
LDM-503-10b	Large Scale CCOB Data Access
LDM-503-11	Ops rehearsal for commissioning #2
LDM-503-11a	ComCam Ops Readiness
LDM-503-14a	Science Platform ready for DP0.1
LDM-GEN3	Gen3 parity demonstrated
LDM-503-12	Ops rehearsal for commissioning #3
LDM-503-EFDb	EFD replicated at USDF
LDM-503-11b	Pipelines Release Fall 2019
LDM-503-13a	Pipelines Release Fall 2020
LDM-503-15a	Pipelines Release Spring 2022
LDM-503-18q	Qserv construction complete
LDM-503-NET	• Network Verification End-to-End
LDM-503-RSPa	Science Platform ready for DP0.2 with Image Services
LDM-503-13	Ops Rehearsal for DRP #1
LDM-503-16a	Pipelines Release Spring 2023
LDM-503-12a	LSSTcam On Sky Readiness
LDM-503-14	DM Readiness for Science Verification Surveys
LDM-503-19a	All P1a DM requirements verified
LDM-503-EFDc	EFD via TAP
LSST-1520	System First Light with LSSTCam
LDM-503-RSPb	Science Platform ready for Science Verification
LSST-1540	Start of Science Verification
LDM-503-17a	Final Pipelines Delivery
LDM-503-19 LDM-503-16	All 1a 1b DM requirements verified
LDM-503-16 LDM-503-17	Ops Rehearsal for processing #3
LDIM-503-17 LSST-1560	 Final operations rehearsal Science Verification Complete
LSST-1560 LSST-1620	 Science Verification Complete Start of Full Science Operations
L331-1020	
l	

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



- DM-NCSA-1: Provide regular reprocessing service for HSC data (Due: 2023-06-01; 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: 2023-06-01; completed 2017-11-01*)
- DM-NCSA-3: Provide database for metadata, provenance, location and demonstrate ingest at small scale (*Due: 2023-06-01; completed 2017-11-01*)

3.3 Alert generation validation: LDM-503-03

Due: 2023-06-01; completed 2017-12-01.

- DM-AP-1: Basic single frame measurement pipeline. (*Due: 2023-06-01; completed 2017-11-01*)
- DM-AP-2: Alard & Lupton-style image differencing. (*Due: 2023-06-01; completed 2017-11-01*)
- DM-AP-3: Point source & dipole measurement on difference images. (Due: 2023-06-01; completed 2017-11-01)
- DM-AP-4: DIASource association (*Due: 2023-06-01; completed 2017-11-01*)
- DM-AP-5: DIAObject generation (Due: 2023-06-01; completed 2017-11-01)
- DM-DAX-6: Prototype level 1 database (Due: 2023-06-01; completed 2017-11-01)

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

Due: 2023-06-01; 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: 2023-06-01; completed 2018-06-29*)



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

Due: 2023-06-01; completed 2018-06-29.

- DM-NCSA-27: Deliver header service code (*Due: 2023-06-01; completed 2017-12-01*)
- 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: 2023-06-01; completed 2018-05-31*)
- DM-NCSA-6: Ability to transfer files originating from Tucson to NCSA and ingest files at NCSA, including metadata and provenance (*Due: 2023-06-01; completed 2018-10-31*)
- DM-NCSA-7: Capability to paint displays for Tucson and NCSA (*Due: 2023-06-01; completed 2018-06-29*)

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

Due: 2023-06-01; completed 2020-06-30.

- DM-NCSA-10: Sustained archiving service that is OCS commandable (*Due: 2023-06-01; completed 2019-05-31*)
- DM-NCSA-11: Verified acquisition of raw and crosstalk-corrected exposures at raft scale, incl. correct metadata (*Due: 2023-06-01; completed 2020-06-30*)

3.7 Camera data processing: LDM-503-07

Due: 2023-06-01; completed 2019-01-17.

• DM-DRP-4: Calibration product generation in support of basic ISR. (Due: 2023-06-01; completed 2017-12-01)

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

Due: 2023-06-01; completed 2019-07-15.



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

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

Due: 2023-06-01; completed 2019-12-31.

• DM-DAX-2: Query service supporting IVOA TAP protocol, w/ support for asynchronous queries (*Due: 2023-06-01; completed 2019-11-29*)

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

Due: 2023-08-25; completed 2021-09-30.

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

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

Due: 2023-09-01; completed 2023-08-31.

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

3.12 Alert distribution validation: LDM-503-05

Due: 2023-09-05; completed 2018-07-17.

- DM-NCSA-9: Test instance of alert distribution hosting service and L1 database in Development & Integration Enclave (*Due: 2023-06-01; completed 2019-05-31*)
- DM-AP-18: Alert packet generation (Due: 2023-09-05; completed 2020-05-29)



3.13 Spectrograph data acquisition: LDM-503-08

Due: 2023-09-05; completed 2019-12-31.

- DM-DRP-6: Camera package supporting the Auxiliary Telescope. (Due: 2023-06-01; completed 2018-01-31)
- DM-NCSA-13: Header Writing Service for Spectrograph use case (*Due: 2023-06-01; completed 2019-05-31*)
- DM-NCSA-14: Data Backbone endpoints in Chile for ingestion and access, distribution over WAN, ingest at NCSA into custodial file sto (*Due: 2023-06-01; completed 2021-11-17*)
- DM-NET-2: Mountain Base Network Functional 2 x 100 Gbps (Due: 2023-06-01; completed 2018-04-02)
- DM-NET-3: Initial Network Ready (Summit) (Due: 2023-06-01; completed 2018-03-05)
- DM-NET-6: Summit LAN installed (Due: 2023-06-01; completed 2018-04-02)
- DM-NCSA-15: Batch Processing Service for offline spectrograph data processing (*Due: 2023-09-05; completed 2020-05-29*)

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

Due: 2023-09-05; completed 2019-10-07.

- DM-DAX-2: Query service supporting IVOA TAP protocol, w/ support for asynchronous queries (*Due: 2023-06-01; completed 2019-11-29*)
- DM-DAX-5: Database ingest in support of HSC reprocessing (ie, large catalog ingest) (Due: 2023-06-01; completed 2019-02-28)
- DM-NCSA-16: Perform ISR processing on ComCam-scale data. (Due: 2023-06-01; completed 2019-06-13)
- DM-SQRE-2: Notebook service capabilities are suitable for the commissioning team to develop notebooks for its needs (*Due: 2023-06-01; completed 2019-11-29*)
- DM-SUIT-5: Search and display processed HSC data (*Due: 2023-06-01; completed 2022-06-30*)



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

Due: 2023-09-05; completed 2019-04-12.

- DM-AP-2: Alard & Lupton-style image differencing. (*Due: 2023-06-01; completed 2017-11-01*)
- DM-AP-3: Point source & dipole measurement on difference images. (Due: 2023-06-01; completed 2017-11-01)
- DM-DRP-16: Global photometric fitting (e.g. Burke et al. Forward Global Calibration Method). (*Due: 2023-06-01; completed 2018-05-31*)
- DM-DRP-32: Object classification system available. (*Due: 2023-06-01; completed 2018-10-31*)
- DM-DRP-7: Coordinate transformation tool provided for use with the Collimated Beam Projector. (*Due: 2023-06-01; completed 2018-07-05*)
- DM-AP-7: Basic instrument signature removal (ISR) capability. (Due: 2023-06-29; completed 2018-06-29)
- DM-DRP-3: PSF-homogenized coadd construction. (*Due: 2023-06-29; completed 2017-11-01*)
- DM-DRP-38: Camera package supporting the Commissioning Camera. (*Due: 2023-06-29; completed 2018-06-29*)
- DM-DRP-5: Camera package supporting the LSST Camera. (Due: 2023-06-29; completed 2018-06-29)
- DM-AP-9: JOINTCAL1: Jointcal at a functional level (*Due: 2023-07-20; completed 2018-11-29*)
- DM-DRP-17: Simultaneous photometric and astrometric fitting to multiple exposures. (*Due: 2023-07-20; completed 2018-11-29*)
- DM-AP-6: Alert format defined & queue system available. (Due: 2023-09-05; completed 2018-07-31)



3.16 DAQ validation: LDM-503-10

Due: 2023-09-05; completed 2020-06-22.

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

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

Due: 2023-09-05; completed 2020-04-22.

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

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

Due: 2023-09-05; completed 2021-09-30.

- DM-NCSA-16: Perform ISR processing on ComCam-scale data. (Due: 2023-06-01; completed 2019-06-13)
- DM-NET-4: Base LAN installed (*Due: 2023-06-01; completed 2020-01-31*)

3.19 ComCam Ops Readiness: LDM-503-11a

Due: 2023-09-05; completed 2020-12-31.

- DM-NCSA-16: Perform ISR processing on ComCam-scale data. (Due: 2023-06-01; completed 2019-06-13)
- DM-NCSA-20: ComCam Archiving Service (Due: 2023-06-01; completed 2020-06-30)
- DM-SUIT-10: SUIT deployment procedure (*Due: 2023-09-01; completed 2020-06-30*)
- DM-NCSA-22: Information in consolidated database available to QA portal (*Due: 2023-09-05; completed 2020-08-31*)



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

Due: 2023-09-05; completed 2021-09-30.

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

3.21 Gen3 parity demonstrated: LDM-GEN3

Due: 2023-09-05; completed 2022-05-31.

• DM-DAX-13: Generation 2 middleware retired (*Due: 2023-09-05; completed 2022-05-31*)

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

Due: 2023-12-01; currently incomplete.

• DM-SQRE-3: Notebook service stable for commissioning and other internal project users (*Due: 2023-06-01; completed 2020-01-30*)

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

Due: 2023-12-01; 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 2019: LDM-503-11b

Due: 2023-12-01; completed 2020-11-30.

• DM-DRP-14: Insertion of simulated sources into the data stream to check pipeline performance. (*Due: 2023-06-01; completed 2017-12-01*)



- DM-DRP-18: Initial multi-band deblending algorithm available. (Due: 2023-06-01; 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: 2023-06-30; completed 2019-01-17*)
- 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: 2023-09-05; completed 2018-11-30*)
- DM-DRP-9: Data reduction pipeline for the Auxiliary Telescope. (Due: 2023-10-13; completed 2019-03-25)
- DM-DRP-19: QA metrics are generated during pipeline execution. (*Due: 2023-12-01; completed 2018-12-13*)

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

Due: 2023-12-05; completed 2021-07-31.

- DM-AP-11: Difference imaging includes noise decorrelation and correction for differential chromatic refraction. (*Due: 2023-06-01; completed 2019-10-01*)
- DM-AP-13: Trailed source measurement on difference images. (Due: 2023-06-01; completed 2021-10-29)
- DM-DRP-22: Template generation integrated with Data Release Production pipelines. (*Due: 2023-09-05; completed 2021-03-31*)
- DM-DRP-28: Difference images are now a first-class data product during data release processing. (*Due: 2023-09-05; completed 2021-04-14*)
- DM-DRP-30: Forced photometry is now performed on individual processed visit images during data releases. (*Due: 2023-09-05; completed 2021-02-01*)
- DM-DRP-34: Selection maps are generated during data releases. (Due: 2023-09-05; completed 2021-05-24)
- DM-DRP-26: Overlap resolution at tract & patch boundaries. (*Due: 2023-12-05; completed 2021-02-01*)

3.26 Pipelines Release Spring 2022: LDM-503-15a

Due: 2023-12-05; completed 2022-02-28.

- DM-AP-12: Difference imaging is now agnostic to the PSF of the template image. (Due: 2023-07-03; completed 2023-05-31)
- DM-DRP-27: Object generation: association and assembly of (DIA, coadd, etc) sources to form objects. (*Due: 2023-12-01; currently incomplete*)

3.27 Qserv construction complete: LDM-503-18q

Due: 2023-12-15; currently incomplete.

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

3.28 Network Verification End-to-End: LDM-503-NET

Due: 2024-04-12; currently incomplete.

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

3.29 Science Platform ready for DP0.2 with Image Services: LDM-503-RSPa

Due: 2024-04-30; completed 2023-01-31.

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

3.30 Ops rehearsal for data release processing #1: LDM-503-13

Due: 2024-05-17; completed 2023-02-28.

• DM-STAFF: Staffing Checkpoint (Due: 2023-06-01; completed 2019-11-29)

3.31 Pipelines Release Spring 2023: LDM-503-16a

Due: 2024-06-07; completed 2023-08-31.

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

3.32 LSSTcam On Sky Readiness: LDM-503-12a

Due: 2025-02-12; currently incomplete.

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

3.33 DM Readiness for Science Verification Surveys: LDM-503-14

Due: 2025-02-12; currently incomplete.

• DM-SQRE-4: Notebook service ready for verification & validation (*Due: 2024-03-04; currently incomplete*)

3.34 All P1a DM requirements verified: LDM-503-19a

Due: 2025-02-12; currently incomplete.

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

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

Due: 2025-02-12; currently incomplete.



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

3.36 Science Platform ready for Science Verification: LDM-503-RSPb

Due: 2025-03-20; currently incomplete.

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

3.37 Final Pipelines Delivery: LDM-503-17a

Due: 2025-06-10; currently incomplete.

• DM-DAX-9: Butler Provenance System (Due: 2025-02-12; currently incomplete)

3.38 All 1a,1b DM requirements verified: LDM-503-19

Due: 2025-06-10; currently incomplete.

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

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

Due: 2025-06-17; currently incomplete.

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

3.40 Final operations rehearsal: LDM-503-17

Due: 2025-06-17; 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
ССОВ	Camera Calibration Optical Bench
ComCam	The commissioning camera is a single-raft, 9-CCD camera that will be in-
	stalled 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

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ETL	extract-transform-load	
FITS	Flexible Image Transport System	
HSC	Hyper Suprime-Cam	
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 Tele-	
	scope)	
M1	primary mirror	
M1M3	Primary Mirror Tertiary Mirror	
M3	tertiary mirror	
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	
SSO	Single Sign On	
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	

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