

# Large Synoptic Survey Telescope Data Management Monthly Report

## November 2017

### High-level Summary

This month marked the end of the Fall 2017 development cycle for DM. During Fall 2017, more than 100 individual epics were completed by the DM team. Many of the key conclusions and the resultant milestones are described in detail below.

Three candidates for the position of DM Subsystem Scientist were interviewed during November. Discussion among the selection committee will extend into next month.

The DM System Science Team delivered a technical note (DMTN-065<sup>1</sup>) reporting on the requirements and plans for processing LSST Special Programs data. The concerns raised have been entered into 14 separate JIRA issues for further analysis by the engineering team.

The Butler Working Group presented initial conclusions to the DM Leadership Team meeting at the start of November, and then spent the rest of the month preparing use cases, requirements and a straw-man design for formal delivery. These will be reviewed next month. At the same time, the Lossy Compression Working Group produced a preliminary report; further work in this WG is ongoing.

The Systems Engineering and Data Facility teams worked to refine the definition of milestones and align delivery dates across Early Integration activities and for internal use within DM.

A number of major improvements were made to the Science Pipelines codebase. Highlights include substantial upgrades to the astrometric matcher, refinements to the algorithm used to reject artefacts when building coadds, and integration of the “Synpipe” synthetic object injection system with the DM Stack. The Science Pipelines groups also focused on delivering functionality for the major LDM-503 (“level 2”) milestones due at the end of the month. In addition, the SQuaRE team delivered upgrades to the `validate_drp` package for tracking key performance metrics (KPMs) and to the continuous integration (CI) system that is used to run it.

The Science User Interface team enhanced the Firefly tool to display HiPS (Hierarchical Progressive Survey<sup>2</sup>) data. The Data Access team completed in-place, partitioned, synthesis of Object catalog at 30%-DR1 density within one of the Qserv test clusters at CC-IN2P3. This

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<sup>1</sup> <https://dmtn-065.lsst.io/>

<sup>2</sup> <http://aladin.u-strasbg.fr/hips/hipsdoc.pdf>

will be used for gathering Qserv KPMs. In addition, they worked with the Data Facility team to load WISE data in preparation for the LDM-503-1 milestone.

At the Data Facility, the expanded Level 1 Services test & Integration system, and testing of Level 1 system software commenced.

The Summit Computer Room mechanical floor, drop ceiling, and 18" copper cable trays were installed. The AURA Dense Wave Division Multiplex (DWDM) equipment was installed in La Serena and on Cerro Pachon. The REUNA DWDM equipment was installed in Santiago and La Serena. The cross-connects (connecting REUNA to LAN/FIU 100 Gbps Ring) were installed in the L3 facility in Santiago. 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.

## Risk Management

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

## Milestone Summary

### Milestones Completed

ID	Description	Due Date
Level 2 Milestones		
F17F	F17 Complete	2017-11-30
Alert Production		
DM-AP-1	Basic single frame measurement pipeline	2017-11-30
DM-AP-2	Alard & Lupton style image differencing	2017-11-30
DM-AP-3	Point source & dipole measurement on difference images	2017-11-30
DM-AP-4	DIASource association	2017-11-30
DM-AP-5	DIAObject generation	2017-11-30
Data Release Production		
DM-DRP-1	HSC merger complete	2017-11-30
DM-DRP-2	Basic visualization and quality assessment tools operational on HSC-scale data volumes	2017-11-30

DM-DRP-3	PSF-Homogenized coadd construction	2017-11-30
Science Data Archive & Application Services		
DLP-473	Async Queries in Qserv <i>This milestone is met with the completion of <a href="#">DM-4451</a></i>	2017-11-30
DM-DAX-1	WISE data ingest to PDAC <i>This milestone is met with the completion of <a href="#">DM-9372</a>, <a href="#">DM-10740</a>, and <a href="#">DM-12523</a></i>	2017-11-30
DM-DAX-6	Prototype L1 / Alert Production database (relaxed scale requirements) <i>Design discussions and experiments detailed in <a href="#">DM-7182</a>. Prototype was made available for use by AP team.</i>	2017-11-30
DLP-725	Working Prototype of AP/L1 Database <i>Post DM replan, this is considered satisfied concomitantly with milestone DM-DAX-6.</i>	2017-11-30
Science User Interface & Tools		
DLP-205	LSST web UI search external catalog	2017-11-30
DLP-207	Extra LSST query capabilities in web UI	2017-11-30
DLP-222	Provide time domain data view	2017-11-30
DM-SUIT-1	Search and display WISE sources (objects) in PDAC	2017-11-30
DM-SUIT-2	Search WISE coadded data single exposure images in PDAC	2017-11-30
DM-SUIT-3	Time series analysis tool for WISE data	2017-11-30
DM-SUIT-4	Multiple data traces in chart space	2017-11-30
LSST Data Facility		
DLP-366	Mid-scale processing of eligible camera data <i>LDF contributions toward Milestone LDM-503-2 demonstrated mid-scale processing of eligible camera data using an alternate production-capable framework.</i>	2017-07-31
DLP-864	Coordination with NCSA/CC-IN2P3 JCC <i>LDF staff held technical discussions regarding networking, data transfer, bulk processing, and central job management at the July DM replan review and the August all-hands meeting.</i>	2017-11-30
DLP-368	Initial AP DMCS <i>The term "AP" was used in the pre-replan era to describe the entire realtime processing and archiving framework. There is a DMCS that is adequate to test feeds to NCSA and control the Archivers. Functionality has been demonstrated in the pathfinder software</i>	2017-11-30

	<i>integration activities.</i>	
DLP-457	Support runs on real cameras data and ImSim data <i>We sustain biweekly processing of HSC data and PDR-scale data processing campaigns. ImSim has not been found to be useful for development of the production framework.</i>	2017-11-30
DM-NCSA-28	Image ingest & processing control code <i>The front-end control code for Archiving and Prompt Processing exists. We have demonstrated flows all the way to the distributors. A mock of the AP production framework code exists.</i>	2017-08-10
DM-NCSA-1	Regular reprocessing service for HSC data available <i>The Batch Production Service has been stood up as a facade and supports regular reprocessing of HSC datasets. Integration of production elements into the service is on-going.</i>	2017-11-30
DM-NCSA-2	Access to results of regular reprocessing available <i>Access to results of regular dataset reprocessing is made available on LDF storage and catalogued on LSST Confluence.</i>	2017-11-30
DM-NCSA-3	Provide database for metadata, provenance, location and demonstrate ingest at small scale <i>A single-node instance of the Oracle consolidated database exists. Initial schema for tracking metadata, provenance, and location of data products is in place, has been used in testing of the batch production system, and was used by the batch production service in the latest HSC reprocessing campaign (LDM-503-2).</i>	2017-11-30
International Communications & Base Site		
DMTC-7400-2420	REUNA La Serena - Santiago DWDM equipment <i>This milestone has been completed with the installation of the equipment in La Serena and Santiago.</i>	
DMTC-7400-2480	AURA DWDM equipment in operation <i>This milestone has been completed with the installation of the equipment in La Serena and on Cerro Pachon.</i>	2017-10-30
DMTC-7400-2510	REUNA La Serena - Santiago Optical Channel in operation <i>This milestone has been completed with the test of the equipment in La Serena and Santiago.</i>	2017-11-30
Science Quality and Reliability Engineering		
DLP-344	Release SQuaSH-in-a-box automated deployment platform <i>This milestone is met with the completion of <a href="#">DM-10742</a></i>	2017-11-30
DLP-352	Metrics of interest integrated in running stacks or post-tests <i>This milestone is met with the completion of <a href="#">DM-8477</a></i>	2017-11-30
DM-SQRE-1	Project internal Jupyter notebook service <i>The JupyterLab-based notebook environment is developed sufficiently</i>	2017-11-30

to allow project-internal use (final epic was [DM-11830](#)). We have commodity cloud (Google Container Engine) deployments that we use for development and tutorials so the SQuaRE milestone is met. However, a deployment sufficiently resourced to allow a service to all internal project users is pending the availability of a Kubernetes cluster in the Data Facility (blocked by [DM-12838](#))

## Milestones Delayed

ID	Description	Due Date
Level 2 Milestones		
LDM-503-01	Test report: Science Platform with WISE data in PDAC <i>The loading of the WISE single-epoch source data was delayed by the larger-than-expected time required to acquire and configure a replacement for the PDAC-cluster Qserv head node with greater capacity and performance, and by a subsequent period of system instability and poor filesystem performance on the PDAC nodes. In spite of this, the WISE single-epoch source data loading was completed by the end of November 2017. The modifications to the PDAC Portal required to make the newly loaded data visible are now in progress and should be completed by the end of December, enabling the milestone tests to be performed.</i>	2017-11-30
LDM-503-02	Test report: HSC reprocessing <i>Data Facility based reprocessing of HSC data was completed in late November 2017. At time of reporting, the Data Release Production group was still testing the data for scientific validity. We expect this work to be complete and a test report issued in mid-December 2017.</i>	2017-11-30
LDM-503-03	Test report: Alert generation validation <i>Activities for this milestone have been completed and a draft test report has been produced and is under review at time of writing.</i>	2017-11-30
DM System Architecture		
DLP-538, DLP-539, DLP-541, DLP-544	Assorted ICDs updated to Phase 3 <i>Work is in progress to remove all TBDs and TBRs from these ICDs and achieve "substantial completion" by the end of the calendar year.</i>	2017-05-31
Science User Interface & Tools		
DM-SUIT-5	Search & display processed HSC data <i>This could not be implemented due to delay of DM-DAX-5.</i>	2017-11-30
Science Data Archive & Application Services		

DLP-802	<p>AP/L1 Database Design</p> <p><i>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.</i></p>	2016-11-30
DLP-472	<p>Qserv Data Distribution</p> <p><i>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.</i></p>	2017-05-31
DLP-808	<p>AP-ready Provenance</p> <p><i>This milestone precedes the DM re-plan. Provenance development work has been rescheduled to F18.</i></p>	2017-11-30
DLP-799	<p>AP-ready Image &amp; File Archive</p> <p><i>AP interaction with the Image &amp; 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.</i></p>	2017-11-30
DLP-837	<p>AP-ready Butler Framework</p> <p><i>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.</i></p>	2017-11-30
DM-DAX-2	<p>Query service supporting IVOA TAP protocol, with support for asynchronous queries</p> <p><i>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.</i></p>	2017-11-30
DM-DAX-3	<p>Image cutout service supporting IVOA SODA protocol</p> <p><i>Image cutout server internals were substantially re-vamped. SODA interface layer was not completed, but is currently scheduled for completion in S18.</i></p>	2017-11-30
DM-DAX-4	<p>Metadata service supporting IVOA SIAv2 protocol</p> <p><i>Delayed by resource reassignment to Butler Working Group. Currently scheduled for completion in S18.</i></p>	2017-11-30
DM-DAX-5	<p>Database ingest in support of HSC reprocessing (automatable, large catalog ingest)</p> <p><i>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.</i></p>	2017-11-30

LSST Data Facility		
DLP-433	Procure infrastructure for Archive Center to FY18 <i>This milestone relates to provisioning of capabilities described in the FY18 Acquisition Strategy Document. Procurements for this capability are on-going throughout FY18.</i>	2017-11-30
DLP-442	Procure infrastructure for Base Center to meet FY18 goals <i>This milestone relates to provisioning of capabilities described in the FY18 Acquisition Strategy Document. Procurements for this capability are on-going throughout FY18</i>	2017-11-30
DLP-458	Ingest of bulk data from real cameras to ComCam scale <i>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.</i>	2017-11-30
DM-NCSA-27	Deliver header service code. <i>Delayed due to Systems Engineering Early Pathfinder Software Integration Activity schedule changes. Delivery of initial header code version expected by December 15, 2017.</i>	2017-08-03
International Communications & Base Site		
DMTC-7400-2090	Report on functional fiber connections, including AURA equipment <i>This milestone is not completed, pending correction of a fault in the circuit between La Serena and Santiago. Equipment is configured for expected 200 Gbs per lambda but current fiber impedance allows for only 100 Gbps. A team of REUNA/Raylex/Coriant will be on-site the week of December 11, additional tuning and testing will continue through December.</i>	2017-08-18
DMTC-8000-0818	Acceptance Test with Equipment Installed <i>This milestone is not completed, pending correction of a fault in the circuit between La Serena and Santiago. Equipment is configured for expected 200 Gbs per lambda but current fiber impedance allows for only 100 Gbps. A team of REUNA/Raylex/Coriant will be on-site the week of December 11, additional tuning and testing will continue through December.</i>	2017-11-30
DMTC-7400-2130	End of commissioning; acceptance of fiber connection. <i>This milestone is not completed, pending completion of DMTC-7400-2090 and documentation.</i>	2017-11-30
System Integration & Test		
DLP-579	Usability and developer efficiency <i>This is currently being held up by Orchestration and Supertask framework.</i>	2016-08-31

# Detailed Project Progress

## 1.02C.01: System Management

### Current accomplishments

Organised and lead DMLT face to face meeting in Tucson Nov 1-3. Part of this meeting was setting epics and milestones for the next six months. Several technical topics were covered.

DM Project manager is supporting the ESA Euclid Ground Segment Review, we consider this a useful connection to maintain. Three candidates were interviewed for the DM Scientist role. Visa work has started for Gabrielle Comoretto (Release Manager hire). A push was made for the the first Test Reports associated with high level milestones.

### Planned activities

The DM Project Manager will present LSST at the La Silla Paranal Observatory review and DM at the LSST Chile community workshop. Make offer for DM scientist.

## 1.02C.02.01: Data Management Science

### Current accomplishments

DMTN-065, "Data Management and LSST Special Programs", reached it's final form. It identified a number of concerns with DM's plans and designs for crowded field processing that were passed on to the engineering team for further analysis. The work spawned 14 JIRA tickets to address outstanding issues and make changes to core DM documentation where needed. The paper "Photometric Redshifts with the LSST: Evaluating Survey Observing Strategies" by Graham et al.<sup>3</sup> was accepted for publication in the *Astronomical Journal*. Melissa Graham prepared and delivered a 1.5 hour contributed seminar on "Towards Science with LSST: Data Products and Communication" and a 30 minute invited talk on "LSST: Data Pipelines and Products" at IAU Symposium 339: Southern Horizons in Time-Domain Astronomy, November 13–17 2017, Stellenbosch Institute for Advanced Studies (STIAS), Stellenbosch, South Africa<sup>4</sup>.

Slater presented an overview of the commissioning process to the Milky Way Science Collaboration telecon. Slater also developed and benchmarked an experimental shared

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<sup>3</sup> <https://arxiv.org/abs/1706.09507>

<sup>4</sup>

<https://community.lsst.org/t/report-from-iau-symposium-339-southern-horizons-in-time-domain-astronomy>



scans extension for Spark, to expand the science team's understanding of technological options for data analysis. Slater continues to supervise the work on quantification of the quality of crowded field processing.

Suberlak has continued work on developing crowded field processing pipeline tests. He's formulated photometry quality assessment tests (width of stellar locus in CMD, morphology of nearest-neighbor separation in photometric and astrometric space, rms of magnitude difference) using source catalogs based on DECam images processed by DECAPS pipeline, or LSST Stack image processing pipeline.

Mario Juric contributed to updates of the LSST Overview Paper (Ivezic et al), delivered an invited talk at the "Science with LSST-CSST Workshop" in Beijing, and continues to work on developing the update plan for LSST Solar System data products and processing. He continues to coordinate the work of the SST and the SST staff.

## Planned activities

In December, we plan to:

- Finalize testing pipeline to provide metrics for validation of photometric and astrometric precision as well as completeness, as a function of source density. The report including high-level characterization will help quantify how well the existing LSST Stack image processing pipelines perform with real as well as simulated data, and how they compare to other state-of-the-art pipelines.
- Attend the LSST Science Platform design workshop to assist with the flow-down of LSE-319 vision to engineering designs/specs.
- Continue community outreach (Chilean LSST workshop, science collaboration telecon presentations).
- Have a workshop with Minor Planet Center staff, draft the initial guidelines for LSST-MPC interfaces, and develop a proposed update for LSST Solar System data products and processing.

## 1.02C.02.02: DM System Architecture

### Current accomplishments

The Architecture Team made progress in the area of requirements and design, discussing those at the DMLT Face-to-Face meeting, submitting the products of the Butler Working Group (LDM-556, LDM-592) for review, baselining the Jointcal requirements (LDM-562), and clarifying aspects of the LSST Data Facility (LDF) design and interfaces. A plan to update the Infrastructure Design document (LDM-129) was agreed to.

Much work was also done in the area of milestones (and indirectly test plans), with decisions being made at the DMLT meeting, a change request being filed to update the Early Integration schedule, a list of missing milestones being generated from a synchronization between Early Integration and DM plans, and better internal milestone definitions being written after discussions with the LDF.

In other technical work, the team discussed Python 3 and Python/C++ bindings at the Mauna Kea Python Workshop and computed raw data volumes suitable for public distribution.

And finally the team interviewed the candidates for DM Subsystem Scientist and completed the administrative tasks to add a software systems engineer.

## Planned activities

In December, the Architecture Team will bring on board the software systems engineer, who will be building a prototype for a verification control tool. The team will also contribute to the design of the LSST Science Platform at a dedicated workshop, the design and integration of control systems software at the Early Integration Exercise #4b and adjacent workshop, and the design and integration of Auxiliary Telescope software systems at a dedicated workshop. The Team will bring relevant ICDs to a state of “substantially complete”. The Team will also conduct the Butler Use Case and Requirements Review.

## 1.02C.03: Alert Production

### Current accomplishments

#### 02C.03.00 – Alert Production Management Engineering and Integration

- Travel & meetings:
  - John Swinbank travelled to Tucson for the DMLT face-to-face meeting of 1–3 November. Eric Bellm participated in this meeting remotely.
  - Eric Bellm travelled to Stellenbosch, South Africa for [Southern Horizons in Time Domain Astronomy](#) (IAU Symposium 339), 13–17 November.
- Planning for the Spring 2018 development cycle:
  - Management and leadership effort during this month focused on developing the plan for Science Pipelines development during the Spring 2018 cycle (running December 2017 to May 2018, inclusive) in conjunction with the Data Release Production team.
- Construction of an “end-to-end” Alert Production test system [[DM-9676](#), [DM-10770](#), [DM-10773](#), [DM-10775](#)]:
  - The AP test system now uses coadded images from the [HiTS](#) 2014 survey as

templates for processing HiTS 2015 data. [[DM-11422](#)]

- Effort has focused on assembling the complete end-to-end system and defining the test procedures to be used to execute the LDM-503-3 (“Alert Generation Validation”) milestone. At time of writing, the test plan is broadly complete and execution of the tests is well advanced; we expect the test report to be delivered in mid-December 2017. [[DM-12533](#), [DM-12534](#), [DM-12536](#)]

#### 02C.03.01 – Single Frame Processing Pipelines

- Replacement of old WCS classes [[DM-9679](#)]:
  - The work to replace our old [WCSLIB](#)-based world coordinate system (WCS) framework with a modernized approach based on [AST](#) is ongoing. This has involved more extensive revision than initially anticipated, and the work is still undergoing review at the time of writing. [[DM-10765](#), [DM-11162](#), [DM-12764](#)]
- Improved astrometric matcher [[DM-10399](#)]:
  - The new “pessimistic” matcher algorithm has been enhanced to allow for distortions when carrying out matching. This has substantially reduced the number of fields for which matching fails. [[DM-12430](#)]

#### 02C.03.02 – Association Pipelines

- Prototype source association system [[DM-10768](#)]:
  - The source association system now computes basic per-object statistics when performing association. These statistics are integrated with the end-to-end system described above. [[DM-11807](#)]
  - This completes the F17 work on source association.

#### 02C.03.03 – Alert Generation Pipelines

- Scale testing of prototype alert distribution system [[DM-9635](#)]:
  - Work has completed to test the scaling of the alert distribution as a function of the number of alert producers (corresponding e.g. to separate CCDs in the source image). Efforts continue to document the scaling as a function of the number of consumers (ie, recipients of the alerts). [[DM-12090](#), [DM-12459](#)]

#### 02C.03.04 – Image Differencing Pipeline

- Research and implementation of techniques for mitigating Differential Chromatic Refraction (DCR) [[DM-9613](#)]:
  - Work is ongoing to convert the prototype differential chromatic refraction (DCR) mitigation code to operate within the framework of the DM Stack. [[DM-9615](#), [DM-12463](#), [DM-12467](#)]
  - A revision was issued to [DMTN-037](#), the description of our prototype

algorithm for mitigating the effects of DCR during coaddition, based on feedback received from members of the project. This version clarifies and expands upon the text and provides updated figures. [\[DM-12465\]](#)

- Work is ongoing to publish a peer-reviewed paper based on the DCR mitigation work. [\[DM-12475\]](#)

#### 02C.03.05 – Application Framework for Exposures

- Emergent work [\[DM-11798\]](#):
  - An algorithmic improvement in the MultiMatch system has provided substantial performance benefits in our QA and validation system. [\[DM-12513\]](#)
  - The Bandpass system has been reworked to provide more accurate effective wavelength calculations for generating coadds corrected for differential chromatic refraction. [\[DM-12476\]](#)
  - The Alert Production group has played an active role in the [Lossy \(Data\) Compression Working Group](#). [\[DM-12457\]](#)
  - A number of minor improvements were made and bugs were fixed across the DM stack. [\[DM-10516, DM-11935, DM-11987, DM-12432, DM-12475, DM-12538, DM-12596, DM-12597, DM-12602, DM-12611, DM-12690, DM-12727\]](#)

#### 02C.03.06 – Moving Objects Pipeline

- No work was undertaken in this WBS during this month.

#### 02C.03.07 – Photometric Calibration Pipeline

- Comparison of Jointcal with meas\_mosaic [\[DM-11783\]](#):
  - The Jointcal package is slated to replace the older, Hyper Suprime-Cam specific, meas\_mosaic when the former can be shown to provide scientifically equivalent results. To establish this, a campaign of processing HSC data through Jointcal has been undertaken, which has exposed some bugs in the package which are now being addressed. [\[DM-12310\]](#)

#### 02C.03.08 – Astrometric Calibration Pipeline

- No work was undertaken in this WBS during this month.

## Planned activities

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

- Manage the start of the Spring 2018 development cycle.
- Ensure that the LDM-503-3 (“Alert Generation Validation”) milestone is completed in a timely fashion.

- John Swinbank will spend a week in Princeton working with the Data Release Production team.

#### 02C.03.01 – Single Frame Processing

- We will deliver a documented, completed version of the “pessimistic B” matcher algorithm.
- We will aggressively move to complete the transition to the AST-backed WCS system.

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

- No work is planned in this WBS during December.

#### 02C.03.03 – Alert Distribution System

- We will complete scale testing of the alert distribution system and publish the resulting technical note.

#### 02C.03.04 – Alert Generation Pipeline

- We will continue integration of the DCR-corrected template generation algorithm with the DM Stack, and on writing it up for publication.

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

- We will begin planning for work on the coordinate transformation tool for the collimated beam projector.

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

- We will begin deploying the prototype “MOPS” system on LSST hardware at the Data Facility and developing test datasets to use in conjunction with it.

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

- Continued effort to replace meas\_mosaic with Jointcal.

### Recruitment update

- Applications are under consideration for a Research Scientist position at the University of Washington to work on image differencing algorithms within the context of the DM Stack.

## 1.02C.04: Data Release Production

### Current accomplishments

#### 02C.04.00 – Data Release Production Management Engineering and Integration

- Travel & meetings:
  - Jim Bosch travelled to Tucson for the DMLT face-to-face meeting of 1–3 November.
  - Jim Bosch took part in the [Mauna Kea Python Workshop](#) during the week of 6 November.
  - Jim Bosch travelled to Tucson to take part in the selection process for the new DM Subsystem Scientist.
- Management & planning [[DM-10816](#)]:
  - Management effort in this month focused on planning for the Spring 2018 development cycle, which will run December 2017 to May 2018 inclusive, and for the delivery of the LDM-503-2 (“HSC Reprocessing”) milestone, scheduled for late November.
- Forward Global Calibration Method (FGCM; [Burke et al., 2018](#)) [[DM-10584](#)]:
  - Large-scale modes observed in the FCHM illumination correction were caused by the differing pixel area across HSC that is not corrected for in the ISR processing. This is now corrected by preprocessing the data. [[DM-12462](#)]
- Emergent work and pipeline support [[DM-10382](#)]:
  - A long-standing issue with the PSFEx point-spread function measurement code, which cause it to perform badly in good seeing was resolved. [[DM-12539](#)]
  - An error whereby pixels rejected from coaddition were not resulting in the correct mask bits being set on the coadd was resolved. [[DM-9953](#)]
  - A number of other minor issues were fixed an improvements made across the DM Stack. [[DM-12450](#), [DM-12531](#), [DM-12529](#)]
- Pipeline QA [[DM-10571](#)]:
  - The “pipe\_analysis” system in use by the Data Release Production group has been adapted to run on the [Dark Energy Science Collaboration](#) “Data Challenge 1” dataset. [[DM-11452](#)]
  - Work has focused on preparing the QA system to support the execution of the LDM-503-2 “HSC Reprocessing” milestone in late November or early December. [[DM-12038](#), [DM-12701](#), [DM-12614](#), [DM-12548](#), [DM-12543](#), [DM-12542](#)]

#### 02C.04.01 – Application Framework for Catalogs

- Middleware and framework development [[DM-10586](#)]:
  - The DRP team contributed actively to the [Data Butler Working Group](#)

throughout this month. In particular, effort focused on finishing a high-level straw-man Butler design based on that presented to the DM Leadership Team meeting early in the month. This will form the basis of ongoing development through Spring 2018. [[DM-11523](#), [DM-12132](#), [DM-12135](#), [DM-12376](#), [DM-12377](#)]

- Emergent work and reduction of technical debt [[DM-10383](#)]:
  - “Shared stacks” on developer infrastructure were updated to use the Red Hat Developer Toolset 6, providing an updated toolchain and newer compilers. [[DM-10343](#)]

#### 02C.04.02 – Calibration Products Pipeline

- Auxiliary telescope development [[DM-10581](#)]:
  - Work is ongoing to reduce test data taken on the 0.9m telescope at CTIO during October of 2017. [[DM-12564](#)]
- Processing camera test stand data [[DM-10897](#)]:
  - The [eotest](#) package, used for electro-optical acceptance testing of LSST sensors, was updated to work with Python version 3. [[DM-12568](#)]
  - Work has continued in wrapping eotest within the DM stack framework, to form the first complete Calibration Products Pipeline package. This work is under review at the time of writing. [[DM-11479](#), [DM-12779](#)]

#### 02C.04.03 – PSF Estimation

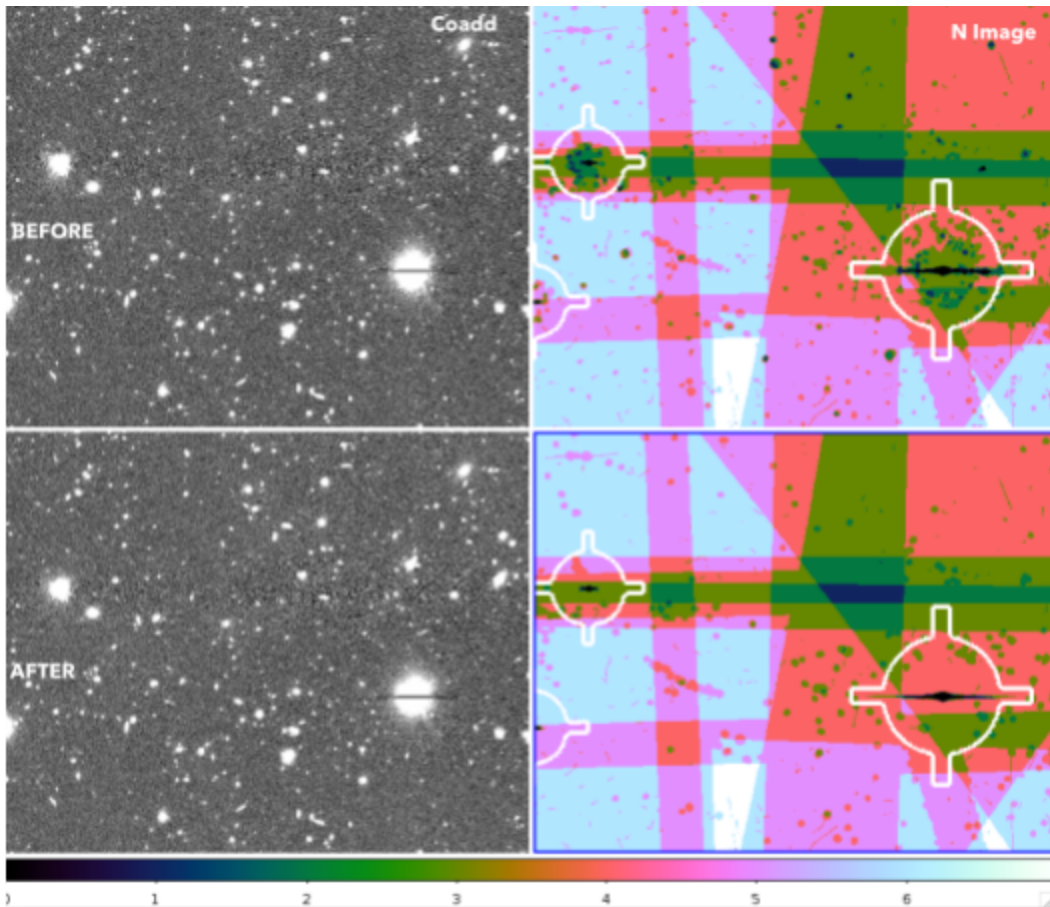
- Wavefront measurement and PSF reconstruction [[DM-10355](#)]:
  - The effects of centering the illuminated portions of off-axis pupils within their pixel arrays has been investigated. It was established that shifting the pixels in this way did not affect the PSF (as expected). However, the centered pupils are modeled by more orthogonal Zernike polynomials. We therefore plan to add pupil centering as an option in a future version of the code. [[DM-12103](#)]
  - Work has continued to write up the work performed over the Fall 2017 development cycle on PSF modeling as a technical note. This note is undergoing review at the time of writing. [[DM-9988](#)]

#### 02C.04.04 – Image Coaddition Pipeline

- Warped image comparison [[DM-8290](#)]:
  - This month’s work focused on a detailed evaluation of the “warped image comparison” method of eliminating artefacts when building coadds based on HSC data. [[DM-12593](#), [DM-12101](#)]
  - As a result of this evaluation, a number of improvements were made to the algorithm. This included:
    1. Speeding up the task by reducing the amount of I/O; [[DM-12491](#)]
    2. Improving the filtering of artifact candidates; [[DM-12514](#), [DM-12517](#)]



3. Refining the default task configuration; [[DM-12445](#)]
  4. Assorted usability fixes.
- This has resulted in a significant improvement in robustness of the algorithm during this month.

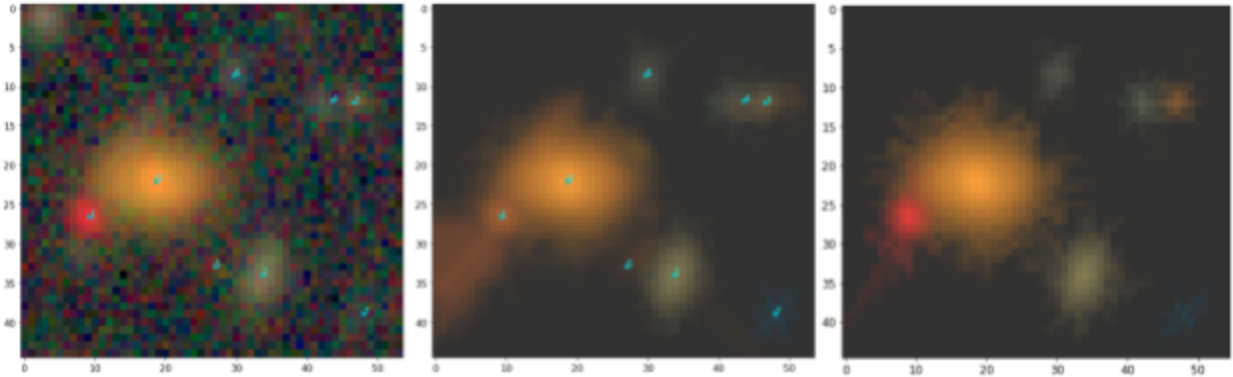


*As of November 1, the CompareWarpAssembleCoadd algorithm was over-aggressively clipping rings around bright sources or epochs from bright sources. The image displaying the number of epochs/visits (right column) contributing to the resulting coadd confirms that the maximum available epochs/visits get coadded around bright sources currently (bottom row). Work in November focused on mitigating this over-aggressive clipping and improving robustness in the case of small numbers of epochs/visits, evaluated on HSC RC dataset processing.*

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

- Deblender development [[DM-10353](#)]:
  - The way that weighting is carried out in the new (“non-negative matrix factorization”) deblender was revised. Previously, we weighted by the inverse variance. However, using inverse variance as a weight map was shown to be problematic as colors (and hence morphologies by design) are incorrectly estimated by the deblender. We now simply mask bad pixels and apply flat weights to each band. [[DM-12783](#)]





*At left, an example of a blend from Hyper Suprime-Cam data. In the center, the deblend model when weighting by inverse variance. At right, the unweighted model.*

- Work has progressed on integrating the new deblender with the DM Stack. [[DM-11329](#), [DM-12776](#)]
- This completes the scheduled work on the deblender for F17. Work will continue in the Spring 2018 development cycle.

## 02C.04.06 – Object Characterization Pipeline

- Experiments in shear measurement on coadds [[DM-10579](#)]:
  - Work has continued to determine the fidelity with which galaxy shears can be recovered from coadded data. A number of minor improvements were made to the test procedure this month, in preparation for a final, refined comparison and report early in December. [[DM-11310](#), [DM-11907](#)]
- Improved galaxy flux measurement algorithms [[DM-10580](#)]:
  - The integration of the [Synpipe](#) synthetic object insertion code with the DM Stack has now been completed. [[DM-10849](#), [DM-11320](#), [DM-12419](#), [DM-12544](#)]
  - Work is underway on the development of a new set of priors for galaxy shape measurement which will inform development of a new shape measurement algorithm during Spring 2018. [[DM-12378](#), [DM-12421](#)]

## Planned activities

### 02C.04.00 – Management and Leadership

- Start the Spring 2018 development cycle.
- John Swinbank will visit Princeton to work with Yusra AlSayyad and other members of the DRP team.

### 02C.04.01 – Software Primitives

- Full-scale development of the new “third generation” Data Butler I/O abstraction.

#### 02C.04.02 – Calibration Products

- Continue with Auxiliary Telescope spectrophotometric data reduction pipeline development based on the October test data.
- Begin detailed integration of eotest algorithmic components with the DM stack.

#### 02C.04.03 – Image Characterization

- Complete the technical note describing PSF estimation work performed in Fall 2017.

#### 02C.04.04 – Coaddition

- Complete the validation of the warped image coaddition algorithm based on HSC data.

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

- Continued work on the new deblender algorithm.

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

- Complete work on the new galaxy shape priors.

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

- Focus on successful completion of the LDM-503-2 (“HSC Reprocessing”) milestone.

### Recruitment update

- Yusra AlSayyad has assumed the role of Deputy Science Pipelines Manager with immediate responsibility for the Data Release Production group at the level of 0.5 FTE. She will continue her technical work on LSST with the remainder of her time.
- Interviews for a Scientific Software Developer to join the DRP team will be held in early December.
- Applications are now being reviewed for a postdoctoral position within the DRP team.

## 1.02C.05: Science User Interface & Tools

### Current accomplishments

#### 02C.05.00

- Prep work (agenda, lodging, refreshment) for ISST Science Platform workshop to be held in December 4-8, 2017.

- Xiuqin and Gregory attended the DM project scientist candidates interview remotely.
- S18 planning.
- Xiuqin took one week vacation.

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

- Bug fixes, improvements, and document publishing. (DM-12268, DM-12616, DM-11374, DM-9787)

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

- New functions
  - Consolidate charts dialog. (DM-12248)
- Firefly Python API related work:
  - Firefly\_client update to be in sync with all the new JS features; (DM-11817)
  - Firefly\_client PyPI installable; (DM-12053)
  - Add tests to firefly\_client and display\_firefly. (DM-12007, DM-12008)

#### 02C.05.05 User workspace

- UI elements for access user workspace. (DM-10855)

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

- HiPS map visualization in Firefly. (DM\_12305, DM-12551, DM-12552)

#### 02C.05.10 Integration and test

- Use webpack to insert only one global object instead of many global variables. (DM-11856)

## Planned activities

#### 02C.05.00

- Host the ISST Science Platform workshop in IPAC, December 4-8, 2017.
- Christmas holiday - Caltech shuts down December 25-29, 2017.

#### 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

- SUIT and Science Platform requirements definition. (DM-8372)

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

- HiPS map display UI and improvement. (DM-12555, DM-12971, DM-12553)

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

- UX improvement:
  - Keep the selected table row after sorting; (DM-11457)
  - Tri-view rendering when table does not contain position information; (DM-12864)
- New WISE single epoch source table in PDAC. (DM-8762)

#### 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

- Team continued improving robustness of DAX services and otherwise supported SUIT integration efforts in the PDAC as necessary.
- Gaponenko worked with the team at NCSA to overcome file system and hardware instabilities in the PDAC, then completed load of WISE n-band catalogs and the NOEWISER Year 1 Single Exposure Source table. [DM-10740, DM-12523]
- Mueller attended DMLT F2F meeting in Tucson.

#### 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 developed a Butler instance caching strategy for imgserv to improve performance. [DM-12035]
- Lo addressed several unit test failures. [DM-12722, DM-12724, DM-12769]

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

- Pease addressed a critical backward-compatibility issue with Butler Generation 2 repositoryCfg.yaml input root. [DM-12117]
- Van Klaveren continued participation in Butler Working Group activities, contributing to the efforts to produce a refined Butler Generation 3 use cases document.

#### 02C.06.02.02 Web Services

- Van Klaveren worked to add support for asynchronous queries at the web service layer; completion of this work was delayed by Butler Working Group activities.

#### 02C.06.02.03 Query Services

- Salnikov extended the Qserv czar to handle per-table overlap. [DM-1693]
- Salnikov investigated potential improvements to the Qserv multi-node integration tests; results documented in DM-4885. [DM-4885]
- Jammes produced documentation on Qserv Kubernetes setup. [DM-12019]
- Mueller updated Travis container build scripts to use newinstall.sh from master rather than the pinned 14.0 release. [DM-12794]
- Gaponenko continued development of Qserv data distribution and replication system; completion of this work was delayed by activities in the PDAC.
- Pease worked on relocation of subchunk query expansion from czar to workers for greater parallelization and to remove a related bottleneck in the current czar implementation.
- Hanushevsky began investigations into potential designs for MR-style next-to-data processing in Qserv.

#### 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

- Team to continue improving robustness of DAX services and otherwise support SUIT integration efforts in the PDAC as necessary.
- Entire team to attend week-long LSST Science Platform Workshop at IPAC.
- SLAC winter closure - December 25 through January 5.

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

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

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

- Lo to finish adding mosaic and image stitching features to imgserv.

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

- Further development on the current Data Butler implementation is now frozen, pending the outcome of the Butler Working Group. Pease to work as needed, however, to address any issues in the current Butler implementation that may be blocking other teams' work.

#### 02C.06.02.02 Web Services

- Van Klaveren to add support for asynchronous queries at the web service layer.

#### 02C.06.02.03 Query Services

- Gates to complete load of 30% DR1 test dataset on the IN2P3 cluster, and Thukral to take KPMs using that dataset.
- Gaponenko to continue work on Qserv data distribution/replication framework.
- Jammes to continue adapting Qserv for deployment within Kubernetes.
- Pease to complete relocation of subchunk query expansion from czar to workers for greater parallelization and to remove a related bottleneck in the current czar implementation.
- Hanushevsky to continue investigations into potential designs for MR-style next-to-data processing in Qserv.

#### 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

- A promising candidate was identified and phone screened. Interviews with the team to take place in early December.

## 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, defining a process for change management requests. We worked on the content of a weekly report visible to DM leadership summarizing the active service management processes.

#### 02C.07.02 Infrastructure Services

We completed planned work investigating local Docker registry in the context of Kubernetes development.

#### 02C.07.04 Site Infrastructure

We continued work toward creating policy for file system reorganization for data sets, including guidelines for use, retention policies, and best practices.

We completed provisioning of the expanded Level 1 Services test & Integration system and configuration of the prototype Kubernetes cluster.

We continued acquisition and provisioning of final FY17 hardware procurements, including a capacity increase for the lsst-db system, and setup for the Base Authentication and Authorization hardware.

We continued work in consolidation of ITC management systems, investigating the use of the Foreman package to provide maintainable processes and procedures for managing multiple enclaves at NCSA, at the Base, and the network-based security systems at the Summit.

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

The management team at NCSA:

- Provided guidance about the formulation of the ESNNet technical interface team.
- Aligned LDF (from replan), DM (from LDM-148), and Commissioning (from Commissioning Plan) services and milestones, including scope and deployment dates.
- Began rewriting LDM-129, which will be renamed the LDF Logical Infrastructure Technology and Communications Design.
- Attended the DMLT face-to-face meeting in Tucson, presenting on status, plans, milestones, LDF service management processes, and compression working group progress.
- Participated in DM Subsystem Scientist hiring committee work, including candidate

review and interviews.

- Held regular steering meetings for internal oversight over all technical areas of the LSST Data Facility.
- Developed next detailed cycle plan activities.
- Participated in the Data Access Working Group, drafting considerations for developing data rights and data access policies.
- Led the Lossy Compression Working Group, completing a preliminary report on findings.

In the service management area, we completed the initial design of service level monitoring capabilities. We continued incremental improvements to Service Management processes. This included preparing for 24/7 incident response as needed to support systems in Chile AA Base, and documenting incident response processes.

#### 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 prototype Kubernetes installation 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 on OpenStack.

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

We continued work putting in place a file transfer mechanism toward support of the Spectrograph test stand, including definition of minimum necessary components and preliminary identification of specific components to fulfill the requirements.

#### 02C.07.08 LDF Service Software

We completed Python 3 conversion for DESDM framework batch production code. We completed reprocessing and framework modifications to support milestone LDM-503-2, and made contributions toward the milestone verification report.

We continued work on L1 Service software, focusing on readying the L1 Test and Integration for supporting the upcoming Pathfinder Early Integration activities and the Spectrograph Test Stand milestone.

We continued Header Client software enhancements based on recommendations from the previous design review, along with preparation for the Header Service Integration activity in December.



### 02C.07.09 ITC and Facilities

We completed planning and acquisition for system test deployment nodes, a build-out of physical infrastructure necessary to support FY18 hardware acquisitions, and a system to support Camera Control System (CCS) development and integration. The CCS system was made available for CCS staff use.

We continued acquisition and planning for additional components of the first phase of the FY18 acquisition plan. The focus in November included continued activities with general enclave infrastructure expansion and Kubernetes cluster acquisition. We continued improvements to the existing disaster recovery system, as well as making general improvements and additions to existing system monitoring for NCSA-based systems and services as well as for the initial Base Authentication and Authorization system.

## Planned activities

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

We will work toward completion of outstanding service management issues, including refinement of the service management change control process.

### 02C.07.04 Site Infrastructure

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

We plan to complete expansion of the Isst-db database system, and continue provisioning the Base Authentication and Authorization systems for delivery to Chile in early 2018.

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

We plan to complete first version of LDM-129 and submit to DM change control, as well as update LDM-230 and submit to DM change control. We will work on schema, factoring by logical system element, towards a revised LDM-144, and provide a working draft of LDM-144 schema redesign.

We plan to present Compression Working Group findings at the Project Science Team (PST) meeting.

We will continue pursuing incremental improvements to Service Management processes. This includes preparing for 24/7 incident response as needed to support systems in Chile AA Base as well as general incident and change request response.

#### 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 prototype Kubernetes installation to support JupyterLab development. We will also complete work towards developing a stable containerized management architecture.

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

We will continue work investigating file transfer mechanisms toward support of the Spectrograph test stand, and begin implementation of file transfer service endpoints.

#### 02C.07.08 LDF Service Software

We will continue work on L1 Service software, focusing on inter-team coordination at workshops and integration activities, implementing the first version of Spectrograph controller functionality, and responding to needs to support upcoming integration activities.

We will continue work on implementing Header Client software, focusing on supporting the Spectrograph test installation in early 2018. We will participate in the Header Service Integration Activity delivery the initial version of Header Client code.

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.

#### 02C.07.09 ITC and Facilities

We will continue planning for and provisioning of the first phase of implementing the FY18 acquisition plan. The focus for December will be provisioning general enclave infrastructure expansion, Kubernetes cluster installation. We will continue installing and testing system-level monitoring services for the AA system prior to delivery to Chile, as well as making general improvements and additions to existing system monitoring.

### Recruitment update

Eric Morganson joined the Data Management subsystem as Research Scientist. A requisition for a full-time database administrator is in progress.

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

### Current accomplishments

#### 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: Summit Computer Room mechanical floor, drop ceiling, and 18" copper cable trays were installed. However, the trays need to be moved further out, a second set of power cables need to be installed under the floor, a grounding bar needs to be installed on the wall, as well as other minor changes. These activities will be done by Elypsa after Besalco is done and gives us access, currently scheduled for December 14. This is significantly delayed from our baseline plan of mid-August, and several weeks delayed from our revised plan set when Jeff Kantor arrived in La Serena. It is still within the acceptable float and not on the critical path, but the margin is getting much thinner. In parallel, we installed an initial configuration of a single Spine Switch, 2 Leaf Switches, and 2 Controllers in La Serena, and started working with the ACI architecture in a sandbox. LSE-239, the Base Data Center Requirements document was imported into MagicDraw and updated. It will be reviewed by Jeff Barr and the IT team prior to being submitted to the CCB as an LCR.

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

- No activity this month.

#### 02C.08.03 – Long-Haul Networks

- Jeff Kantor remained in La Serena, to coordinate the Summit and Summit - Base installations and configuration and test. He will depart La Serena on December 30 on vacation in Chile, and return to Tucson on approximately January 9, 2018. 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.

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

- Summits–AURA Gatehouse Network: No activity. This segment is accepted.
- Dense Wave Division Multiplex (DWDM) Equipment: The AURA equipment is installed in La Serena and on Cerro Pachon. The REUNA DWDM equipment is installed in Santiago and La Serena. The DWDM installation in La Serena

- required the installation of a new transformer and new grounding mesh.
- Santiago–La Serena: No activity. This segment is accepted. The primary link to Level3 is operational. The backup link to Level3 is being installed; 3 of 5 nodes are installed.
  - La Serena–AURA Gatehouse: No activity. This segment is accepted.

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

- *100 Gbps Managed Ring*: The ring is performing as expected. CLARA's cross-connects (REUNA to LAN/FIU) have been installed in the L3 facility in Santiago.
- *Management and Coordination Contract*: The LSST Network Engineering Team (NET) meeting was held on November 9. Jeronimo Bezerra reported on a new solution being tested, using the Brocade SLX, to reach 95Gbps with 1 NIC. A Quality of Service (QoS) report was also made available. Ron Lambert reported the progress of the AURA DWDM installation at the Cerro Pachon. Albert Astudillo provided updates on the REUNA's DWDM installation at La Serena and Santiago, which is almost completed. Target date for the demonstration from the Summit to the NCSA is 18 Dec 2017 - 19 Dec 2017. During this demonstration network statistic measurements will be gathered (logs, statistics regarding data rate, p2p link to link performance, latency, etc.) for further analysis of the network performance. LSST management report and press release will be created and distributed later in December 2017 or early January 2018. Additional concerns about potential bottlenecks at the campus or regional networks at Tucson, Arizona were discussed. A possible demo with Korea was also discussed.
- Members of the NET attended conferences and presented papers relevant to LSST Networks:
  - SuperComputing Conference November 13-17, Denver: Performed demonstrations at SC17, with DTNs (data transfer nodes) in São Paulo (UNESP/ANSP), Miami (AMPATH) and Denver (Caltech and UNESP booths). The Kytos SDN Platform was utilized to provision Layer 2 paths between these DTNs for the data transfers, using dedicated OpenFlow switches and AmLight SDN's slicing capabilities. A steady 370 Gbps total aggregated traffic was transported from AmLight.
- *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*: ESNNet collaboration discussions are in progress.

## Planned activities

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

- Jeff Kantor will continue in La Serena. Preparations will be made 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

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

- Summits - AURA Gatehouse Network: No activity. This segment is accepted.
- DWDM Equipment: There is a fault in the circuit between La Serena and Santiago and a fault between La Serena and Cerro Pachon. The equipment is configured for expected 200 Gbs per lambda but current fiber impedance allows for only 100 Gbps. A team of REUNA/Raylex/Coriant will be on-site the week of December 11, additional tuning and testing will continue through December. We will do an end to end test from Cerro Pachon to NCSA using that equipment. The LSST DWDM equipment will not be installed until March 2018 or later.
- Santiago-La Serena: During December the final formal commissioning will be done, this includes the certification of the equipment deployment. This also includes the activation of the services (lambdas from La Serena – Santiago). We will also continue the work on the backup link in Santiago to Level3. It is expected we will finish the physical installation of the equipment during January, and the commissioning during February-March.
- La Serena - AURA Gatehouse: No activity. This segment is accepted.

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

- 100 Gbps Managed Ring: LAN and AmLight are ready to finish the activation of the cross-connects, which are expected to be activated in December. We will use FIU's loaner equipment until March 2018 to activate the 100G links while a final solution is provided with redundancy and programmability. Julio Ibarra will work with Jeff Kantor and with Paola Arrellano (REUNA) on identifying the permanent solution.
- Management and Coordination Contract: Coordinate next NET meeting.
- Spectrum Contract: Continue work on the Operations and Maintenance Agreement.
- US National WAN: A meeting with technical representatives from ESNNet, FIU, and NCSA is scheduled for December 15 to discuss in detail the design and implementation plan of the final solution.

### Recruitment update

- See Ron Lambert transition above. We are exploring the possibility of opening an additional position in La Serena, and/or increasing resource sharing with CISS.

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

Highlights of work completed this month include:

### Current accomplishments

- Due to the increasing demand for custom deployments of the JupyterLab-based Notebook Aspect of the LSST Science Platform, we automated most of the [deployment process](#) for convenience. We will revisit how we deploy all SQuaRE kubernetes-based services in the future.
- We experimented with [bokeh+holoviews](#) in notebooks and have some promising avenues for using notebooks to create launchable bokeh apps. This only works in notebook classic right now (not Jupyterlab) so we will wait for an upstream fix before we can proceed further.
- We significantly improved SQuaSH performance by [paginating queries](#).
- validate\_drp was [ported](#) to the verification framework and the validation CI matrix job was converted to a [Jenkins pipeline](#).
- Documentation on usage of the CI system was added to the [developer guide](#).
- We engaged in cycle-end activities such as planning for S18 and brought seven F17 epics to a close.
- Notable external interactions:
  - FE and SK represented SQuaRE at the DMLT meeting.
  - We had an extended visit from SKA colleagues (Nick Rees, Head of Software and Marco Barolini, Software Quality Engineer) who wished to understand SQuaRE's activities in support of software quality and DM's development

process. In return, we learned about a number of approaches SKA is utilising, such as frameworks for [evaluating architecture](#).

- JS had a meeting with AAS Journals on living papers and software ontologies.

## Planned activities

- devtoolset 6 update.
- Science Platform workshop.
- flask API for SQuaSH.

## Recruitment update

- None planned for SQuaRE. We participated in the recruitment process for the DM Project Scientist.