

# Large Synoptic Survey Telescope Data Management Monthly Report

## December 2017

### High-level Summary

The first formal tests of the DM system following the procedure described in LDM-503 were carried out this month. Specifically, the DM team executed the LDM-503-2 (“HSC Reprocessing”) and LDM-503-3 (“Alert Generation Validation”) test specifications. Test reports have been supplied to the DM Change Control Board. As well as formal verification of parts of the DM system, these milestones provided a focus for ongoing technical work within DM, in particular developing an enhanced set of QA tools for validating the test results.

The DM software engineering teams continued their focus on developing requirements and prototypes for the “generation 3 Data Butler” I/O abstraction framework. These requirements, and associated use cases, underwent a successful internal review during December; a similar review focusing on the prototype implementation is expected in January. In addition, the “cp\_pipe” package was added to the DM software stack. This is the initial version of what will grow to become the LSST Calibration Products Pipeline. Meanwhile, The NEOWISE year one single epoch source table is accessible through SUIT in the Prototype Data Access Center (PDAC), and the Image Service was updated to support multiple datasets.

The Network Engineering Team completed the first successful transfer of digital data over LSST/AURA fiber optic networks from the Summit Site on Cerro Pachon to the Base Site in La Serena and on to the Archive Site at NCSA in Champaign. A set of 6 x 10 Gbps Network Interface cards on Data Transfer Nodes (DTN) configured with iPerf3 generated a sustained data rate of approximately 44 gigabits per second, over a period of 24 hours, exceeding the target of 40 gigabits per second.

Members of the DM team took part in several meetings, workshops and reviews during December. In particular:

- The DM Project Manager took part in the successful LSST Operations Proposal Review in Tucson during the week of December 4.
- Graham and O’Mullane supported the “Towards Science with LSST in Chile III”, meeting (Dec 13-15) giving talks and a two hour hack session.
- A very constructive week long LSST Science Platform technical workshop was held at IPAC (12/4-8, 2017) attended by 25 team members.
- DM team members took part in the Auxiliary Telescope workshop and Early

Integration activities.

- DM team members at the University of Washington met staff members of the Minor Planet Center to discuss integration of DM and MPC activities.

## Risk Management

The DM Risk Register was reviewed in the regular monthly process. No new risks were added and no significant changes to existing risk exposure were made.

## Milestone Summary

### Milestones Completed

#### Level 2 Milestones

LDM-503-2 Test report: HSC Reprocessing

Due 2017-11-30

*DMTR-51, describing this work, has been accepted by the DM-CCB.*

LDM-503-3 Test report: Alert Generation Validation

Due 2017-11-30

*DMTR-53, describing this work, has been accepted by the DM-CCB.*

### Data Release Production

DM-DRP-4 Calibration Product Generation in Support of Basic ISR

Due 2017-12-01

*The `ip_cpp` package was added to the DM codebase following [RFC-415](#) on ticket [DM-12779](#).*

DM-DRP-14 Insertion of simulated sources

Due 2017-12-01

*The Synpipe simulated source insertion framework is now available within the DM codebase following work performed on [DM-10580](#).*

DM-DRP-18 Initial multi-band deblending algorithm available

Due 2017-12-01

*The non-negative matrix factorization based deblender prototype developed on [DM-10353](#) is now mature enough to fulfil this role.*

### LSST Data Facility

DM-NCSA-27 Deliver header service code

Due 2017-08-03

*Delivered and tested during Systems Engineering Early Pathfinder Software Integration Activity #04, December 15, 2017.*

## International Communications & Base Site

DMTC-7400-2090 Report on functional fiber connections, including AURA equipment  
Due 2017-08-18  
*Successfully completed*

DMTC-8000-0818 Acceptance Test with Equipment Installed  
Due 2017-11-30  
*Successfully completed*

DMTC-7400-2130 End of commissioning; acceptance of fiber connection  
Due 2017-11-30  
*Successfully completed*

## System Integration & Test

DLP-579 Usability & Developer Efficiency  
Due 2016-08-31  
*This milestone will be closed now that the acceptance of LDM-503-2 has demonstrated small-to-medium-scale automated processing.*

## Milestones Delayed

### Level 2 Milestones

LDM-503-1 Test report: Science Platform with WISE data in PDAC  
Due 2017-11-30  
*The WISE single-epoch source data loading was completed by the end of November 2017, but instability in the PDAC hardware and lack of personnel availability due to the Science Platform workshop and the holidays delayed testing, which will now occur before the end of January.*

## DM System Architecture

DLP-538, DLP-539, DLP-541, DLP-544 Assorted ICDs updated to Phase 3  
Due 2017-05-13  
*While substantial work has been done on these ICDs in the last year, especially LSE-72 and LSE-131, a few TBRs remain in the latter, negotiations on changes are still occurring with the relevant subsystems, and new versions have not yet gone to the LSST CCB. An LCR for LSE-68 will be prepared before LDM-503-4b; LCRs for the others should be prepared by the end of March.*

## Data Release Production

DM-DRP-6 Camera Package Supporting the Auxiliary Telescope  
Due 2017-12-01  
*The implementation phase of the obs\_auxtel package has been completed, but it is currently undergoing code review on [DM-12563](#) before being accepted to the DM codebase.*

DM-DRP-16 Global photometric fitting

Due 2017-12-01

*Work on adding the Forward Global Calibration Method algorithm to the DM codebase continues on [DM-10584](#).*

DM-DRP-32 Object classification system available

Due 2017-12-01

*Although a basic star-galaxy separation system is currently available within the DM stack, work to provide a more comprehensive solution to the problem will be undertaken on [DM-10578](#) during early calendar 2018.*

## Science User Interface and Tools

DM-SUIT-5 Search & Display Processed HSC Data

Due 2017-11-30

*This milestone is captured in DM-8721, which is scheduled for S18 now. It is blocked by DM-DAX-5.*

## Science Data Archive & Application Services

DLP-802 AP/L1 Database Design

Due 2016-11-30

*The combination of aggressive performance and science requirements for this database have made a working design at scale more difficult than was originally anticipated. A functional prototype at reduced scale has been produced. Work in search of a full-scale solution will continue in S18 with scheduled experiments involving different back-end database technologies.*

DLP-472 Qserv Data Distribution

Due 2017-05-31

*Resource conflicts with PDAC efforts put this deliverable behind schedule. The majority of the implementation work was completed, however, and the milestone is expected to be achieved early in S18.*

DLP-808 AP-ready Provenance

Due 2017-11-30

*This milestone precedes the DM re-plan. Provenance development work has been rescheduled to F18.*

DLP-799 AP-ready Image & File Archive

Due 2017-11-30

*AP interaction with the Image & File Archive has been re-conceived as a combination of Generation 3 Butler + Data Backbone. Development of these pre-requisite subsystems is ongoing in S18.*

DLP-837 AP-ready Butler Framework

Due 2017-11-30

*Further development of the Generation 2 Butler has been frozen by recommendation of the Butler Working Group. Groundwork for Generation 3 Butler which will support this milestone is scheduled to occur in S18.*

DM-DAX-2 Query service supporting IVOA TAP protocol with support for async queries

Due 2017-11-30

*Qserv asynchronous query support was completed. IVOA TAP front-end service to expose this new capability was delayed by resource reassignment to Butler Working Group. Currently scheduled for completion in S18.*

DM-DAX-3 Image cutout service supporting IVOA SODA protocol

Due 2017-11-30

*Image cutout server internals were substantially re-vamped. SODA interface layer was not completed, but is currently scheduled for completion in S18.*

DM-DAX-4 Metadata service supporting IVOA SIAv2 protocol

Due 2017-11-30

*Delayed by resource reassignment to Butler Working Group. Currently scheduled for completion in S18.*

DM-DAX-5 Database ingest in support of HSC reprocessing

Due 2017-11-30

*Ingest of the final WISE data sets at the PDAC as well as synthesis and ingest of the KPM30 dataset at CC-IN2P3 were found to be labor intensive and time-consuming. A plan has been formulated to concentrate effort on a significant revamp of Qserv ingest tooling in the first part of the S18 cycle. The HSC dataset is then to be used for validation of this work in the latter part of the S18 cycle.*

## LSST Data Facility

DLP-433 Procure infrastructure for Archive Center to FY18

Due 2017-11-30

*This milestone relates to provisioning of capabilities described in the FY18 Acquisition Strategy Document. Procurements for this capability are on-going throughout FY18.*

DLP-442 Procure infrastructure for Base Center to meet FY18 goals

Due 2017-11-30

*This milestone relates to provisioning of capabilities described in the FY18 Acquisition Strategy Document. Procurements for this capability are on-going throughout FY18.*

DLP-458 Ingest of bulk data from real cameras to ComCam scale

Due 2017-11-30

*The ComCam Archiving Service is timed for deployment to coincide with the ComCam Test Stand in Tucson in FY19. The Spectrograph Archiving Service will be deployed to support the Spectrograph Test Stand in Tucson in February 2018.*

DM-NCSA-29 Deliver image ingest & processing client code

Due 2017-12-07

*This milestone refers to the ability of the Archive OCS Commandable device to place FITS files on a file system that is apart from the archiver itself downstream in an archiving chain. Due to revision of the Pathfinder Early Integration Activity schedule, this milestone has been delayed to January 31, 2018.*

# Detailed Project Progress

## 1.02C.01: System Management

### Current accomplishments

The DM Project Manager supported the successful LSST Operations proposal review in Tucson (Dec 5–7) and represented LSST at the La Silla Paranal annual review on Paranal (Dec 12–13). At the latter, he gave a project status, DM overview and brief operations overview talk.

In addition, the DM Project Manager attended the “Towards Science with LSST in Chile III” meeting (Dec 13-15), leading a two hour hack session based around Jim Bosch’s DM software stack tutorial notebook, as well as giving a talk on DM’s current status. The LSST stack and notebook environment was installed on the local computing cluster by Juan Muriera with minimal support from Tucson.

### Planned activities

The DM Project Manager will support LSST booth at AAS in Washington then visit Princeton and NCSA.

## 1.02C.02.01: Data Management Science

### Current accomplishments

Melissa Graham continued work on LSST photometric redshifts and participation in the LSST data access working group; prepared for and delivered an invited oral presentation on data products and pipelines at the “Towards Science with LSST in Chile III” meeting in Santiago; and organized and participated in a three-night remote observing run with the Apache Point 3.5m telescope as part of ongoing participation in the Zwicky Transient Facility as preparatory work for LSST.

Colin Slater attended the LSST Science Platform workshop to provide input on science use cases and requirements for the different platform aspects.

Mario Juric held a two day meeting at UW with the NASA Minor Planet Center staff to discuss plans for integrating LSST moving object processing with the processing performed by the MPC. The results from this meeting will be worked into updated plans for LSST MOPS software and data products.

Chris Suberlak presented a status update on his study of crowded field processing to the DM Subsystem Science Team, and is incorporating feedback from this presentation into the

work. Colin Slater, Chris Suberlak, and Zeljko Ivezić met with the principal investigator and pipeline scientist from a DECam Galactic Bulge survey to discuss leveraging their data products and experience for improving LSST crowded field processing.

## Planned activities

In January we plan to:

- Finalize and submit two conference proceedings for IAUS 339 “Southern Horizons in Time-Domain Astronomy”; continue work to circulate and resolve the outstanding issues regarding LSST Special Programs and Data Management (DMTN-065); finalize the results of the Data Access Working Group and wrap up the first draft of LSE-349; participate in testing and using the ZTF alert stream software in production at UW; and contribute to the new LDM-612 Brokers document.
- Begin writing up a high-level overview of the results of the crowded field processing tests.

## 1.02C.02.02: DM System Architecture

### Current accomplishments

The Architecture Team contributed significantly to several major activities in the month, including the LSST Science Platform technical workshop, an Early Integration test of a prototype of the DM Header Service plus other control system integration discussions, a one-day Auxiliary Telescope workshop, and a review of the Generation 3 Data Butler requirements and use cases. The team also evaluated requirements management tools and built an initial mockup of a DM-specific web-based tool. The DM Systems Engineer assisted in hiring for new LSST Systems Engineering positions.

### Planned activities

The Architecture Team will work on requirements flowdown to the DM System Requirements and internal component requirements documents as well as the requirements management tool; negotiate ICDs to “substantially complete” status; perform an informal review of Generation 3 Data Butler and SuperTask design progress and participate in a “hack week” to advance their development; and comment on LSST Data Facility operations concept and design documents.

## 1.02C.03: Alert Production

### Current accomplishments

#### 02C.03.00 – Management and Leadership

- Start of the Spring 2018 development cycle:

- Management and leadership effort during this month focused on ensuring a smooth transition to the Sprint 2018 cycle (running December 2017 to May 2018, inclusive).
- Key leadership goals for this cycle are the development of test specifications for milestones later in DM construction, as well as refinements to the overall alert production requirements documentation and system design, particularly in the area of alert distribution.
- Level 2 milestone LDM-503-3 (“Alert Generation Validation”):
  - The LDM-503-3 milestone test specification ([LDM-533](#)) was developed, the tests were executed, and the report ([DMTR-53](#)) was drafted during this month. [[RFC-429](#), [DM-12533](#), [DM-12534](#)]
  - This milestone focused on the execution of an “end-to-end” (ie, images to alerts) execution of the AP pipeline on DECam [HITS](#) data. The baseline of functionality thus established will serve as the basis for future development of the AP system.
  - The [DMTR-53](#) test report was submitted to the DM Change Control Board for approval during December, but was still under review at the end of the month.
- Construction of an “end-to-end” Alert Production test system [[DM-9676](#), [DM-10770](#), [DM-10773](#), [DM-10775](#)]:
  - The AP system was refactored to run over the full test data repository, rather than processing each CCD individually. [[DM-12535](#)]
  - Functionality to collect “object count” metrics (e.g. the fraction of science image sources that become DIASources after image differencing, the number of DiaSources that create new DiaObjects in a difference image, etc) was integrated to the AP system. This marks the completion of [DM-10770](#), the metric collection system for the initial AP prototype. [[DM-11155](#)]
  - The prototype AP system used for the LDM-503-3 milestone has now been properly documented. This completes the implementation phase for this system, and marks the end of the [DM-9676](#) epic. [[DM-11592](#)]
  - The completion of the leadership effort on this system is marked by the submission of the [DMTR-53](#) test report, as described above: this closes epic [[DM-10775](#)].
- Jointcal validation framework integration [[DM-9539](#)]:
  - All work planned by the AP team in this epic is now complete. The remaining tasks to complete the validation framework integration will be carried out by the SQuaRE team. [[DM-6577](#), [DM-7151](#)]
- Travel & meetings:
  - John Swinbank spent the week of 11 December working with the Data Release Production team in Princeton.



### 02C.03.01 – Single Frame Processing

- Replacement of old WCS classes [\[DM-9679\]](#):
  - A major overhaul of the SkyWcs system has been completed. The new version is simpler, easier to maintain, and provides additional functionality. [\[DM-12764\]](#)
  - Work continues to replace all of the existing WCS-handling code with SkyWcs. A [detailed description of the changes](#) was made available on [community.lsst.org](http://community.lsst.org). This work was undergoing code review at the end of the month.
  - David Berry has been contracted to undertake some development on the [AST](#) system for LSST. Specifically, he will:
    - Improve the inverse transformation of WCS with [SIP](#) distortions.
    - Provide functionality for AST to write SIP terms to FITS WCS headers.
  - This work is expected to be completed early in calendar 2018.

### 02C.03.02 – Catalog Association for Alert Production

- No work was performed under this WBS element during this month.

### 02C.03.03 – Alert Distribution System

- Scale testing of prototype alert distribution system [\[DM-9635\]](#):
  - Scale testing the prototype alert distribution system as a function of the number of consumers was completed this month. The results have been written up for inclusion in [DMTN-028](#); this text is currently undergoing review. [\[DM-12459\]](#)

### 02C.03.04 – Alert Generation Pipeline

- Integrate differential chromatic refraction (DCR) mitigation with the DM Stack [\[DM-9613\]](#):
  - Facilities for calculating atmospheric refraction have been added to the stack. These are primarily intended for use in mitigating DCR, but are general-purpose enough to be useful elsewhere. [\[DM-13096\]](#)

### 02C.03.05 – Tools for Science Pipelines

- Emergent work [\[DM-11798, DM-12728\]](#):
  - The AP group has continued its involvement in the Lossy Compression Working Group, attending meetings and considering the impacts of proposed compression strategies on the AP data products. [\[DM-12866\]](#)
  - The astrometric source selector now rejects sources if the uncertainties on their position are recorded as NaN. [\[DM-13055\]](#)
  - The “shared software stack” available on developer systems has been

upgraded to use Python 3 and to provide the latest released version of the DM codebase. [[DM-12206](#), [DM-12455](#)]

- The parallactic angle is now available in an exposure's VisitInfo. [[DM-12473](#)]
- A build error on some Ubuntu systems was resolved. [[DM-12527](#)]

#### 02C.03.06 – Moving Objects Processing System (MOPS)

- MOPS development during S18 [[DM-12704](#)]:
  - UW hosted Matt Holman and Peter Veres of the [Minor Planet Center](#) (MPC) during the week of 17 December. Discussions focused on the integration of LSST's solar system data processing with the MPC's regular handling of large survey data, and on how data from the MPC can be incorporated into LSST's prompt processing pipelines. A proposal to update DM's plans in this area, based on the results of the meeting, is currently under development.

#### 02C.03.07 – Transform Fitting on Stacks of Images

- Replacement of meas\_mosaic with Jointcal [[DM-11783](#)]:
  - The validate\_drp system has now been expanded to handle the results of Jointcal-based fitting. [[DM-11571](#)]
  - All of the data to be used in the comparison of Jointcal with meas\_mosaic has now been successfully processed through the latter, and the results have been archived. [[DM-11786](#)]
  - Pierre Astier added functionality to his (externally hosted) version of Jointcal to better manage photometry errors and outlier rejection. This work has now been reviewed and incorporated into the LSST version of the codebase. [[DM-12918](#)]

#### 02C.03.08 – Integration

- Alert Production pipeline development [[DM-12711](#)]:
  - A major goal for the S18 development cycle is to update the prototype AP system to use the new middleware functionality being developed by other teams within DM (e.g. Butler Generation 3, SuperTask). This work has started with a comprehensive review of how those technologies impact on the existing system. [[DM-12867](#)]
  - The AP system has been refactored to reduce code duplication, and build problems due to missing dependencies have been resolved. [[DM-11745](#), [DM-12865](#)]
  - An issue in which source association was not properly updating the properties of DIAObjects has been resolved. [[DM-13052](#)]

## Planned activities

### 02C.03.00 – Management and Leadership

- Respond to DM-CCB comments on the [DMTR-53](#) (“Alert Generation Validation”) test report, and have it added to the project baseline.
- John Swinbank will travel to both NCSA and Harvard to support DM and Calibration Products planning and management activities.

### 02C.03.01 – Single Frame Processing

- Continue working to migrate to the new AST-backed SkyWcs system across the codebase.

### 02C.03.02 – Catalog Association for Alert Production

- No work planned.

### 02C.03.03 – Alert Distribution System

- Complete the [DMTN-028](#) report on alert distribution system performance.
- Begin work on alert filtering systems.

### 02C.03.04 – Alert Generation Pipeline

- Continue working to integrate the DCR mitigation algorithms with the DM software stack, and to prepare them for refereed publication.

### 02C.03.05 – Tools for Science Pipelines

- Begin planning for work on the coordinate transformation tool for the collimated beam projector.
- Continue to address emergent issues across the codebase.

### 02C.03.06 – Moving Objects Processing System (MOPS)

- Develop an overhauled plan for interaction with the Minor Planet Center based on December’s interactions.

### 02C.03.07 – Transform Fitting on Stacks of Images

- Continue work to replace meas\_mosaic with Jointcal.

### 02C.03.08 – Integration

- Begin design work to update the prototype AP pipeline to integrated with next-generation DM middleware and systems.

## Recruitment update

- Interviews are underway for a Research Scientist position at UW to join the AP team, primarily focusing on the development of algorithms and pipelines for image differencing. This selection procedure will continue into January 2018.

## 1.02C.04: Data Release Production

### Current accomplishments

#### 02C.04.00 – Management and Leadership

- Travel & meetings:
  - John Swinbank spent the week of 11 December in Princeton working with the Data Release Production team.
- Start of the Spring 2018 development cycle:
  - Management and leadership effort during this month focused on ensuring a smooth transition to the Sprint 2018 cycle (running December 2017 to May 2018, inclusive).
  - Key leadership goals for this cycle are the development of test specifications for milestones later in DM construction, as well as refinements to the overall data release production requirements documentation and system design
- Level 2 milestone LDM-503-2 (“HSC Reprocessing”):
  - The LDM-503-2 test specification ([LDM-534](#)) was developed, the tests were executed, and the report ([DMTR-51](#)) was drafted during this month.
  - This milestone focused on the execution of at-scale data release pipelines on [Hyper Suprime-Cam](#) Data at the LSST Data Facility. It included a component related primarily to verification of the processing systems and middleware, and a component related to algorithmic and data product verification. The Data Facility team took the lead on the former; DRP involvement was primarily with the latter.
  - The test report was submitted to the DM Change Control Board for approval during December, but was still undergoing review at the end of the month. [\[RFC-425\]](#)
- Forward Global Calibration Method (FGCM; [Burke et al., 2018](#)) [\[DM-10584\]](#):
  - A command-line task providing end-user access to the FGCM system is now available. [\[DM-11313\]](#)
  - Illumination correction functionality is now available within the FGCM codebase. [\[DM-12444\]](#)

#### 02C.04.01 – Software Primitives

- Generation 3 middleware development [\[DM-10586, DM-12738\]](#):

- The Generation 3 middleware development being undertaken in the current cycle involves work on both the Butler and the SuperTask system.
- DRP team members are actively participating in this work, but it is being coordinated and managed by Fritz Mueller, T/CAM of the Data Access & Database team.
- The DRP team took part in the successful DM Change Control Board review of the Butler use cases and requirements documentation which was developed by the Data Butler Working Group.
- Work has continued to produce a prototype implementation of the key concepts planned for the new Butler system. [[DM-12371](#), [DM-12667](#), [DM-12668](#), [DM-12920](#), [DM-12921](#)]
- Maintenance & emergent works [[DM-10383](#)]:
  - Following the completion of [DM-10367](#) by the SQuaRE team, documentation and the build system were updated to use C++14.

#### 02C.04.02 – Calibration Products

- Spring 2018 Calibration Products development [[DM-12733](#)]:
  - [A tutorial](#) was posted to community.lsst.org describing how the DM calibration products tools can be used to process data from the camera test stands on hardware at the LSST Data Facility. [[DM-10896](#)]
- Processing of camera test stand data [[DM-10897](#)]:
  - The “cp\_pipe” product, forming the basis of LSST’s Calibration Products Pipeline, has been added to the codebase and is now part of the standard LSST software distribution. This already provides useful functionality, and will form the basis for further development over the next several years. [[RFC-415](#), [DM-11479](#), [DM-12779](#)]
  - The cp\_pipe system is now capable of using code derived from the Camera Team’s [eotest](#) tool to generate PDF-based reports on detector characteristics. [[DM-11348](#)]

#### 02C.04.03 – Image Characterization

- Wavefront measurement and PSF reconstruction [[DM-10355](#)]:
  - Work continues to write up the results of the Fall 2017 development cycle as technical note [DMTN-064](#). This material is still under review at time of writing. [[DM-9988](#), [DM-12472](#)]

#### 02C.04.04 – Coaddition

- Warped image comparison [[DM-8290](#)]:
  - Efforts to commission and resolve failure modes in the “warped image comparison” method of eliminating artefacts when building coadds has continued through this month.
  - The team has used the upcoming Hyper Suprime-Cam internal data release

as an algorithmic proving ground; this has shaken out a number of issues which have been resolved. Work continues to apply the algorithm to this data at scale to identify any remaining problems. [[DM-12664](#), [DM-12697](#)]

#### 02C.04.05 – Detection and Deblending

- Deblender prototyping [[DM-12416](#)]:
  - The documentation for the new (non-negative matrix factorization, or NMF) deblender prototype has been enhanced. [[DM-12981](#)]
  - Work is ongoing to write a peer-reviewed paper describing the new deblending algorithm. [[DM-12972](#)]
  - A number of enhancements have been made to the deblender API and to resolve a series of bugs within it. This work was still undergoing review at the end of December; we expect it to be merged in early January. [[DM-12233](#), [DM-13045](#), [DM-13116](#), [DM-13211](#), [DM-13214](#)]

#### 02C.04.06 – Characterization and Measurement

- Experiments in shear measurement on coadds [[DM-10579](#), [DM-12732](#)]:
  - Test measurements have been made on the complete suite of simulations planned for this epic. Work is now underway to prepare a publication describing the results. [[DM-11311](#), [DM-12405](#), [DM-12406](#), [DM-12407](#), [DM-12408](#), [DM-12409](#), [DM-12934](#)]
- Improved galaxy flux measurement algorithms [[DM-10580](#)]:
  - Work has focused on identifying failure modes for our existing galaxy measurement algorithms. Bad objects were identified using failure flags set by the measurement algorithm and by identifying erroneous or questionable object properties. These were then used to build a library of “postage stamp” images of hard cases, which will form the basis of future development. [[DM-12422](#), [DM-12423](#)]

#### 02C.04.07 – Maintenance, Quality and Documentation

- Quality Assurance [[DM-12735](#)]:
  - Much of the effort expended on this activity in December went into verifying data quality as part of the LDM-503-2 milestone. In addition to running existing scripts on the processed data, visualization tools were developed to help quickly and efficiently analyze the results. [[DM-12873](#), [DM-13152](#)]
  - In addition, our regular QA plots were enhanced to compare PSF magnitudes and shapes across multiple runs, and to persist additional data quality flags to intermediate data products for further analysis. [[DM-12761](#), [DM-12802](#), [DM-13080](#)]
- Emergent work [[DM-12729](#)]:
  - The DRP team supported Jointcal development (being spearheaded by the AP team) by processing test data through the meas\_mosaic package. This is

required for the ongoing Jointcal commissioning effort ([DM-11783](#)).  
[\[DM-11786\]](#)

- An issue was resolved whereby bad image alignment caused problems with coaddition. This was ultimately traced to a problem with compression of the image data, and has now been fixed. [\[DM-12882\]](#)
- A number of minor improvements were made and bugs addressed across the codebase. [\[DM-12881, DM-12909, DM-12933, DM-13082\]](#)

## Planned activities

### 02C.04.00 – Management and Leadership

- Respond to DM-CCB comments on the DMTR-51 (“HSC Reprocessing”) test report, and have it added to the project baseline.
- Wil O’Mullane will visit Princeton to work with the DRP team in person.
- Princeton will host a meeting to coordinate the Generation 3 middleware development effort.
- Merlin Fisher-Levine and John Swinbank will travel to Harvard to meet Robert Lupton, Christopher Stubbs and Augustin Guyonnet to flesh out the plans for Auxiliary Telescope pipeline development during (calendar) 2018.

### 02C.04.01 – Software Primitives

- Continued development of the Generation 3 Butler prototype.

### 02C.04.02 – Calibration Products

- Incorporate further eotest-derived quantities into the new cp\_pipe package.

### 02C.04.03 – Image Characterization

- Complete [DMTN-064](#), the technical note describing the results of “donut” analysis on Hyper Suprime-Cam data.

### 02C.04.04 – Coaddition

- Continue to resolve issues in the warped image comparison artefact rejection algorithm.
- Start work on background matching.

### 02C.04.05 – Detection and Deblending

- Submit the paper describing the new deblending algorithm for internal review.

### 02C.04.06 – Characterization and Measurement

- Complete work on the new galaxy shape priors.

## 02C.04.07 – Maintenance, Quality and Documentation

- Continue to respond to emergent issues.
- Develop prototype QA analysis code to provide user-accessible tooling.

## Recruitment update

- Interviews for a Scientific Software Developer to join the DRP team were held during December. An offer has been made, and negotiations with the candidate are ongoing.
- Interviews for postdoctoral scientists to join the DRP team are scheduled for January.

# 1.02C.05: Science User Interface & Tools

## Current accomplishments

### 02C.05.00

- Hosted the week long (12/4-8, 2017) LSST Science Platform workshop. There were about 25 people attended the workshop.
- Christmas holiday, Caltech shuts down December 25-29, 2017

### 02C.05.01 Basic Archive Access Tools

- Add NEOWISE data to PDAC (DM-12993)

### 02C.05.02 Data Analysis and Visualization Tools

- Add reStructuredText documentation to display\_firefly (DM-12980)
- Add display\_firefly to lsst\_distrib (DM-8387)

### 02C.05.05 User workspace

- Level 3 data and user workspace requirement (DM-8387)
- SUIT and Science Platform requirements definition (DM-8372)

### 02C.05.06 Client-server query and visualization framework

- Bug fixes
  - Error in saving image as PNG file and adding marker on image (DM-10925, 12940))
  - Filter with column expression failed on chart (DM-12949)
- Tracking the active table in a chart container or multiple data traces. (DM-9072)



- HiPS images display improvement (DM-12971)

#### 02C.05.07 Science Platform

- Attended LSST Science Platform workshop 12/4-8, 2017. Many good discussions and tasks assigned.  
<https://confluence.lsstcorp.org/display/DM/Actions+from+2017-12-04+to+2017-12-08+LSP+workshop>.

### Planned activities

#### 02C.05.00

- Some vacation time

#### 02C.05.01 Basic Archive Access Tools

- Bug fixes and improvements
- Work with DAX on ImageServ and MetaServ API v1

#### 02C.05.02 Data Analysis and Visualization Tools

- Finish Firefly\_client Python documents and examples, publish the doc.

#### 02C.05.05 User workspace

- Prepare narrative description of Level 3 operations from the perspective of the SUIT (DM-5267)

#### 02C.05.06 Client-server query and visualization framework

- HiPS map display: make the HiPS viewer switch to FITS when zoomed in (DM-12553)
- Query a HiPS server to give user the choice of available HiPS maps. (DM-12555)

#### 02C.05.08 Applications (portal construction)

- UX improvement:
  - Keep the selected table row selected after sorting, (DM-11457)
  - Tri-view rendering when table does not contain position information (DM-12864)

#### 02C.05.10 Integration and test

- Experiment with kubernetes for SUIT and Firefly deployment (DM-12950)

### Recruitment update

- None

## 1.02C.06: Science Data Archive & Application Services

### Current accomplishments

#### 02C.06.00 Science Data Archive and Application Services Management Engineering and Integration

- Entire team attended LSST Science Platform workshop at IPAC.
- Lab closure from Dec 23rd - Jan 7th.
- Gaponenko summarized all WISE data loaded at PDAC in 2017 [DM-12910].
- Continued support of DAX services at the PDAC for SUIT team.

#### 02C.06.01.01 Catalogs, Alerts and Metadata

- No work was carried out in this WBS element this month.

#### 02C.06.01.02 Image and File Archive

- Lo finished new implementation of mosaics into imgserv v1 API [DM-11742].
- Lo added JSON schema validation package for imgserv [DM-12104].

#### 02C.06.02.01 Data Access Client Framework

- Planning work was begun for Gen2 Butler for S18 downstream of the outputs of the Butler Working Group. Design documents are being updated. An informal design review by the architecture team as well as a kickoff technical meeting for the primary implementers are being organized for January 2018.

#### 02C.06.02.02 Web Services

- No work was carried out in this WBS element this month.

#### 02C.06.02.03 Query Services

- Gates continued work on loading 30% DR1 dataset at IN2P3. Multiple issues with loader concurrency and data size were encountered and handled [DM-11997].
- Gates reworked large result handling on the czar which could cause bottlenecks by switching to a pull-model for result aggregation to control data influx [DM-10291].
- Gaponenko worked on Qserv data distribution/replication framework.
- Salnikov developed a tool to dump CSS information (which can become too large) for user-friendly and readability improvements, in addition to unit test improvements [DM-1899].
- Pease finished moving subchunk query expansion code from the czar to workers. Thukral tested performance improvements which identified other issues to be solved [DM-10515, DM-13097].
- Jammes experimented running integration tests/CI with Kubernetes [DM-1260].

- Jammes split Qserv master image pod within Kubernetes [DM-11932].

#### 02C.06.02.04 Image Services

- No work was carried out in this WBS element this month.

#### 02C.06.02.05 Catalog Services

- No work was carried out in this WBS element this month.

### Planned activities

#### 02C.06.00 Science Data Archive and Application Services Management Engineering and Integration

- Lab closure from Dec 23rd - Jan 7th.
- Continued support for DAX services at PDAC for SUIT team.

#### 02C.06.01.01 Catalogs, Alerts and Metadata

- Van Klaveren to update SDSS PDAC metadata.

#### 02C.06.01.02 Image and File Archive

- No work is planned for this WBS element this month.

#### 02C.06.02.01 Data Access Client Framework

- Mueller to participate in Butler Gen3 technical kickoff meeting, and work with the developers to generate a Butler Gen3 S18 Jira backlog.

#### 02C.06.02.02 Web Services

- Van Klaveren to document designs for async query support in web services transition implementation responsibilities to Lo.
- Van Klaveren to document designs for API extensions to pass security tokens and transition implementation responsibilities to Lo.
- Lo to work improving error handling in dbserve.

#### 02C.06.02.03 Query Services

- Gates to complete 30% DR1 dataset loading at IN2P3 and fix Qserv large result handling for certain queries at PDAC.
- Gaponenko to conclude work on Qserv data distribution/replication framework.
- Jammes to continue adapting Qserv for deployment with Kubernetes.
- Hanushevsky to continue investigations into potential designs for MR-style next-to-data processing in Qserv.
- Pease to investigate modernization of Qserv parser to ANTLR4.
- Salnikov to correct issue where match table separation is improperly conflated with

default table overlap.

#### 02C.06.02.04 Image Services

- No work is planned for this WBS element this month.

#### 02C.06.02.05 Catalog Services

- No work is planned for this WBS element this month.

### Recruitment update

- Candidate mentioned previously did not wish to relocate, and has accepted an alternative offer with a different project.
- Van Klaveren (previously part-time) is transitioning off the team to a position with the Architecture team.

## 1.02C.07: LSST Data Facility

### Current accomplishments

#### 02C.07.00 Processing Control and Site Infrastructure Management, Engineering and Integration

We continued service management work, refining phases and roles involved in the LDF IT service change management process.

#### 02C.07.04 Site Infrastructure

We finished provisioning of a capacity increase for the lsst-db system as well as an expansion of the GPFS storage system. Use of the expanded GPFS is awaiting completion of the central core network upgrade. We continued setup and testing at NCSA for the Base Authentication and Authorization System and Network-based IT Security System hardware.

#### 02C.07.05 LSST Data Facility Management, Service Architecture, and Project Controls

The management team at NCSA:

- Completed initial revised version of LDM-129 and submitted to DM change control. LDM-129 describes the logical ITC design of the LSST Data Facility, as consistent with the replan baseline.
- Updated LDM-230 and submitted to DM change control. LDM-230 describes the concept of operations of all LSST Data Facility services, as consistent with the replan baseline.
- Began work on LDM-144 schema redesign. Developed initial basic schema, factoring by logical system element, and tested schema using disk storage needs and forecasts as specified in baseline version of LDM-144.
- Investigated technical capabilities of the InCommon system for identifying class of professional astronomers in support of project-wide Data Access working group.

- Began drafting a Compression Working Group tech note.
- Organized and attended an NCSA-HTCondor one-day meeting, with discussions surrounding use of HTCondor to manage LDF resources and use of HTCondor in the Batch Processing Service.
- Reviewed data access use cases and requirements for Butler working group review.
- Held regular steering meetings for internal oversight over all technical areas of the LSST Data Facility.

In the Service management area, we continued incremental improvements to Service Management processes. This included defining incident response over the extended holiday break, as well as an initial documentation of daily duties of the service manager.

#### 02C.07.06.01 LDF-offered Services

We continued periodic reprocessing of RC datasets in support of biweekly stack release testing and ongoing pipeline development.

#### 02C.07.06.02 Reusable Production Services

We continued supporting the in-place Kubernetes capability on the NCSA Nebula to support JupyterLab development. We also continued work towards developing a stable containerized management architecture, continuing documentation of installation procedures for provisioning the FY18 cluster hardware and verifying installation of Kubernetes in various system configurations. This work also supports the request for Kubernetes capability on the PDAC ahead of the cluster installation.

#### 02C.07.07 Data and Compute Services

We continued work putting in place a file transfer and ingestion mechanism toward support of the Spectrograph test stand, including integration with existing authorization mechanisms.

#### 02C.07.08 LDF Service Software

We began integrating Python 3 code into the DESDM framework batch production code. This included writing scripts for verification tests, continued testing, and addressing integration issues.

We continued work on L1 Service software, focusing on readying the L1 Test and Integration system to support Pathfinder Early Integration activities and the Spectrograph Test Stand milestone.

We completed a version of the Header Client software based on recommendations from the previous design review, and successfully ran the client during Pathfinder Early Integration Activity #04b. We prepared for and attended Pathfinder Integration Activity #04b, which demonstrated the Header Service functions under OCS control, is capable of receiving telemetry, and can produce a header for a single visit. We also attended associated meetings and a week-long workshop in Tucson, coordinating work with Camera

Control, Observatory Control, and Telescope Control subsystem staff.

#### 02C.07.09 ITC and Facilities

We completed planning and acquisition of the Kubernetes cluster, and continued acquisition planning for data transfer nodes as well as the central core network at NCSA.

We continued provisioning of the single-node Oracle consolidated database system.

We completed the initial production version of the overall general system and service monitoring infrastructure, which provides the framework for system-level monitoring of computing and data systems at NCSA supporting Data Facility services, as well as providing consolidated dashboards configurable for different viewpoints, including live monitoring, capacity and availability management, and trends for future acquisition planning. We completed installation and configuration of monitoring software on the Base Authentication and Authorization system to be shipped to Chile.

We continued improvements to and verification for the existing disaster recovery system.

### Planned activities

#### 02C.07.00 Processing Control and Site Infrastructure Management, Engineering and Integration

We will refine the IT services change management and incident processes for LDF-provided services, as well as provide documentation on the interface to these processes by users of the services.

#### 02C.07.04 Site Infrastructure

Work toward consolidation of ITC management systems will continue with evaluation and testing of third-party packages for system configuration management, and documentation of the resulting system.

We plan to continue provisioning the Base Authentication and Authorization and Network-based IT Security systems for delivery to Chile, disassembling the systems and shipping to Tucson.

We will work toward completion of the provisioning of the single-node consolidated database system.

#### 02C.07.05 LSST Data Facility Management, Service Architecture, and Project Controls

We will respond to DM CCB comments on LDM-129 and LDM-230 as needed to baseline these documents.

We will continue work on a schema, factoring by logical system element, towards a revised LDM-144, and provide a working draft of LDM-144 schema redesign.

We plan to continue leading the Compression Working with work toward a compression technical note.

We will continue pursuing incremental improvements to LDF-internal Service Management processes with proper interface with NCSA's existing service delivery processes. This includes preparing for 24/7 incident response as needed to support systems at the Chilean Base Facility as well as general incident and change request response.

For internal facility management, modeling of the re-baselined LDF service architecture in the Archimate tool will continue with a focus on tracing all services through the service layers and documenting the logical systems with the content presented in the revised LDM-129.

#### 02C.07.06.01 LDF-offered Services

We will continue periodic reprocessing of datasets in support of stack testing and pipeline development.

#### 02C.07.06.02 Reusable Production Services

We will continue supporting the in-place Kubernetes capability on the NCSA Nebula to support JupyterLab development. We will also work with system engineers to begin provisioning the incoming Kubernetes system with a stable containerized management architecture. We will work with the PDAC groups to provide a Kubernetes capability as needed.

#### 02C.07.07 Data and Compute Services

We will continue work implementing prototype file transfer agents, file transfer service endpoints, and file ingestion into the Data Backbone, toward support of the Tucson Spectrograph test stand.

#### 02C.07.08 LDF Service Software

We will continue work on L1 Service software, focusing on inter-subsystem coordination at workshops and integration activities, configuring the generic archiver controller functionality for the Spectrograph, and responding to needs to support upcoming integration activities.

We will continue incremental improvements to Header Client software, focusing on supporting the Spectrograph test installation in early 2018. Integration of the Archiving Service and Header Client will proceed, with demonstration on the L1 Complete Test Stand.

We will continue modification of Batch Production Service framework to support dataset reprocessing activities as well as upcoming project milestones.

We will participate in design and implementation activities for Butler and Supertask, including a week-long workshop on Butler and SuperTask development at Princeton.

#### 02C.07.09 ITC and Facilities

We will continue implementation of the FY18 hardware acquisition plan. Planning and acquisition was completed for development test nodes and the Kubernetes cluster. We will

continue planning and acquisition for remaining elements of general enclave support, and data backbone components. Provisioning activities for January include work on setting up the Kubernetes Cluster, development test nodes, single-node Oracle system, and general enclave support infrastructure, as well as completion of testing for the Base AA system. We will also continue supporting requested changes to the PDAC system. Procurement of the central core network upgrade will be initiated in January.

We will complete installation and documentation of system-level monitoring services for the Base AA system prior to delivery to Chile. We will incorporate existing LDF services into the monitoring framework and begin developing data collection and dashboards for service-level monitoring use cases and viewpoints.

## Recruitment update

Matt Long joined the Data Management subsystem as System Engineer. JD Maloney joined the Data Management subsystem as Storage Engineer. A requisition for a full-time database administrator is in progress.

## 1.02C.08: International Communications & Base Site

### 02C.08.01 – Base Center

- Summit Base ITC Tiger Team: No activity. Regular meetings suspended pending completion of Summit and Summit - Base Network installations. Will resume in CY18 with focus on the Base Computer Center.
- Summit and Base Networking and Computing: Computer racks were moved into the Summit Computer room. Two racks were damaged in transportation from Santiago and a claim will be made. Power cables were pulled above the floor in preparation for installation of outlets by Elpysa, which also needs to move 18" copper cable trays further out, and install a grounding bar on the wall. We are also waiting on Besalco to finish cleaning the room of dust and to turn on the electricity and HVAC. In La Serena, we continued working with the ACI architecture in the La Serena sandbox and installed the AURA gateway router that will be used for general traffic (email, web, etc.). LSE-239, the Base Data Center Requirements document was reviewed by Jeff Barr and the IT team. We completed initial designs for the dome wireless network and the Auxiliary Telescope connections. We also ordered the wall jacks and fibers for the Summit Facility offices and conference rooms, as well as the General Services Servers Network (GSSN) for DNS and DHCP services.

### 02C.08.02 – Chilean Data Access Center

- No activity this month.

### 02C.08.03 – Long-Haul Networks

- The LSST Network Engineering Team (NET) completed the first successful transfer of



digital data over LSST/AURA fiber optic networks from the Summit Site on Cerro Pachon, Chile to the Base Site in La Serena, Chile and on to the Archive Site at NCSA in Champaign. The test transmissions commenced at 0900 on December 18 and continued through December 22. A set of 6 x 10 Gbps Network Interface cards on Data Transfer Nodes (DTN) configured with iPerf3 generated a sustained data rate of approximately 44 gigabits per second, over a period of 24 hours. This exceeded the test target of 40 gigabits per second. Future tests to achieve higher speeds will require upgrading the DTN to faster machines. Transmissions on the current configuration will continue through the holidays to get a better sense of stability. It is interesting to note that this test was run over 100 gigabit per second links in several segments: LSST/AURA from Cerro Pachon to La Serena, REUNA from La Serena to Santiago, FIU/Amlight for Santiago to Miami, and internet2 for Miami to Chicago, and NCSA for Chicago to Champaign. This shows not only that we have continuity and performance from the network point of view, but also that all of the partners acted as a very well-coordinated engineering team for LSST.

#### *02C.08.03.01 – Chile National WAN*

- **Summits–AURA Gatehouse Network:** This segment was certified by Coriant/Raylex.
- **Dense Wave Division Multiplex (DWDM) Equipment:** The AURA equipment were used in the First Optic Light Demonstration (see above). We are waiting on AURA Operations to install a new backup generator in the Cerro Pachon caseta.
- **La Serena–AURA Gatehouse:** Completed the commissioning of the equipment on this segment, and activation of the lambdas on the path. Two 100G channel are working, one dedicated to LSST and other being used by REUNA. This segment was certified by Coriant/Raylex.

#### *02C.08.03.02 – International Chile–US WAN*

- **100 Gbps Managed Ring:** On Dec 1st, the AmLight-Exp 100G Miami to Sao Paulo via Pacific circuit (FIU031) was opened in Santiago, becoming two 100G circuits: Miami to Santiago and Santiago to Sao Paulo. By Dec 7th, only the 100G circuit from Sao Paulo to Santiago was fully deployed and stable. By Dec 27th, the 100G circuit from Santiago to Miami was still under activation. All spans related to the Miami to Santiago circuit were isolated with the support of LANautilus, Level3, CLARA and REUNA. At this moment, LANautilus is investigating the issue with CIENA (DWDM optical vendor).
- **Management and Coordination Contract:** The LSST Network Engineering Team (NET) meeting was held on December 14. Updates from REUNA, CIARA, RNP, and NSCA were provided regarding the First Optic Light demonstration (see above).
- **Members of the NET attended conferences and presented papers relevant to LSST Networks:**
  - Operating Innovative Networks (OIN) 23 Workshop, December 5-6, 2017. Presented by experts from the Department of Energy's ESnet, Indiana

University and Internet2, the workshop focused on Science DMZ network architectures, perfSONAR performance measurement software, Data Transfer Nodes, and emerging Software Defined Networking technologies.

- *Spectrum Contract*: A Request for Proposal was submitted by FIU to select the optical vendor to provide the DWDM solution to be used by LSST on the Spectrum link.
- *US National WAN*: On Dec 15th, ESNET, NCSA, LSST and AmLight discussed the technical details of a possible network connectivity solution between Atlanta and Chicago to support LSST's operation: ESNET will provide 2 (two) optical unprotected dedicated circuits. The technical solution is still under review.

## Planned activities

### 02C.08.00 – International Communications and Base Site Management Engineering and Integration

- Jeff Kantor will return to Tucson on 1/9/18. Preparations continue to transition Ron Lambert and to establish a revised reporting structure for his direct reports in La Serena.

### 02C.08.01 – Base Center

- Summit to Base ITC Tiger Team: Tiger Team completed its last regularly scheduled meeting in CY2017. Will resume with the focus on the Base Facility after Jeff Kantor returns from Chile in January, 2018.
- Summit and Base Networking and Computing: We will install the racks in the Summit Computer Room, transport the Summit Network Cisco equipment to the summit, and install start to configure the Core Network on the summit. We will also complete orders of access switches, VOIP phones, WAPs, wall boxes, fibers, etc. for the rest of the Summit Facility. We will submit an LCR to baseline the new version of LSE-239 Base Data Center Requirements. Finally, we will let a contract for the installation of fiber optic cable trays in the computer room.

### 02C.08.03 – Long-Haul Networks

- An LSST management report and press release on the First Optic Light demonstration will be created and distributed.

#### 02C.08.03.01 – Chile National WAN

- Summits - AURA Gatehouse Network: We will terminate the LSST network fiber in the Summit Computer Room. We will examine the fiber to assess if sightings reported of parrots perching on the fiber represent a threat to the fiber.
- DWDM Equipment: From now through March the network will be in testing from the equipment perspective, to verify everything is working properly.
- Santiago-La Serena: We will be working on the documentation and procedures to

move to the operational stage of the network, including finishing the fiber maintenance contract. Finish the physical installation of the DWDM equipment on the Santiago ring.

- La Serena - AURA Gatehouse: No activity. This segment is accepted.

#### *02C.08.03.02 – International Chile - US WAN*

- 100 Gbps Managed Ring: AmLight-ExP engineers will continue working with LANautilus, Level3 and CLARA to activate the 100G Santiago to Miami circuit.
- Management and Coordination Contract: Coordinate next NET meeting.
- Spectrum Contract: Continue work on the Operations and Maintenance Agreement.
- US National WAN: Negotiations to refine and improve the service and costs will continue during January 2018.

### Recruitment update

- Jeff Kantor remained in La Serena, to coordinate the Summit and Summit - Base installations and configuration and test. He departed La Serena on December 30 on vacation in Chile, and returns to Tucson on January 9, 2018.
- As reported last month, Ron Lambert has decided to move to Canada effective March, 2018. He will remain an AURA employee through calendar year 2018 and will work remotely from Canada and take periodic trips to La Serena. In 2019, Ron will retire from AURA, but we expect to engage him on contract. The transition reporting structure and effective dates were documented in email to relevant project managers and staff. We reached an agreement to jointly recruit for an additional position in La Serena, and increasing resource sharing between LSST and CISS.

## 1.02C.10: Science Quality and Reliability Engineering

### Current accomplishments

Highlights of work completed this month include:

- CI improvements included a major overhaul on our build-test infrastructure on how we dealt with the default devtoolset version used by the stack to make future migrations easier. We then migrated to the requested devtoolset-6 to verify the process (and fulfil that request).
- Documentation content work included an update the Documenting Python APIs page in the DM Developer Guide to clarify and document issues that have come up in real-world application of Numpydoc-based docstrings in the last few months.
- Documentation infrastructure improvements included switching documentation workflow to match the code workflow by having master be the latest integration branch (instead of draft), switching to semantic tags for releases, and changing Ltd

to present the latest release by default to website users. We also added an edition switcher to the technote theme, improved deployment and in keeping with other kubernetes-based services switched from using our own nginx service to the kubernetes ingress resource.

- Improvements to the QC/metrics infrastructure included migrating the SQuaSH API and database to be compatible with `lsst.verify`.
- Science Platform improvements included authentication and deployment fixes as well as an update to the [SQR-018](#) technote to reflect current status.
- Notable meetings
  - AF, AT, SK and FE attended the week-long Science Platform workshop at IPAC.
  - SK continued his participation in the Euclid review.

## Planned activities

- Science Platform requirements
- Landing page for [www.lsst.io](http://www.lsst.io)
- CI notifications

## Recruitment update

- None planned for SQuaRE. We participated in the recruitment process for the EPO Web Developer