Rubin Observatory

## Vera C. Rubin Observatory
## Data Management

# LSST Science Platform Test Specification

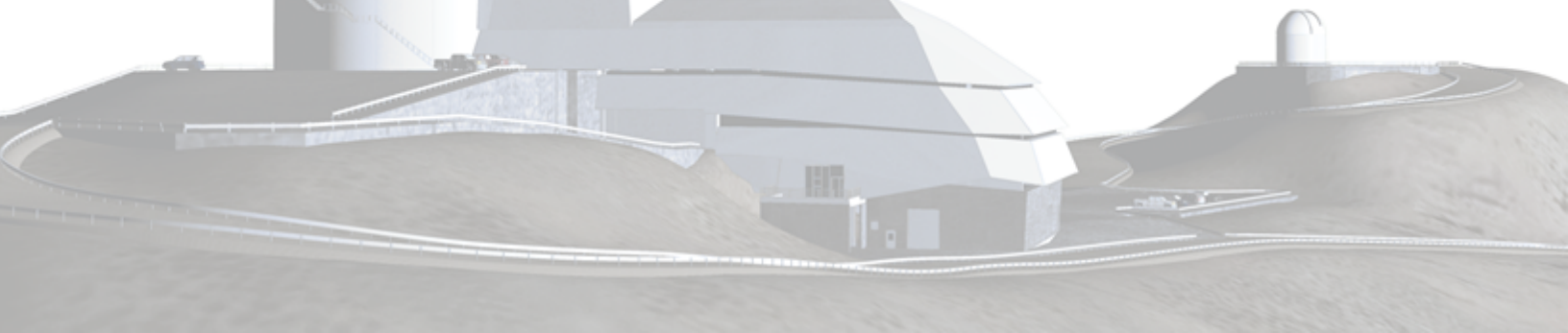
**G. P. Dubois-Felsmann, L.P. Guy, J. Carlin, K.S. Krughoff, C. Slater, M. Wood-Vasey**

**LDM-540**

**Latest Revision: 2020-11-10**







## Abstract

This document describes the detailed test specification for the LSST Science Platform. It is a work in progress; the current version provides Test Cases covering all requirements on the LSST Science Platform, however only ≈ 10% are currently fully specified. This document will be updated as work continues on completing Test Cases.

## Change Record

| Version | Date | Description | Owner name |
|---|---|---|---|
| 0.1 | 2018-01-26 | Early drafting | G. P. Dubois-Felsmann |
| 1.0 | 2018-05-01 | Adopted under RFC-468. Used to drive test LSP–00. | G. P. Dubois-Felsmann |
| 2.0 | 2019-03-29 | Adopted under RFC-586. All Test Cases baselined from Jira. Issued for LSP review, April 2019 | G. P. Dubois-Felsmann, L. P. Guy |
| 2.1 | 2020-08-19 | Baseline and approve test cases for DM-SUIT-8 and LDM-503-10a. Adopted under RFC-713 | G. P. Dubois-Felsmann |

*Document curator:* G. P. Dubois-Felsmann
*Document source location:* `https://github.com/lsst/ldm-540`
*Version from source repository:* 1eae37b

Rubin Observatory

# Contents

# LSST Science Platform Test Specification

## 1 Introduction

This document specifies the test procedure for the LSST Science Platform. The LSST Science Platform is the component of the LSST system which is responsible for providing data access and data analysis capabilities to users. It is aimed at meeting the needs of several categories of users, including:

- Science users with LSST data rights;
- LSST Project, and later, Operations staff doing algorithm development and the associated validations;
- LSST Project staff engaged in Commissioning and related activities; and
- LSST Operations staff engaged in science validation and other data quality analyses

A full description of this product is provided in LDM-542, with requirements enumerated in LDM-554.

### 1.1 Objectives

This document builds on the description of LSST Data Management's approach to testing as described in LDM-503 to describe the detailed tests that will be performed on the LSST Science Platform as part of the verification of the DM system.

It identifies test cases and procedures for the tests, and the pass/fail criteria for each test.

### 1.2 Scope

This document describes the test procedures for the following components of the LSST system (as described in LDM-542), and their deployment over the resources and services of the LSST Data Facility:

- The science database, especially its Qserv component;
- The API Aspect of the Science Platform, comprising:
  - Catalog query via TAP and related VO services;
  - Image metadata query via TAP and SIAv2;
  - Image retrieval and cutout generation;
  - User Workspace database creation and access; and
  - User Workspace file system access.
- The Portal Aspect of the Science Platform, comprising a set of Web-based tools for:
  - Data discovery for Project-generated and user-generated data;
  - Catalog and image query;
  - Image display;
  - Catalog data visualization;
  - Exploratory data analysis; and
  - Alert subscription control.
- The Notebook Aspect of the Science Platform, comprising:
  - A deployment of the JupyterHub and JupyterLab interactive computing environments;
  - Access to the API Aspect services from within that environment;
  - Direct access to elements of the data systems underlying those services, e.g., access to the User File Workspace as a mounted filesystem rather than through the VOSpace API;
  - A customizable, persistent user environment; and
  - The provision of pre-built deployments of releases of the LSST Stack, usable to configure the computational environment provided by JupyterLab.

## 1.3 Applicable Documents

| | |
|---|---|
| LDM-148 | LSST DM System Architecture |
| LDM-294 | LSST DM Organization & Management |
| LDM-503 | LSST DM Test Plan |
| LDM-542 | LSST Science Platform Design |
| LDM-554 | LSST Science Platform Requirements |
| LSE-61 | LSST DM Subsystem Requirements |
| LSE-319 | LSST Science Platform Vision Document |
| LSE-163 | LSST Data Products Definition Document |

## 1.4 References

[1] **[LSE-61]**, Dubois-Felsmann, G., Jenness, T., 2018, *LSST Data Management Subsystem Requirements*, LSE-61, URL https://ls.st/LSE-61

[2] **[LDM-542]**, Dubois-Felsmann, G., Lim, K.T., Wu, X., et al., 2017, *LSST Science Platform Design*, LDM-542, URL https://ls.st/LDM-542

[3] **[LDM-554]**, Dubois-Felsmann, G., Ciardi, D., Mueller, F., Economou, F., 2018, *Science Platform Requirements*, LDM-554, URL https://ls.st/LDM-554

[4] **[LSE-319]**, Jurić, M., Ciardi, D., Dubois-Felsmann, G., 2017, *LSST Science Platform Vision Document*, LSE-319, URL https://ls.st/LSE-319

[5] **[LSE-163]**, Jurić, M., et al., 2017, *LSST Data Products Definition Document*, LSE-163, URL https://ls.st/LSE-163

[6] **[LDM-148]**, Lim, K.T., Bosch, J., Dubois-Felsmann, G., et al., 2018, *Data Management System Design*, LDM-148, URL https://ls.st/LDM-148

[7] **[LDM-502]**, Nidever, D., Economou, F., 2016, *The Measurement and Verification of DM Key Performance Metrics*, LDM-502, URL https://ls.st/LDM-502

[8] **[LDM-294]**, O'Mullane, W., Swinbank, J., Jurić, M., DMLT, 2018, *Data Management Organization and Management*, LDM-294, URL https://ls.st/LDM-294

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

[10] **[LPM-122]**, Petravick, D., 2015, *LSST Information Classification Policy*, LPM-122, URL https://ls.st/LPM-122

## 2 Approach

The major activities to be performed are to:

- Verify that the LSST Science Platform components are capable of performing the functions defined in the relevant DM System Requirements, LSE-61, and in the Science Platform Requirements, LDM-554.
- Ensure that the components of the Science Platform match the documented design.
- Test all the interfaces among components of the Science Platform.
- Test all the interfaces between components of the Science Platform and other DM system components.
- Within the limits of available integration and test hardware platforms and datasets, verify that the Science Platform components meet the performance requirements set forth in the above documents, or extrapolate appropriately from the test systems available to verify that the performance requirements should be met on a fully provisioned hardware platform.
- Repeat these tests when the full hardware platform becomes available.
- Ensure that the test procedures developed are also relevant to pre-deployment testing in the Operations era.
- Ensure that the observed behavior of the Science Platform components when under test is consistent with the available documentation produced by their developers or by other authors.

## 2.1 Tasks and criteria

The following are the major items under test:

- The LSST science database;
- The API Aspect of the Science Platform, encompassing Web APIs for access to LSST Data Products, both within the science database and within the Data Backbone, and enabling the creation, sharing, and management of User Generated Data Products;
- The Portal Aspect of the Science Platform, encompassing user interfaces for data discovery, retrieval, visualization, and exploratory data analysis, as well as an interface for the control of the alert subscription and "mini-broker" filtering mechanism; and
- The Notebook Aspect of the Science Platform, providing interactive computing services for LSST science users and project-internal analysts.

## 2.2 Features to be tested

- Availability and, where relevant, proper interpretation of Prompt Data Products through each Aspect of the Science Platform;
- Availability and, where relevant, proper interpretation of Data Release Data Products through each Aspect of the Science Platform;
- Creation of, access to, and management of User Generated Data Products through each Aspect of the Science Platform;
- Features related to authentication and authorization of users, including those related to custom access controls to User Generated Data Products;
- Features related to the manageability of the Science Platform as an operational service; and
- Integration of the components of the Science Platform with each other and with the underlying services on which they run.

## 2.3 Features not to be tested

This document does not describe facilities for periodically generating or collecting key performance metrics (KPMs), except insofar as those KPMs are incidentally measured as part of executing the documented testcases. The KPMs and the system being used to track KPMs and to ensure compliance with documented requirements are described in LDM-502.

## 2.4 Pass/fail criteria

The results of all tests will be assessed using the criteria described in LDM-503 §4.

Note that, when executing pipelines, tasks or individual algorithms, any unexplained or unexpected errors or warnings appearing in the associated log or on screen output must be described in the documentation for the system under test. Any warning or error for which this is not the case must be filed as a software problem report and filed with the DMCCB.

## 2.5 Suspension criteria and resumption requirements

Refer to individual test cases where applicable.

## 2.6 Naming convention

With the introduction of Jira ATM plugin, the adopted naming convention is based on the corresponding Jira objects:

**LVV** : Is the label for the “LSST Verification and Validation” project in Jira.

**LVV-XXX** : Are Verification Elements, where XXX is the Verification Element identifier. Each Verification Element has at least one Test Case.

**LVV-TYYY** : Are Test Cases. Each Test Case is associated with a Verification Element, where YYY is the Test Case identifier.

A few deprecated test cases are still reporting in the name the old identification, that was according to the pattern LSP-XX-YY where:

**LSP** The product under test: the LSST Science Platform

**xx** Test specification number (in increments of 10)

**yy** Test case number (in increments of 5)

## 3 Test Cases Summary

| Test Id | Test Name | |
|---|---|---|
| LVV-T622 | Verify LSP only available to authenticated users | Approved |
| LVV-T807 | Verify synchronous TAP queries | Approved |
| LVV-T1334 | LDM-503-10a: Portal Aspect tests for LSP with Authentication and TAP milestone | Approved |
| LVV-T1436 | LDM-503-10a: Notebook Aspect tests for LSP with Authentication and TAP milestone | Approved |
| LVV-T1437 | LDM-503-10a: API Aspect tests for LSP with Authentication and TAP milestone | Approved |
| LVV-T1818 | DM-SUIT-8: Verify Portal integration with workspace (via WebDAV) | Approved |
| LVV-T598 | Verify access to All Released or Authorized Data Products | Draft |
| LVV-T600 | Verify LSP provides a portal aspect | Draft |
| LVV-T601 | Verify LSP provides a notebook aspect | Draft |
| LVV-T602 | Verify LSP provides web API | Draft |
| LVV-T603 | Verify data access through multiple linked aspects | Draft |
| LVV-T604 | Verify use of VO standards | Draft |
| LVV-T605 | Verify that LSP complies with LSST data access policies | Draft |
| LVV-T606 | Verify semantic linkages between data items | Draft |
| LVV-T607 | Verify semantic linkages between data items and uncertainties | Draft |
| LVV-T608 | Verify transfer of Portal data references to Notebook aspect | Draft |
| LVV-T609 | Verify providing user file storage in LSP | Draft |
| LVV-T610 | Verify providing user generated database in LSP | Draft |
| LVV-T611 | Verify access controls in user workspace | Draft |
| LVV-T612 | Verify ability to download data from LSP | Draft |
| LVV-T613 | Verify ability to upload data to LSP | Draft |
| LVV-T614 | Verify ability to transfer data to and from the Workspace | Draft |
| LVV-T615 | Verify file formats provided for tabular data download | Draft |
| LVV-T616 | Verify file formats provided for image data download | Draft |

| Test Id | Test Name | |
|---|---|---|
| LVV-T617 | Verify support for peak volume of moderate-sized queries | Draft |
| LVV-T618 | Verify support for peak volume of queries on all Objects | Draft |
| LVV-T619 | Verify LSP handles peak volume of queries | Draft |
| LVV-T620 | Verify LSP supports required download bandwidth | Draft |
| LVV-T621 | Verify LSP user reference and documentation | Draft |
| LVV-T623 | Verify support for new LSP users | Draft |
| LVV-T624 | Verify implementation of common identity across LSP aspects | Draft |
| LVV-T625 | Verify authentication via external identity providers | Draft |
| LVV-T626 | Verify LSP identity can have multiple associated credentials | Draft |
| LVV-T627 | Verify implementation of Acceptable Use Policy | Draft |
| LVV-T628 | Verify LSP connections encrypted | Draft |
| LVV-T629 | Verify privacy of users' activities | Draft |
| LVV-T630 | Verify multiple LSP instances | Draft |
| LVV-T631 | Verify LSP access from the public Internet (IPv4) | Draft |
| LVV-T632 | Verify LSP access from the public Internet (IPv6) | Draft |
| LVV-T633 | Verify indication of system availability | Draft |
| LVV-T634 | Verify Portal is a web application | Draft |
| LVV-T635 | Verify Portal discovery of all data products | Draft |
| LVV-T636 | Verify Portal access to Workspace | Draft |
| LVV-T637 | Verify Portal provides semantic linkages between data products | Draft |
| LVV-T638 | Verify access to calibration products via Portal | Draft |
| LVV-T639 | Verify associations between single images and coadds | Draft |
| LVV-T640 | Verify access to external archives from Portal | Draft |
| LVV-T641 | Verify API for Access to Portal Session State | Draft |
| LVV-T642 | Verify Portal supports both synchronous and asynchronous queries | Draft |
| LVV-T643 | Verify capability to run long queries in the background | Draft |
| LVV-T644 | Verify user notification of query status | Draft |
| LVV-T645 | Verify limitation of query results size | Draft |
| LVV-T646 | Verify ability to browse query history | Draft |
| LVV-T647 | Verify implementation of saving of queries | Draft |
| LVV-T648 | Verify implementation of generic queries in API aspect | Draft |
| LVV-T649 | Verify implementation of form-based generic query in API aspect | Draft |
| LVV-T650 | Verify implementation of ADQL-based generic query in API aspect | Draft |
| LVV-T651 | Verify estimation of query result size | Draft |

| Test Id | Test Name | |
|---|---|---|
| LVV-T652 | Verify query by unique identifier | Draft |
| LVV-T653 | Verify query by object or source identifier | Draft |
| LVV-T654 | Verify query by Solar System object identifier | Draft |
| LVV-T655 | Verify query by position on the sky | Draft |
| LVV-T656 | Verify query by list of positions | Draft |
| LVV-T657 | Verify implementation of astrophysical coordinate systems | Draft |
| LVV-T658 | Verify positional query by astrophysical source name | Draft |
| LVV-T659 | Verify positional query by Source or Object name | Draft |
| LVV-T660 | Verify positional query based on Solar System object names | Draft |
| LVV-T661 | Verify query by cone search | Draft |
| LVV-T662 | Verify query by box search | Draft |
| LVV-T663 | Verify query by time of observation | Draft |
| LVV-T664 | Verify implementation of user-friendly tabular query | Draft |
| LVV-T666 | Verify query by image metadata | Draft |
| LVV-T667 | Verify queries on the alerts database | Draft |
| LVV-T668 | Verify access to original alert state | Draft |
| LVV-T669 | Verify query for single-epoch visit images | Draft |
| LVV-T670 | Verify query for single-epoch raft images | Draft |
| LVV-T671 | Verify query for single-epoch CCD images | Draft |
| LVV-T672 | Verify metadata query for single-epoch images | Draft |
| LVV-T673 | Verify query for coadds by image metadata | Draft |
| LVV-T674 | Verify query for coadd image cutouts | Draft |
| LVV-T675 | Verify query for single-epoch image cutouts | Draft |
| LVV-T676 | Verify display of native single-visit images | Draft |
| LVV-T677 | Verify Portal provides visualization of tabular and image data | Draft |
| LVV-T678 | Verify visualization of ancillary information | Draft |
| LVV-T679 | Verify visualization linking image and tabular data | Draft |
| LVV-T680 | Verify visualization tool for uploaded tabular or image data | Draft |
| LVV-T681 | Verify visualization of workspace data | Draft |
| LVV-T682 | Verify availability of property sheets for table rows | Draft |
| LVV-T683 | Verify visualization of alerts | Draft |
| LVV-T684 | Verify display of tabular data | Draft |
| LVV-T685 | Verify column selection from tables | Draft |
| LVV-T686 | Verify capability to re-order columns in displayed tabular data | Draft |

| Test Id | Test Name | |
|---|---|---|
| LVV-T687 | Verify capability of copying data in tables | Draft |
| LVV-T688 | Verify row selection from tables | Draft |
| LVV-T689 | Verify capability to display tabular data in paged format | Draft |
| LVV-T690 | Verify creation and display of X-Y scatter plots | Draft |
| LVV-T691 | Verify creation and display of histogram plots | Draft |
| LVV-T692 | Verify capability to change symbol shapes, sizes, and colors in XY(Z) scatter plots | Draft |
| LVV-T693 | Verify visualization of uncertainties in plots | Draft |
| LVV-T694 | Verify visualization of asymmetric uncertainties | Draft |
| LVV-T695 | Verify visualization of upper and lower limits in plots | Draft |
| LVV-T696 | Verify visualization of multiple XY plots on the same display | Draft |
| LVV-T697 | Verify display of raft and full focal-plane single-visit images | Draft |
| LVV-T698 | Verify display of cutout from single-visit image | Draft |
| LVV-T699 | Verify display of native coadd images | Draft |
| LVV-T700 | Verify display of coadd cutouts and mosaics | Draft |
| LVV-T701 | Verify display of calibration images | Draft |
| LVV-T702 | Verify display of user-provided images | Draft |
| LVV-T703 | Verify display of image property sheet | Draft |
| LVV-T704 | Verify that coordinate display tools are provided for images | Draft |
| LVV-T705 | Verify image pixel content display | Draft |
| LVV-T706 | Verify spatial manipulation of images | Draft |
| LVV-T707 | Verify multi-image scaling and alignment | Draft |
| LVV-T708 | Verify manipulation of image appearance | Draft |
| LVV-T709 | Verify display of image mask and variance overlays | Draft |
| LVV-T710 | Verify display of plot overlays on images | Draft |
| LVV-T711 | Verify capability to adjust the appearance of plot overlays on images | Draft |
| LVV-T712 | Verify display all-sky HEALPix image | Draft |
| LVV-T713 | Verify ability to zoom in/out on a HEALPix image | Draft |
| LVV-T714 | Verify panning in HEALPix image display | Draft |
| LVV-T715 | Verify selection of HEALPix pixels | Draft |
| LVV-T716 | Verify retrieval of HEALPix-associated data | Draft |
| LVV-T717 | Verify broad applicability of coordinate display | Draft |
| LVV-T718 | Verify point coordinate display | Draft |
| LVV-T719 | Verify distance measurement tool | Draft |

| Test Id | Test Name | |
|---|---|---|
| LVV-T720 | Verify coordinate grid overlays | Draft |
| LVV-T721 | Verify astrophysical compass overlay | Draft |
| LVV-T722 | Verify geometric figure overlays | Draft |
| LVV-T723 | Verify sorting of tabular data by column | Draft |
| LVV-T724 | Verify simple filtering of tabular data | Draft |
| LVV-T725 | Verify calculated filtering of tabular data | Draft |
| LVV-T726 | Verify filtering data by multiple table columns | Draft |
| LVV-T727 | Verify calculated tabular data columns | Draft |
| LVV-T728 | Verify statistical measurements on tabular data | Draft |
| LVV-T729 | Verify saving of displayed tabular data | Draft |
| LVV-T730 | Verify creation and display of false-color images | Draft |
| LVV-T731 | Verify statistical measurements on user-selected regions of images | Draft |
| LVV-T732 | Verify overlay of catalog sources/objects on images | Draft |
| LVV-T733 | Verify overlay of LSST-derived orbits on images | Draft |
| LVV-T734 | Verify overlay of user-supplied catalogs on images | Draft |
| LVV-T735 | Verify overlay of user-supplied region files on images | Draft |
| LVV-T736 | Verify overlay of camera artifacts on images | Draft |
| LVV-T737 | Verify single-object time-domain image view | Draft |
| LVV-T738 | Verify position-based time-domain image view | Draft |
| LVV-T739 | Verify display of light curves | Draft |
| LVV-T740 | Verify linked tables, plots, and images | Draft |
| LVV-T741 | Verify capability to select data from a plot or image | Draft |
| LVV-T742 | Verify saving data selection from a plot or image | Draft |
| LVV-T743 | Verify access to user databases | Draft |
| LVV-T744 | Verify tabular data download | Draft |
| LVV-T745 | Verify image data download | Draft |
| LVV-T746 | Verify selected image download | Draft |
| LVV-T747 | Verify estimation of data download volume | Draft |
| LVV-T748 | Verify notification of long download completion | Draft |
| LVV-T749 | Verify API for visualization components | Draft |
| LVV-T750 | Verify implementation of storage quotas status | Draft |
| LVV-T751 | Verify implementation of computational quotas status | Draft |
| LVV-T752 | Verify saved Portal display preferences | Draft |
| LVV-T753 | Verify alert subscription service | Draft |

| Test Id | Test Name | |
|---|---|---|
| LVV-T754 | Verify availability of pre-defined alert filters | Draft |
| LVV-T755 | Verify availability of user-defined alert filters | Draft |
| LVV-T756 | Verify monitoring of alert subscription | Draft |
| LVV-T757 | Verify access to survey documentation | Draft |
| LVV-T758 | Verify access to Portal documentation | Draft |
| LVV-T759 | Verify access to Portal API documentation | Draft |
| LVV-T760 | Verify tolerance of database changes | Draft |
| LVV-T761 | Verify implementation of system-busy notification | Draft |
| LVV-T762 | Verify availability of interactive Python environment | Draft |
| LVV-T763 | Verify availability of Unix shell access | Draft |
| LVV-T764 | Verify availability of containerized software releases | Draft |
| LVV-T765 | Verify latency of release deployment | Draft |
| LVV-T766 | Verify availability of data access middleware | Draft |
| LVV-T767 | Verify availability of standard astronomy software | Draft |
| LVV-T768 | Verify availability of user package installation | Draft |
| LVV-T769 | Verify availability of user development environment | Draft |
| LVV-T770 | Verify availability of persistent user home file space | Draft |
| LVV-T771 | Verify availability of Notebook aspect documentation | Draft |
| LVV-T772 | Verify new-user onboarding | Draft |
| LVV-T773 | Verify availability of shared file space | Draft |
| LVV-T774 | Verify API and Portal aspects accessible from Notebook | Draft |
| LVV-T775 | Verify access to User File Workspace | Draft |
| LVV-T776 | Verify access to VOSpace services from Notebook aspect | Draft |
| LVV-T777 | Verify user database workspace access from Notebook aspect | Draft |
| LVV-T778 | Verify access to batch system | Draft |
| LVV-T779 | Verify implementation of quotas in Notebook aspect | Draft |
| LVV-T780 | Verify access to all data products from Notebook aspect | Draft |
| LVV-T781 | Verify ease of Notebook aspect deployment | Draft |
| LVV-T782 | Verify workload for deployment in Kubernetes | Draft |
| LVV-T783 | Verify monitoring of Notebook system health | Draft |
| LVV-T784 | Verify visualization of images in Notebook aspect | Draft |
| LVV-T785 | Verify availability of scientific plotting tools in Notebook aspect | Draft |
| LVV-T786 | Verify linkage of visualization tools in Notebook aspect | Draft |
| LVV-T787 | Verify interactivity of visualizations in Notebook aspect | Draft |

| Test Id | Test Name | |
|---|---|---|
| LVV-T788 | Verify interactive scaling of visualizations in Notebook aspect | Draft |
| LVV-T789 | Verify access to Portal queries from Notebook aspect | Draft |
| LVV-T790 | Verify access to Portal visualization API from Notebook aspect | Draft |
| LVV-T791 | Verify ability to launch a notebook with access to Portal query results | Draft |
| LVV-T792 | Verify implementation of secure protocol for Notebook aspect | Draft |
| LVV-T793 | Verify implementation of authentication and authorization service in Notebook aspect | Draft |
| LVV-T794 | Verify secure implementation of Notebook aspect | Draft |
| LVV-T795 | Verify access to Notebook aspect via IPv6 | Draft |
| LVV-T796 | Verify web APIs use CAOM2 | Draft |
| LVV-T797 | Verify API access to image and visit metadata | Draft |
| LVV-T798 | Verify API access to catalog data products | Draft |
| LVV-T799 | Verify API access to observatory metadata | Draft |
| LVV-T800 | Verify API enforcement of information classification | Draft |
| LVV-T801 | Verify API access to reference catalogs | Draft |
| LVV-T802 | Verify API access to virtual data products | Draft |
| LVV-T803 | Verify API access to FITS image data | Draft |
| LVV-T804 | Verify API access to multiple data releases | Draft |
| LVV-T805 | Verify API provides catalog metadata | Draft |
| LVV-T806 | Verify availability of TAP service | Draft |
| LVV-T808 | Verify asynchronous TAP queries | Draft |
| LVV-T809 | Verify availability of ADQL for queries | Draft |
| LVV-T810 | Verify SIA service for image availability | Draft |
| LVV-T811 | Verify availability of SODA service for image data | Draft |
| LVV-T812 | Verify API SODA cutout image support | Draft |
| LVV-T813 | Verify query history retrieval | Draft |
| LVV-T814 | Verify availability of cached query result retrieval | Draft |
| LVV-T815 | Verify retrieval of query specifications | Draft |
| LVV-T816 | Verify Butler interface to data products | Draft |
| LVV-T817 | Verify availability of VOSpace service | Draft |
| LVV-T818 | Verify availability of WebDAV service | Draft |
| LVV-T819 | Verify VOTable 1.3 support | Draft |
| LVV-T820 | Verify support for VOTable TABLEDATA payload | Draft |

| Test Id | Test Name | |
|---|---|---|
| LVV-T821 | Verify support for VOTable BINARY2 payload | Draft |
| LVV-T822 | Verify JSON support for TAP outputs | Draft |
| LVV-T823 | Verify CSV support for TAP outputs | Draft |
| LVV-T824 | Verify SQLite support for TAP outputs | Draft |
| LVV-T825 | Verify support for tabular result download to Workspace | Draft |
| LVV-T826 | Verify support for tabular upload to Workspace | Draft |
| LVV-T827 | Verify ability to drop catalogs from Workspace | Draft |
| LVV-T828 | Verify API uses secure protocols | Draft |
| LVV-T829 | Verify API authentication | Draft |
| LVV-T830 | Verify API uses project authorization infrastructure | Draft |
| LVV-T831 | Verify secure implementation of APIs | Draft |
| LVV-T832 | Verify containerized deployment of API services | Draft |
| LVV-T833 | Verify support for compression of API results | Draft |
| LVV-T834 | Verify API upgradeability | Draft |
| LVV-T835 | Verify API logging and monitoring | Draft |
| LVV-T1824 | Portal Aspect access to processed HSC data in the LSP | Draft |
| LVV-T1825 | Notebook Aspect access to processed HSC data in the LSP | Draft |

# 4 Active Test Cases

This section documents all active test cases that have a status in the Jira/ATM system of Draft, Defined or Approved.

## 4.1 Approved Test Cases

### 4.1.1 LVV-T622 - Verify LSP only available to authenticated users

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Approved | Normal | Inspection | Jeffrey Carlin |

Open LVV-T622 in Jira

#### 4.1.1.1 Verification Elements

- LVV-9830 - DMS-LSP-REQ-0020-V-01: Authenticated User Access_1

#### 4.1.1.2 Test Items

Verify that the functions and services of all three aspects of the LSP are accessible only to authenticated users.

#### 4.1.1.3 Test Procedure

| Step 1 | Description |
|---|---|
| Attempt to navigate to the Portal Aspect of the LSP instance under test. Verify that credentials are requested and that a Portal interface is not displayed. | |

| | Expected Result |
|---|---|
| No direct access to Portal; credential request screen displayed. | |

| Step 2 | Description |
|---|---|

Enter the (presumably invalid) credentials user=foo, password=xyzzy, and verify that access to the Portal Aspect interface is not granted.

| Test Data |
|---|

user=foo, password=xyzzy

| Expected Result |
|---|

No access to Portal Aspect; credential request screen displayed again. Record any error message that is shown.

| Step 3 | Description |
|---|---|

Enter a set of valid credentials, and verify that access to the Portal interface is granted.

This test does not involve any exploration of the Portal behavior at this point.

| Test Data |
|---|

Credentials for the user executing the test.

| Expected Result |
|---|

Access to some version of the Portal interface is granted. (The exact nature of that interface will be evolving in the course of LSST construction and system integration.)

| Step 4 | Description |
|---|---|

Log out from the Portal.

| Expected Result |
|---|

A logout or LSP landing page is displayed.

| Step 5 | Description |
|---|---|

Attempt to navigate to the Notebook Aspect of the LSP instance under test. Verify that credentials are requested and that no other Notebook Aspect functionality is exposed.

| Expected Result |
|---|

No direct access to the Notebook Aspect; credential request screen displayed.

| Step 6 | Description |
|---|---|

Enter the (presumably invalid) credentials user=foo, password=xyzzy, and verify that access to the Notebook Aspect interface is not granted.

### Test Data

user=foo, password=xyzzy

### Expected Result

No access to Notebook Aspect; credential request screen displayed again. Record any error message that is shown.

## Step 7 Description

Enter a set of valid credentials, and verify that access to the Notebook Aspect interface is granted.

This test does not involve any exploration of the Notebook Aspect behavior at this point.

### Test Data

Credentials for the user executing the test.

### Expected Result

An initial page of the JupyterHub system is displayed. Note briefly what is seen, but no further testing is required.

## Step 8 Description

Log out of the Notebook Aspect.

### Expected Result

## Step 9 Description

From a Unix prompt on a system with network access to the TAP service in the LSP instance under test, verify using the “curl” command below that an attempt to access the TAP service without credentials is rejected.

### Expected Result

## Step 10 Description

From a Unix prompt on a system with network access to the TAP service in the LSP instance under test, verify using the “curl” command below that an attempt to access the TAP service with invalid credentials is rejected.

Replace “lsst-lsp-int.ncsa.illinois.edu” in the “curl” command with the appropriate root URL for the LSP instance under test.

### Example Code

```
curl -w 'HTTP status code: %{http_code}\nContent-Type: %{content_type}\nTotal time: %{time_total}\nBytes received: %{size_download}\nFinal URL: %{url_effective}\n' -L 'https://lsst-lsp-int.ncsa.illinois.edu/api/tap/sync?LANG=ADQL&REQUEST=doQuery&QUERY=SELECT+*+FROM+TAP_SCHE
```

| Expected Result |
|---|

| Step 11 | Description |
|---|---|

Using a web browser, navigate to the token-access endpoint (/auth/tokens) of the LSP instance under test. Authenticate with valid LSST credentials. Obtain a token for the “read:tap” capability. Leave the resulting web page displayed. It is not necessary to expose the full token text.

| Expected Result |
|---|

A token is granted.

| Step 12 | Description |
|---|---|

From a Unix prompt on a system with network access to the TAP service in the LSP instance under test, and a “bash”-style shell, verify using the “export” and “curl” commands below that an attempt to access the TAP service with the token from the previous step is successful.

Replace “lsst-lsp-int.ncsa.illinois.edu” in the “curl” command with the appropriate root URL for the LSP instance under test.

Use the “copy to clipboard” function from the token-access page from the previous step to paste the token into the (blind) prompt that results from the first “export” command.

Ensure that the token is deleted from the test environment after the “curl” command is complete, and that the token is invalidated via the token-access web interface.

| Example Code |
|---|

```
export ACCESS_TOKEN
read -p token -s ACCESS_TOKEN
curl -w 'HTTP status code: %{http_code}\nContent-Type: %{content_type}\nTotal time: %{time_total}\nBytes received: %{size_download}\nFinal URL: %{url_effective}\n' -L –header "Authorization: Bearer ${ACCESS_TOKEN}" -o tap-tables.xml 'https://lsst-lsp-int.ncsa.illinois.edu/api/tap/sync?LAN
unset ACCESS_TOKEN
```

| Expected Result |
|---|

The “curl” command should return HTTP status code 200 and a VOTable containing a list of tables in the TAP service should be obtained.

Retain the VOTable file in the test records.

### 4.1.2 LVV-T807 - Verify synchronous TAP queries

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Approved | Normal | Inspection | Jeffrey Carlin |

Open LVV-T807 in Jira

#### 4.1.2.1 Verification Elements

- LVV-10014 - DMS-API-REQ-0007-V-01: Synchronous TAP Support_1

#### 4.1.2.2 Test Items

Verify that the API Aspect TAP endpoint supports synchronous queries as described by the IVOA TAP 1.1 specification.

#### 4.1.2.3 Test Procedure

| Step 1-1 from LVV-T1591 | Description |
|---|---|
| Using a Web browser, navigate to the "/auth/tokens" endpoint of the LSP instance under test. | |
| | Expected Result |
| A credential-entry screen should be displayed, unless the test user is already logged in in another window or tab of the browser. | |

| Step 1-2 from LVV-T1591 | Description |
|---|---|
| If necessary, enter a valid set of credentials. They may be NCSA or non-NCSA credentials. | |
| | Expected Result |
| The token-request UI is displayed. | |

| Step 1-3 from LVV-T1591 | Description |
|---|---|
| Request a token for the "read:tap" capability. | |
| | Expected Result |
| A screen confirming the creation of the token. | |

| Step 1-4 from LVV-T1591 | Description |
|---|---|
| Leave the resulting page's browser tab/window open for use in subsequent test steps. | |

In many cases you may be asked in a subsequent step to use the “copy token to clipboard” UI element on this page in order to transfer your token to a prompt in another window.

| Expected Result |
|---|

| Step 2 | Description |
|---|---|

From a Unix prompt on a system with network access to the TAP service in the LSP instance under test, and a “bash”-style shell, verify using the “export” and “curl” commands below that an attempt to access the TAP service with the token from the previous step is successful.

Replace “lsst-lsp-int.ncsa.illinois.edu” in the “curl” command with the appropriate root URL for the LSP instance under test.

Use the “copy to clipboard” function from the token-access page from the previous step to paste the token into the (blind) prompt that results from the “read” command.

Ensure that the token is deleted from the test environment after the “curl” command is complete, and that the token is invalidated via the token-access web interface.

| Example Code |
|---|

```
export ACCESS_TOKEN
read -p token -s ACCESS_TOKEN
curl -w 'HTTP status code: %{http_code}\nContent-Type: %{content_type}\nTotal time: %{time_total}\nBytes received: %{size_download}\nFinal URL: %{url_effective}\n' -L –header "Authorization: Bearer ${ACCESS_TOKEN}" -o tap-tables.xml 'https://lsst-lsp-int.ncsa.illinois.edu/api/tap/sync?LAN
unset ACCESS_TOKEN
```

| Expected Result |
|---|

| Step 3 | Description |
|---|---|

Verify by inspection that the file resulting from the “curl” command above has the general form of a VOTable. (A separate test case will verify the VOTable format itself.)

Save this file as part of the test records using LSST standard procedures.

| Expected Result |
|---|

### 4.1.3 LVV-T1334 - LDM-503-10a: Portal Aspect tests for LSP with Authentication and TAP milestone

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Approved | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T1334 in Jira

#### 4.1.3.1 Verification Elements

- LVV-9811 - DMS-LSP-REQ-0002-V-01: Portal Aspect_1
- LVV-9809 - DMS-LSP-REQ-0005-V-01: Linkage of Aspects_1
- LVV-9812 - DMS-LSP-REQ-0006-V-01: Use of VO Standards_1
- LVV-9830 - DMS-LSP-REQ-0020-V-01: Authenticated User Access_1
- LVV-9831 - DMS-LSP-REQ-0022-V-01: Common Identity_1
- LVV-9834 - DMS-LSP-REQ-0023-V-01: Use of External Identity Providers_1
- LVV-9835 - DMS-LSP-REQ-0024-V-01: Use of Multiple Sets of Credentials_1
- LVV-9841 - DMS-PRTL-REQ-0001-V-01: Portal is a Web Application_1
- LVV-9857 - DMS-PRTL-REQ-0015-V-01: Generic Query_1
- LVV-9856 - DMS-PRTL-REQ-0016-V-01: Generic Query - Form-based_1
- LVV-9855 - DMS-PRTL-REQ-0017-V-01: Generic Query - ADQL-based_1
- LVV-9866 - DMS-PRTL-REQ-0020-V-01: Positional Query: Position on the Sky_1
- LVV-9869 - DMS-PRTL-REQ-0026-V-01: Positional Query by Region: Cone-Search_1
- LVV-9891 - DMS-PRTL-REQ-0049-V-01: Display of Tabular Data_1
- LVV-9932 - DMS-PRTL-REQ-0095-V-01: Saving Displayed Tabular Data_1

#### 4.1.3.2 Test Items

This test case verifies that the Portal Aspect of the Science Platform is accessible to authorized users through a login process, and that TAP searches can be performed from the Portal

Aspect UI.

In so doing and in conjunction with the other LDM-503-10a test cases collected under LVV-P48, it addresses all or part of the following requirements:

- DMS-LSP-REQ-0002, DMS-LSP-REQ-0005, DMS-LSP-REQ-0006, DMS-LSP-REQ-0020, DMS-LSP-REQ-0022, DMS-LSP-REQ-0023, DMS-LSP-REQ-0024
- DMS-PRTL-REQ-0001, DMS-PRTL-REQ-0015, DMS-PRTL-REQ-0016, DMS-PRTL-REQ-0017, DMS-PRTL-REQ-0020, DMS-PRTL-REQ-0026, DMS-PRTL-REQ-0049, and DMS-PRTL-REQ-0095, primarily

Note this test was not designed to perform a full verification of the above requirements, but rather to demonstrate having reached a certain level of partial capability during construction.

#### 4.1.3.3 Environment Needs

##### 4.1.3.3.1 Software

The test requires only the use of a Web browser. Depending on the location / IP address of the browser host, a VPN connection to NCSA may be required.

#### 4.1.3.4 Test Procedure

| Step 1 | Description |
|---|---|
| Navigate to the `https://lsst-lsp-stable.ncsa.illinois.edu/` endpoint of the LSP at the LDF. From the displayed page, navigate to the Portal Aspect. | |
| | Test Data |
| n/a | |
| | Expected Result |
| A login screen should be displayed. | |

Rubin Observatory

| Step 2 | Description |
|---|---|

Log in to the Portal Aspect with NCSA credentials. Verify that a Portal TAP search screen comes up. Note the user name displayed in the upper left of the Portal. Log out.

### Test Data

(NCSA credentials for an authorized user)

### Expected Result

Following login, the Portal Aspect TAP search screen should be displayed, or a clearly visible UI element allowing one-click access to that screen. A user name corresponding to the credentials entered should be displayed.

| Step 3 | Description |
|---|---|

Log in to the Portal Aspect with alternate credentials that are associated with the same identity.

### Expected Result

The Portal application should come up just as in the previous step; the user name displayed in the upper left of the Portal should be the same as in the previous step.

| Step 4 | Description |
|---|---|

Navigate to the TAP search screen, if necessary, and ensure that the LSST TAP service associated with the chosen LSP instance is selected.

### Expected Result

A TAP search screen should either already be displayed after the previous step, or should be displayed after a one-click action from the Portal's initial page. On the TAP screen, a UI element allowing the choice of TAP service to user should be available, and an LSST TAP service associated with the LSP instance under test should be pre-selected as the default.

| Step 5 | Description |
|---|---|

Verify that the same WISE and SDSS catalog tables that were explored in DMTR-52 are now visible in the TAP service.

### Expected Result

The SDSS Stripe 82 2013 processing's deep detection and forced photometry catalogs, and the WISE mission's principal catalog, forced photometry catalog, and single-epoch source catalog should be accessible.

| Step 6 | Description |
|---|---|

Perform a TAP search on the AllWISE source catalog around the equatorial coordinates (2, 0) (degrees), with a 30 arcminute radius, using the Portal UI to specify the query (select the "Single Table" radio button).
To find the AllWISE source catalog, select the "wise_00" schema from the schema menu, and then the "wise_00.allwise_p3as_psd" table from the table menu.
When the query completes, note the total number of rows in the table, as displayed in the table header, and record it.

| Test Data |
|---|
| Equatorial coordinates: (2, 0), cone radius 30 arcmin |

| Expected Result |
|---|
| This query should return about 12,000 rows of data. It should be displayed in a table, as an overlay on a context image, and as a configurable 2D density plot. |

| Step 7 | Description |
|---|---|
| Using the table viewer UI, save the result of this search as a text file in CSV format. Use a line-counting tool to find the number of rows in the result, record it, and compare it with the reported number from the previous step. Ensure that the CSV file's name is "LVV-T1334-output.csv" and save it to the designated repository for test outputs. | |

| Expected Result |
|---|
| Allowing for the CSV header row, the number of rows in the file should match the number of rows in the table header in the UI. |

| Step 8 | Description |
|---|---|
| Return to the TAP search screen in the UI (this can be done with the "TAP Searches" button near the top of the window), select the "ADQL" radio button, and view and record the ADQL text displayed for the query performed. Select "Cancel" to dismiss the search screen. | |

| Expected Result |
|---|
| The query should appear to have the expected form for an ADQL cone search, using the CONTAINS() and CIRCLE() functions. |

| Step 9 | Description |
|---|---|
| Select the "i"-in-a-circle button in the table header. In the resulting dialog box, click on the copy-to-clipboard icon for the TAP job URL for the query and paste the URL into the test record. | |

| Expected Result |
|---|
| |

| Step 10 | Description |
|---|---|
| In a separate browser window, access the page available at the URL obtained from the previous step. Observe and record the ADQL text for the query, in the '<uws:parameter id="query">' XML element. Verify that it matches the ADQL text obtained from the UI in a previous step. | |

| Expected Result |
|---|
| The ADQL code matches that from Step 8. |

### 4.1.4 LVV-T1436 - LDM-503-10a: Notebook Aspect tests for LSP with Authentication and TAP milestone

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Approved | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T1436 in Jira

#### 4.1.4.1 Verification Elements

- LVV-9810 - DMS-LSP-REQ-0003-V-01: Notebook Aspect_1
- LVV-9809 - DMS-LSP-REQ-0005-V-01: Linkage of Aspects_1
- LVV-9812 - DMS-LSP-REQ-0006-V-01: Use of VO Standards_1
- LVV-9830 - DMS-LSP-REQ-0020-V-01: Authenticated User Access_1
- LVV-9831 - DMS-LSP-REQ-0022-V-01: Common Identity_1
- LVV-9834 - DMS-LSP-REQ-0023-V-01: Use of External Identity Providers_1
- LVV-9835 - DMS-LSP-REQ-0024-V-01: Use of Multiple Sets of Credentials_1
- LVV-9836 - DMS-LSP-REQ-0026-V-01: Using secure protocols_1
- LVV-10000 - DMS-NB-REQ-0001-V-01: Secure Protocol_1
- LVV-9998 - DMS-NB-REQ-0002-V-01: Authentication and Authorization_1
- LVV-9971 - DMS-NB-REQ-0005-V-01: Interactive Python Environment_1
- LVV-9976 - DMS-NB-REQ-0006-V-01: Unix Shell Access_1
- LVV-9973 - DMS-NB-REQ-0013-V-01: Persistent User Home File Space_1
- LVV-9980 - DMS-NB-REQ-0017-V-01: Access to the API and Portal Aspects_1
- LVV-9996 - DMS-NB-REQ-0029-V-01: Access to Portal-Initiated Queries_1

#### 4.1.4.2 Test Items

This test case verifies that the Notebook Aspect of the Science Platform is accessible to authorized users through a login process, and that TAP searches can be performed from Python code in the Notebook Aspect.

In so doing and in conjunction with the other LDM-503-10a test cases collected under LVV-P48, it addresses all or part of the following requirements:

- DMS-LSP-REQ-0003, DMS-LSP-REQ-0005, DMS-LSP-REQ-0006, DMS-LSP-REQ-0020, DMS-LSP-REQ-0022, DMS-LSP-REQ-0023, DMS-LSP-REQ-0024
- DMS-NB-REQ-0001, DMS-NB-REQ-0002, DMS-NB-REQ-0005, DMS-NB-REQ-0006, DMS-NB-REQ-0013, DMS-NB-REQ-0017, and DMS-NB-REQ-0029, primarily

Note this test was not designed to perform a full verification of the above requirements, but rather to demonstrate having reached a certain level of partial capability during construction.

#### 4.1.4.3 Environment Needs

##### 4.1.4.3.1 Software

As client-side software, the test requires only the use of a Web browser. Depending on the location / IP address of the browser host, a VPN connection to NCSA may be required. Within the Notebook Aspect, a dedicated test notebook is required.

#### 4.1.4.4 Test Procedure

| Step 1 | Description |
|---|---|
| If LVV-T1334 (1.0) has just been carried out, the tester will already be logged in to the Portal Aspect; skip to the next step. | |
| Otherwise, use a Web browser to navigate to the landing page of the LSP instance under test, and click through to the Portal | |

Aspect link. This should trigger a login process; the tester should log in. Non-NCSA credentials should be used (or have been used) to log in to the Portal Aspect.

| Expected Result |
|---|
| The web browser should display a Portal Aspect page with the user's name noted in the upper right hand corner. |

| Step 2 | Description |
|---|---|
| Use the same Web browser (in a new page or tab) to navigate to the landing page of the LSP instance under test, and click through to the Notebook Aspect link. | |

| Expected Result |
|---|
| No login credentials should be requested. A page allowing the creation of a Notebook Aspect session should be visible. |

| Step 3 | Description |
|---|---|
| Use the Notebook Aspect UI to create a "small" session using the most recent "recommended" (weekly) release image. | |

| Expected Result |
|---|
| The main JupyterLab UI should appear. |

| Step 4 | Description |
|---|---|
| Close any Portal Aspect window/tab(s) that are open. | |

| Expected Result |
|---|
| |

| Step 5 | Description |
|---|---|
| Use the JupyterLab Terminal application to create a small file in the user's home directory. | |

| Example Code |
|---|
| *To be executed in the Terminal at the shell prompt, e.g.:*<br>touch ~/test-20190915.txt<br>*(Use the current date.)* |

| Expected Result |
|---|
| The test file should be visible in the JupyterLab file browser. |

| Step 6 | Description |
|---|---|
| Log out of the Notebook Aspect. | |

| Expected Result |
|---|
| |

| Step 7 | Description |
|---|---|
| Navigate to the landing page for the LSP instance under test. Navigate to the Portal Aspect from that page. (Do not log in if a login is requested.) | |
| | Expected Result |
| A login should be requested when the Portal Aspect is accessed. (This verifies that *logout* is cross-Aspect.) | |

| Step 8 | Description |
|---|---|
| Close the login window and quit the web browser in use. | |
| | Expected Result |
| | |

| Step 9 | Description |
|---|---|
| Launch a web browser and navigate to the landing page for the LSP instance under test. Navigate to the Notebook Aspect. When prompted for a login, use NCSA credentials (for the same user as the non-NCSA credentials used above). Request a session of the "medium" category with the most recent "recommended" (weekly) release image. | |
| | Expected Result |
| The usual JupyterLab UI should be displayed. | |

| Step 10 | Description |
|---|---|
| Examine the JupyterLab file browser for the file created in **Step 5** above. If convenient (e.g., based on other distinctive files or persistent settings), verify further that the same user environment has been reached as with the non-NCSA credentials above. | |
| | Expected Result |
| The same file should be visible. (This verifies that the two sets of credentials lead to the same Notebook Aspect user environment.) | |

| Step 11 | Description |
|---|---|
| Clone the test notebook for LDM-503-10a, "LDM-503-10a-test.ipynb", into the user environment from the TBD tag of the TBD Github repository. Record the SHA that applies to the version of the test notebook that has been cloned. | |
| | Expected Result |
| | |

| Step 12 | Description |
|---|---|
| Copy the file "LVV-T1334-output.csv" that was saved in the output repository for the LVV-T1334 test case into the home directory of the notebook session. | |
| | Expected Result |
| | |

| Step 13 | Description |
|---|---|
| Open the test notebook and insert the URL saved from the execution of LVV-T1334, Step 9 into the input cell that reads “portal_job_url = ””. | |
| | Expected Result |

| Step 14 | Description |
|---|---|
| Execute the entire notebook. | |
| | Expected Result |

| Step 15 | Description |
|---|---|
| Record the success and/or failure indications that appear in the final output cell of the notebook.<br>If the notebook execution produced an exception, record that. | |
| | Expected Result |

| Step 16 | Description |
|---|---|
| Save and close the test notebook. Save the fully-executed notebook in TBD location as a record of the test. | |
| | Expected Result |

| Step 17 | Description |
|---|---|
| Without logging out, open a new browser window or tab, and navigate to the Portal Aspect of the LSP instance under test. Verify that the Portal Aspect can be accessed without a further login. Verify that the username displayed at the upper right is the same one as in **Step 1** above. | |
| | Expected Result |

| Step 18 | Description |
|---|---|
| Log out of the Notebook Aspect, close the Portal Aspect windows, and quit the Web browser in use. | |
| | Expected Result |

### 4.1.5 LVV-T1437 - LDM-503-10a: API Aspect tests for LSP with Authentication and TAP milestone

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Approved | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T1437 in Jira

#### 4.1.5.1 Verification Elements

- LVV-9808 - DMS-LSP-REQ-0004-V-01: API (Data Access) Aspect_1
- LVV-9809 - DMS-LSP-REQ-0005-V-01: Linkage of Aspects_1
- LVV-9812 - DMS-LSP-REQ-0006-V-01: Use of VO Standards_1
- LVV-9830 - DMS-LSP-REQ-0020-V-01: Authenticated User Access_1
- LVV-9831 - DMS-LSP-REQ-0022-V-01: Common Identity_1
- LVV-9834 - DMS-LSP-REQ-0023-V-01: Use of External Identity Providers_1
- LVV-9835 - DMS-LSP-REQ-0024-V-01: Use of Multiple Sets of Credentials_1
- LVV-10034 - DMS-API-REQ-0003-V-01: Authentication_1
- LVV-10035 - DMS-API-REQ-0004-V-01: Authorization_1
- LVV-10015 - DMS-API-REQ-0006-V-01: TAP Service for Tabular Queries_1
- LVV-10014 - DMS-API-REQ-0007-V-01: Synchronous TAP Support_1
- LVV-10013 - DMS-API-REQ-0008-V-01: Asynchronous TAP Support_1
- LVV-10012 - DMS-API-REQ-0009-V-01: ADQL Support_1
- LVV-10002 - DMS-API-REQ-0023-V-01: Access to Catalog Data Products_1
- LVV-10019 - DMS-API-REQ-0039-V-01: Cached Query Result Retrieval_1
- LVV-10037 - DMS-API-REQ-0001-V-01: Secure Protocols_1

#### 4.1.5.2 Test Items

This test case verifies that the TAP service in the API Aspect of the Science Platform is accessible to authorized users through a login process, and that TAP searches can be performed using the IVOA TAP protocol from remote sites.

In so doing and in conjunction with the other LDM-503-10a test cases collected under LVV-P48, it addresses all or part of the following requirements:

- DMS-LSP-REQ-0004, DMS-LSP-REQ-0005, DMS-LSP-REQ-0006, DMS-LSP-REQ-0020, DMS-LSP-REQ-0022, DMS-LSP-REQ-0023, DMS-LSP-REQ-0024
- DMS-API-REQ-0003, DMS-API-REQ-0004, DMS-API-REQ-0006, DMS-API-REQ-0007, DMS-API-REQ-0008, DMS-API-REQ-0009, DMS-API-REQ-0023, and DMS-API-REQ-0039, primarily

Note this test was not designed to perform a full verification of the above requirements, but rather to demonstrate having reached a certain level of partial capability during construction.

#### 4.1.5.3 Environment Needs

##### 4.1.5.3.1 Software

The user's computer must have software installed that will permit running a Jupyter notebook, preferably under JupyterLab.

#### 4.1.5.4 Test Procedure

| Step 1 | Description |
|---|---|
| On the local computer, clone the test notebook for LDM-503-10a, "LDM-503-10a-test.ipynb", into the user environment from the TBD tag of the TBD Github repository. Note the SHA that applies to the version of the test notebook that has been cloned. | |
| | Expected Result |

| Step 2 | Description |
|---|---|
| On the local computer, execute the command “pip install pyvo jupyterlabutils” in the local environment. (It is suggested to do this in a venv or conda environment.) | |

| Expected Result |
|---|
| |

| Step 3 | Description |
|---|---|
| Copy the file “LVV-T1334-output.csv” that was saved in the output repository for the LVV-T1334 test case into the home directory of the JupyterLab session. | |

| Expected Result |
|---|
| |

| Step 4 | Description |
|---|---|
| Obtain an access token for the TAP service from the LSP instance under test, by navigating to the https://lsst-lsp-stable.ncsa.illinois.edu/auth/tokens endpoint in a web browser and logging in. NCSA credentials for the tester should be used.<br>Copy the access token to the clipboard. | |

| Expected Result |
|---|
| |

| Step 5 | Description |
|---|---|
| Within the Posix shell session from which JupyterLab is to be launched, set the environment variable “ACCESS_TOKEN” to the value of the token obtained in the previous step. To do this without exposing the token unnecessarily, it is suggested to use the “read -s” command, pasting the token in at the no-echo prompt this command produces. | |

| Example Code |
|---|
| export ACCESS_TOKEN<br>read -s ACCESS_TOKEN |

| Expected Result |
|---|
| |

| Step 6 | Description |
|---|---|
| Launch a LOCAL instance of JupyterLab (i.e., by running “jupyter lab”) on the computer to be used for testing. Ensure that the test notebook is visible from within JupyterLab. **NB: as a reminder, this test case must NOT be run in the Notebook Aspect.** | |

| Expected Result |
|---|
| |

| Step 7 | Description |
|---|---|
| Open the test notebook and insert the URL saved from the execution of LVV-T1334, Step 9 into the input cell that reads “portal_job_url = ””. | |

| | Expected Result |
|---|---|

| Step 8 | Description |
|---|---|

Execute the entire notebook.

| | Expected Result |
|---|---|

| Step 9 | Description |
|---|---|

Record the success and/or failure indications that appear in the final output cell of the notebook.
If the notebook execution produced an exception, record that.

| | Expected Result |
|---|---|

| Step 10 | Description |
|---|---|

Save and close the test notebook. Save the fully-executed notebook in TBD location as a record of the test.

| | Expected Result |
|---|---|

### 4.1.6 LVV-T1818 - DM-SUIT-8: Verify Portal integration with workspace (via WebDAV)

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Approved | Normal | Demonstration | Gregory Dubois-Felsmann |

Open LVV-T1818 in Jira

#### 4.1.6.1 Verification Elements

- LVV-9886 - DMS-PRTL-REQ-0046-V-01: Visualization of Workspace Data_1
- LVV-9846 - DMS-PRTL-REQ-0003-V-01: Portal Access to Workspace_1
- LVV-9932 - DMS-PRTL-REQ-0095-V-01: Saving Displayed Tabular Data_1
- LVV-9951 - DMS-PRTL-REQ-0111-V-01: Image Data Download_1
- LVV-9954 - DMS-PRTL-REQ-0110-V-01: Tabular Data Download_1

#### 4.1.6.2 Test Items

This test case verifies that the Portal Aspect software is capable of accessing a file-oriented workspace via the WebDAV protocol.

In so doing, it partially verifies several Portal Aspect requirements that relate to this capability - “partially” because some of these requirements depend on workspace capabilities which were not present in the prototype WebDAV service delivered by the DAX group, because some of the requirements also cover the User Database Workspace (not relevant to this milestone, and not yet available), and also because the milestone was not envisioned as an exhaustive test covering edge cases:

- DMS-PRTL-REQ-0003 (LVV-9846, Portal access to workspace) is covered at “demonstration” level, with basic tests of saving image and tabular data to the workspace, and only for the User File Workspace (there is currently no User Database Workspace prototype available);
- DMS-PRTL-REQ-0046 (LVV-9886, Visualization of workspace data) is covered at “demonstration” level for a couple of FITS image and table files, and only for the User File Workspace;
- DMS-PRTL-REQ-0110 (LVV-9954, Tabular data download) is covered at “demonstration” level, only for catalog data (there was no image metadata in the LSP deployment at the time of test), and only for the User File Workspace;
- DMS-PRTL-REQ-0095 (LVV-9932, Saving Displayed Tabular Data) is covered at “demonstration” level for a simple subset operation in the table browser; and
- DMS-PRTL-REQ-0111 (LVV-9951, Image data download) is covered at “demonstration” level, and only for download from an image display screen itself (as LSST-style image metadata services, e.g., ObsTAP, were not available in the LSP at the time of testing).

#### 4.1.6.3 Environment Needs

#### 4.1.6.3.1 Software

A Web browser

#### 4.1.6.3.2 Hardware

A computer with access, whitelisted or via VPN, to the NCSA-hosted LSP instances

### 4.1.6.4 Test Procedure

| Step 1 | Description |
|---|---|
| Using a web browser, navigate to the home page of the selected instance of the LSP at the LDF. From the displayed page, navigate to the Portal Aspect and log in with valid credentials for the instance under test. | |
| | Expected Result |
| Successful login to the Portal should display the TAP search screen by default. | |
| **Step 2** | **Description** |
| Navigate to the TAP search screen, if necessary (in case the default Portal screen was changed since this test was written), and ensure that the LSST TAP service associated with the chosen LSP instance is selected. | |
| | Expected Result |
| The lists of schemas and tables available in the services should be displayed as selectable menus. | |
| **Step 3** | **Description** |
| Perform a TAP search on the AllWISE source catalog around the equatorial coordinates (2, 0) (degrees), with a 30 arcminute radius, using the Portal UI to specify the query (select the “Single Table” radio button).<br>To find the AllWISE source catalog, select the “wise_00” schema from the schema menu, and then the “wise_00.allwise_p3as_psd” table from the table menu. Use the column selector pane of the search screen to select the “ra, decl, source_id, w1mpro, w2mpro, w3mpro, w4mpro” columns for retrieval.<br>When the query completes, note the total number of rows in the table, as displayed in the table header, and record it. | |
| | Test Data |
| Equatorial coordinates: (2, 0), cone radius 30 arcmin | |
| | Expected Result |
| This query should return about 12,000 rows of data. It should be displayed in a table, as an overlay on a context image, and as a configurable 2D density plot. | |
| **Step 4** | **Description** |
| Using the table viewer UI, save the result of this search as a text file in CSV format, specifying that the file be saved to the “workspace”. Ensure that the CSV file’s name is “LVV-T1818-ufw-table.csv”. | |

| Expected Result |
|---|
| A UI indication that the file has been successfully saved to the workspace. |

| Step 5 | Description |
|---|---|
| In the table viewer UI, use the “funnel” icon in the table toolbar, if necessary, to make the column-header filtering text boxes visible. Locate the “w1mpro” column (band W1 magnitude), enter the filter expression “<8”, and hit TAB or RETURN to apply the filter. Note the number of rows remaining following the application of the filter. | |

| Test Data |
|---|
| Filter expression “< 8” for the “w1mpro” column. |

| Expected Result |
|---|
| Approximately 10 rows should remain visible. |

| Step 6 | Description |
|---|---|
| Using the table viewer UI, save the result of this search as a text file in CSV format, specifying that the file be saved to the “workspace”. Ensure that the CSV file’s name is “LVV-T1818-ufw-table-w1m8.csv”. | |

| Expected Result |
|---|
| A UI indication that the file has been successfully saved to the workspace. |

| Step 7 | Description |
|---|---|
| Navigate to the legacy IRSA image access screen, using the blue “External Images” button at the top of the screen.<br><br>Note that this and the following step are being done exclusively to load an image into the viewer, not itself to demonstrate an LSP-Portal-specific capability; these steps simply bypass the lack of a current image query service in the LSP. | |

| Expected Result |
|---|
| The “IRSA Viewer” image-search screen will be displayed. |

| Step 8 | Description |
|---|---|
| Use the UI to load a WISE band W1 image for the coordinates (2,0) without a cutout size limit:<br><br>1. Choose Image Type: “View FITS Images”<br>2. Select Image Source: “Search”<br>3. Select Target: “Name or Position” set to “2 0”; “Cutout size” left blank<br>4. Select Data Set:<br><br>a. If “WISE AllWISE Atlas” is not immediately visible under “Selection”, use the “MISSION” checkbox on the left to narrow the scope to “WISE”.<br>b. Use the disclosure triangle to the left of “WISE AllWISE Atlas” to reveal the filter band selection boxes, and select “W1”. | |

5. Click on the “Search” button at the bottom of the screen.

| Test Data |
|---|
| Equatorial coordinates (2, 0) expressed as “2 0” (“2, 0” will also work). |

| Expected Result |
|---|
| An image for the selected region of sky should be displayed. As the chosen coordinates are not centered in one of the WISE coadded atlas sky tiles, a “target” glyph will be seen displayed off-center at the (2,0) coordinates. |

| Step 9 | Description |
|---|---|
| Use the “save” action from the image toolbar - the “floppy disk” icon at the far left of the toolbar (in the version of Firefly current at the time of writing) to save the image in FITS format to the workspace. Ensure that the image name is “LVV-T1818-ufw-image.fits”. | |

| Expected Result |
|---|
| A UI indication of a successful file-save action. |

| Step 10 | Description |
|---|---|
| Close the web browser tab or window being used for the test, but do not quit the browser or clear credentials. (That is only for convenience; it is also acceptable to log out entirely and log in again.) | |

| Expected Result |
|---|
| |

| Step 11 | Description |
|---|---|
| Using the same web browser, navigate to the home page of the selected instance of the LSP at the LDF. From the displayed page, navigate to the Portal Aspect. | |

| Expected Result |
|---|
| No credentials should be needed unless an explicit logout or credential-clearing action was performed. |

The Portal Aspect UI should be displayed with the TAP search screen in the foreground and no image or tabular search results present.

| Step 12 | Description |
|---|---|
| Select the blue “Upload” button at the top of the screen. On the resulting screen, choose to upload from the workspace. Verify that the image file saved in Step 9 above, “LVV-T1818-ufw-image.fits”, is visible. Select the file and open it with the UI. Verify qualitatively that it seems to be the same image as displayed above in Step 8. | |

| Expected Result |
|---|
| The saved image should be displayed. Depending on the Portal Aspect software version deployed at the time of test, the image may be displayed immediately, or it may be necessary to navigate through a UI for choosing which extension in the file to |

display.

| Step 13 | Description |
|---|---|
| Select “Upload” again. This time choose the filtered table file, “LVV-T1818-ufw-table-w1m8.csv”. Note the number of rows displayed and verify qualitatively that the sky coordinates correspond to the region around the original (2,0) search center. | |

| Expected Result |
|---|
| The small, filtered table should be displayed, with the same number of rows as previously. |

| Step 14 | Description |
|---|---|
| Select “Upload” again. This time choose the full table file, “LVV-T1818-ufw-table.csv”. Note the number of rows displayed and verify qualitatively that the sky coordinates correspond to the region around the original (2,0) search center. | |

| Expected Result |
|---|
| The original query table should be displayed, with the same number of rows as previously. |

## 4.2 Draft Test Cases

### 4.2.1 LVV-T598 - Verify access to All Released or Authorized Data Products

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T598 in Jira

#### 4.2.1.1 Verification Elements

- LVV-9807 - DMS-LSP-REQ-0001-V-01: Access to All Released or Authorized Data Products_1

#### 4.2.1.2 Test Items

Verify that the LSP can access all data products defined in the DPDD, and additional data products.

#### 4.2.1.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.2 LVV-T600 - Verify LSP provides a portal aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Michael Wood-Vasey |

Open LVV-T600 in Jira

#### 4.2.2.1 Verification Elements

- LVV-9811 - DMS-LSP-REQ-0002-V-01: Portal Aspect_1

#### 4.2.2.2 Test Items

Verify that the LSP provides a web-based “Portal” to access LSST data products and user storage resources.

The Portal is defined by further requirements.

#### 4.2.2.3 Test Procedure

| Step 1 | Description |
|---|---|
| Open LSP Portal Aspect in a browser | |
| | Expected Result |
| LSP Portal Home Page appears | |
| Step 2 | Description |
| Log in through LSP credentials | |

| Expected Result |
| --- |
| SSO Login page presented and log-in successful. Success of login is indicated by some visual cue. |

| Step 3 | Description |
| --- | --- |
| Look for available datasets and releases. | |

| Expected Result |
| --- |
| LSP will show available datasets and data releases. |

| Step 4 | Description |
| --- | --- |
| Look for user-stored data. Upload a sample catalog. Upload a sample image. | |

| Expected Result |
| --- |
| LSP should show user products in an easy-to-find way. |

| Step 5 | Description |
| --- | --- |
| Upload a sample catalog. Upload a sample image. | |

| Expected Result |
| --- |
| Sample catalog and image should appear in user data area. |

| Step 6 | Description |
| --- | --- |
| Visually navigate to a selected region of the sky. | |

| Expected Result |
| --- |
| Image will be shown for regions of sky with imaging. If navigating to a region of sky not in the selected dataset, then a clear indication of no image available will be shown. |

| Step 7 | Description |
| --- | --- |
| Navigate to a specific RA, Dec. | |

| Expected Result |
| --- |
| Image shown for given RA, Dec. |

| Step 8 | Description |
| --- | --- |
| Ask for overlay of catalog of objects at current image view. | |

| Expected Result |
| --- |
| Boxes or circles or similar markers should apear on image. |

| Step 9 | Description |
|---|---|
| Mouse-over a catalog object. | |

| | Expected Result |
|---|---|
| Information about that catalog object should appear | |

| Step 10 | Description |
|---|---|
| Select a region on the image. Look at table display. | |

| | Expected Result |
|---|---|
| See that table display is now restricted to images within the select area. | |

| Step 11 | Description |
|---|---|
| Initiate a query against some other dataset. | |

| | Expected Result |
|---|---|
| Expect to see a new table with results from same region of sky. | |

| Step 12 | Description |
|---|---|
| Download image of selected region | |

| | Expected Result |
|---|---|
| Download interface presents to user with offer to download selected file in available formats (presumably at least FITS). | |

| Step 13 | Description |
|---|---|
| Download tables for selected region | |

| | Expected Result |
|---|---|
| Download interface will present offering option to download tables in any of the supported formats. | |

### 4.2.3 LVV-T601 - Verify LSP provides a notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Michael Wood-Vasey |

Open LVV-T601 in Jira

#### 4.2.3.1 Verification Elements

- LVV-9810 - DMS-LSP-REQ-0003-V-01: Notebook Aspect_1

#### 4.2.3.2 Test Items

Verify that the LSP provides an interactive Python computing environment, accessible via web browser, with access to LSST data products and user storage resources.

#### 4.2.3.3 Test Procedure

| Step 1 | Description |
|---|---|
| Log in to Portal | |
| | Expected Result |
| SSO interface to authenticate to Protal service. | |

| Step 2 | Description |
|---|---|
| Launch/Access Notebook interface | |
| | Expected Result |
| Notebook will present with loaded Python environment and give an input cell for entry. | |

| Step 3 | Description |
|---|---|
| Use Python API to query for available images that cover a given RA, Dec | |
| | Expected Result |
| List of available images will be return | |

| Step 4 | Description |
|---|---|
| Use Python API to download an image | |
| | Expected Result |
| Image object will be returned to user | |

| Step 5 | Description |
|---|---|
| Inspect Image object | |

| Expected Result |
|---|
| Image metadata will be shown to user |

| Step 6 | Description |
|---|---|
| Save Image object to user storage area. | |

| Expected Result |
|---|
| An inspection of the user-storage area will reveal a newly created image. |

| Step 7 | Description |
|---|---|
| Retrieve a table of objects in the region of the selected image. | |

| Expected Result |
|---|
| Table object available in Notebook kernel. |

| Step 8 | Description |
|---|---|
| Plot a color-color diagram for retrieved objects from image. | |

| Expected Result |
|---|
| Rendered plot in notebook about color-color diagram. |

| Step 9 | Description |
|---|---|
| | |

| Expected Result |
|---|
| |

### 4.2.4 LVV-T602 - Verify LSP provides web API

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Michael Wood-Vasey |

Open LVV-T602 in Jira

#### 4.2.4.1 Verification Elements

- LVV-9808 - DMS-LSP-REQ-0004-V-01: API (Data Access) Aspect_1

#### 4.2.4.2 Test Items

Verify that the LSP provides a web API for access to LSST data products and user storage resources.

#### 4.2.4.3 Test Procedure

| Step 1 | Description |
|---|---|
| Upload a table to the LSP using the web API. Likely launched from a Python session or shell. | |
| | Expected Result |
| Inspection of user area will show file now uploaded | |

| Step 2 | Description |
|---|---|
| Upload 5 tables to LSP using the web API. | |
| | Expected Result |
| Inspection of user area will show 5 tables. | |

| Step 3 | Description |
|---|---|
| Query contents of LSP User Storage area | |
| | Expected Result |
| One image and Five tables | |

| Step 4 | Description |
|---|---|
| Download one of the tables using the web API | |
| | Expected Result |
| local file created that matches table | |

| Step 5 | Description |
|---|---|
| Query RA, Dec region for table of objects using web API | |

| Expected Result |
| --- |
| File or object returned with requested objects |

### 4.2.5 LVV-T603 - Verify data access through multiple linked aspects

| Version | Status | Priority | Verification Type | Owner |
| --- | --- | --- | --- | --- |
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T603 in Jira

#### 4.2.5.1 Verification Elements

- LVV-9809 - DMS-LSP-REQ-0005-V-01: Linkage of Aspects_1

#### 4.2.5.2 Test Items

Verify that the LSP facilitates access of the same LSST or user data through multiple aspects.

#### 4.2.5.3 Test Procedure

| Step 1 | Description |
| --- | --- |
| | Expected Result |

### 4.2.6 LVV-T604 - Verify use of VO standards

| Version | Status | Priority | Verification Type | Owner |
| --- | --- | --- | --- | --- |
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T604 in Jira

#### 4.2.6.1 Verification Elements

- LVV-9812 - DMS-LSP-REQ-0006-V-01: Use of VO Standards_1

#### 4.2.6.2 Test Items

Verify that the LSP utilizes stable and accepted Virtual Observatory standards for public APIs.

#### 4.2.6.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.7 LVV-T605 - Verify that LSP complies with LSST data access policies

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |
| Open LVV-T605 in Jira | | | | |

#### 4.2.7.1 Verification Elements

- LVV-9806 - DMS-LSP-REQ-0007-V-01: Abide by the Data Access Policies_1

#### 4.2.7.2 Test Items

Verify that the LSP complies with the public data access policy and access restrictions defined by the LSST Project.

#### 4.2.7.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.8 LVV-T606 - Verify semantic linkages between data items

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T606 in Jira

#### 4.2.8.1 Verification Elements

- LVV-9814 - DMS-LSP-REQ-0008-V-01: Semantic Linkage_1

#### 4.2.8.2 Test Items

Verify that the LSP provides access to linkages between data items that reflect their provenance and data dependencies.

#### 4.2.8.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.9 LVV-T607 - Verify semantic linkages between data items and uncertainties

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T607 in Jira

#### 4.2.9.1 Verification Elements

- LVV-9813 - DMS-LSP-REQ-0009-V-01: Semantic Linkage: Uncertainties_1

#### 4.2.9.2 Test Items

Verify that the LSP provides methods to identify uncertainties associated with a given quantity.

#### 4.2.9.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.10 LVV-T608 - Verify transfer of Portal data references to Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T608 in Jira

#### 4.2.10.1 Verification Elements

- LVV-9815 - DMS-LSP-REQ-0010-V-01: Transfer of Portal Data References to Notebook_1

#### 4.2.10.2 Test Items

Verify that data references derived from Portal exploration can be transferred and used in to

retrieve the same data in the Notebook aspect.

#### 4.2.10.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.11 LVV-T609 - Verify providing user file storage in LSP

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T609 in Jira

#### 4.2.11.1 Verification Elements

- LVV-9817 - DMS-LSP-REQ-0011-V-01: User File Workspace_1

#### 4.2.11.2 Test Items

Verify that the LSP provides a user file workspace for storage of user generated data files. These shall be accessible from all three aspects.

#### 4.2.11.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.12 LVV-T610 - Verify providing user generated database in LSP

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T610 in Jira

#### 4.2.12.1 Verification Elements

- LVV-9816 - DMS-LSP-REQ-0012-V-01: User Database Workspace_1

#### 4.2.12.2 Test Items

Verify that the LSP allows for creation, use, and management of User Generated databases, and interaction with user databases by the same facilities as Project databases, where feasible.

#### 4.2.12.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.13 LVV-T611 - Verify access controls in user workspace

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T611 in Jira

#### 4.2.13.1 Verification Elements

- LVV-9818 - DMS-LSP-REQ-0013-V-01: User Workspace Access Controls_1

#### 4.2.13.2 Test Items

Verify that LSP users can place access restrictions on data in the User File and Database workspaces, and that these restrictions are enforced across all aspects.

#### 4.2.13.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.14 LVV-T612 - Verify ability to download data from LSP

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T612 in Jira

#### 4.2.14.1 Verification Elements

- LVV-9819 - DMS-LSP-REQ-0014-V-01: Download Data_1

#### 4.2.14.2 Test Items

Verify that the LSP provides a means to download data from queries, user workspaces, or other operations, to the user's system.

#### 4.2.14.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.15 LVV-T613 - Verify ability to upload data to LSP

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T613 in Jira

#### 4.2.15.1 Verification Elements

- LVV-9823 - DMS-LSP-REQ-0015-V-01: Upload Data_1

#### 4.2.15.2 Test Items

Verify that LSP users can upload data from their system for use in the LSP aspects and storage in their user workspace.

#### 4.2.15.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.16 LVV-T614 - Verify ability to transfer data to and from the Workspace

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T614 in Jira

#### 4.2.16.1 Verification Elements

- LVV-9822 - DMS-LSP-REQ-0016-V-01: Transfer Data to Workspace_1

#### 4.2.16.2 Test Items

Verify that users can transfer data between all features of the LSP that allow for upload and download of data.

#### 4.2.16.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.17 LVV-T615 - Verify file formats provided for tabular data download

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T615 in Jira

#### 4.2.17.1 Verification Elements

- LVV-9821 - DMS-LSP-REQ-0017-V-01: Tabular Data Download File Formats_1

#### 4.2.17.2 Test Items

Verify that the LSP allows tabular data from search results to be downloaded in FITS, VOTable,

and ASCII delimiter-separated tables (e.g., CSV).

#### 4.2.17.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.18 LVV-T616 - Verify file formats provided for image data download

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T616 in Jira

#### 4.2.18.1 Verification Elements

- LVV-9820 - DMS-LSP-REQ-0018-V-01: Image Data Download File Format_1

#### 4.2.18.2 Test Items

Verify that LSST image data products can be downloaded via the LSP in FITS format, with appropriate metadata included.

#### 4.2.18.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.19 LVV-T617 - Verify support for peak volume of moderate-sized queries

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T617 in Jira

#### 4.2.19.1 Verification Elements

- LVV-9824 - DMS-LSP-REQ-0028-V-01: Peak Volume for Moderate-Sized Queries_1

#### 4.2.19.2 Test Items

Verify that the LSP can handle a peak usage of 50 simultaneous queries without degradation, where the queries include input selection of up to 1E7 objects in the catalog, result data set of up to 0.1GB, and a response time of 10 seconds.

#### 4.2.19.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.20 LVV-T618 - Verify support for peak volume of queries on all Objects

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T618 in Jira

#### 4.2.20.1 Verification Elements

- LVV-9825 - DMS-LSP-REQ-0029-V-01: Peak Volume for Queries on all Objects_1

#### 4.2.20.2 Test Items

Verify that the LSP can handle a peak usage of 20 simultaneous queries without degradation, where the queries include input selection of up to the entire object database, result data set of up to 6 GB, and a response time of 1 hour.

#### 4.2.20.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.21 LVV-T619 - Verify LSP handles peak volume of queries

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T619 in Jira

#### 4.2.21.1 Verification Elements

- LVV-9826 - DMS-LSP-REQ-0030-V-01: Peak Volume of In-process Queries_1

#### 4.2.21.2 Test Items

Verify that the LSP can simultaneously handle peak usage of 20*6 GB = 120 GB of downloads.

#### 4.2.21.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.22 LVV-T620 - Verify LSP supports required download bandwidth

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T620 in Jira

#### 4.2.22.1 Verification Elements

- LVV-9827 - DMS-LSP-REQ-0031-V-01: Query Result Download Bandwidth_1

#### 4.2.22.2 Test Items

Verify that the LSP supports a download rate of at least 6 Gbps for query results including tables and images.

#### 4.2.22.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.23 LVV-T621 - Verify LSP user reference and documentation

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T621 in Jira

#### 4.2.23.1 Verification Elements

- LVV-9828 - DMS-LSP-REQ-0019-V-01: Documentation_1

#### 4.2.23.2 Test Items

Verify that the LSP provides user reference and documentation for all of its aspects.

#### 4.2.23.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.24 LVV-T623 - Verify support for new LSP users

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |
| | | Open LVV-T623 in Jira | | |

#### 4.2.24.1 Verification Elements

- LVV-9832 - DMS-LSP-REQ-0021-V-01: New-user Support_1

#### 4.2.24.2 Test Items

Verify that guidance is provided to new users about how to become authenticated users of the LSP.

#### 4.2.24.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.25 LVV-T624 - Verify implementation of common identity across LSP aspects

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Leanne Guy |

Open LVV-T624 in Jira

#### 4.2.25.1 Verification Elements

- LVV-9831 - DMS-LSP-REQ-0022-V-01: Common Identity_1

#### 4.2.25.2 Test Items

Verify that users can authenticate and access all three aspects of the LSP using the same credentials.

#### 4.2.25.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.26 LVV-T625 - Verify authentication via external identity providers

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Leanne Guy |

Open LVV-T625 in Jira

#### 4.2.26.1 Verification Elements

- LVV-9834 - DMS-LSP-REQ-0023-V-01: Use of External Identity Providers_1

#### 4.2.26.2 Test Items

Verify that LSP users can be authenticated using external credentials from trusted identity providers.

#### 4.2.26.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.27 LVV-T626 - Verify LSP identity can have multiple associated credentials

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T626 in Jira

#### 4.2.27.1 Verification Elements

- LVV-9835 - DMS-LSP-REQ-0024-V-01: Use of Multiple Sets of Credentials_1

#### 4.2.27.2 Test Items

Verify that an LSP user can have multiple credentials, from different providers, associated

with the same identity within the LSP.

#### 4.2.27.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.28 LVV-T627 - Verify implementation of Acceptable Use Policy

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T627 in Jira

#### 4.2.28.1 Verification Elements

- LVV-9829 - DMS-LSP-REQ-0025-V-01: Acceptable Use Policy_1

#### 4.2.28.2 Test Items

Verify that non-Project users of the LSP are required to agree to and abide by an Acceptable Use Policy.

#### 4.2.28.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.29 LVV-T628 - Verify LSP connections encrypted

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T628 in Jira

#### 4.2.29.1 Verification Elements

- LVV-9836 - DMS-LSP-REQ-0026-V-01: Using secure protocols_1

#### 4.2.29.2 Test Items

Verify that all external connections to the LSP are encrypted in accordance with LSST cyber-security policy.

#### 4.2.29.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.30 LVV-T629 - Verify privacy of users' activities

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T629 in Jira

#### 4.2.30.1 Verification Elements

- LVV-9833 - DMS-LSP-REQ-0027-V-01: Privacy of User Activities_1

#### 4.2.30.2 Test Items

Verify that users' activities on the LSP are not visible to other users without the originating user's explicit permission.

#### 4.2.30.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.31 LVV-T630 - Verify multiple LSP instances

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T630 in Jira

#### 4.2.31.1 Verification Elements

- LVV-9839 - DMS-LSP-REQ-0032-V-01: Multiple installations_1

#### 4.2.31.2 Test Items

Verify that separate instances of the LSP accessible to the public, and only within the LSST Project, are available and maintained.

#### 4.2.31.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.32 LVV-T631 - Verify LSP access from the public Internet (IPv4)

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T631 in Jira

#### 4.2.32.1 Verification Elements

- LVV-9837 - DMS-LSP-REQ-0033-V-01: Internet-Accessible (IPv4)_1

#### 4.2.32.2 Test Items

Verify that the LSP is accessible from the public Internet using IPv4 protocols.

#### 4.2.32.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.33 LVV-T632 - Verify LSP access from the public Internet (IPv6)

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T632 in Jira

#### 4.2.33.1 Verification Elements

- LVV-9838 - DMS-LSP-REQ-0034-V-01: Internet-Accessible (IPv6)_1

#### 4.2.33.2 Test Items

Verify that the LSP is accessible from the public Internet using IPv6 protocols.

#### 4.2.33.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.34 LVV-T633 - Verify indication of system availability

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |
| Open LVV-T633 in Jira | | | | |

#### 4.2.34.1 Verification Elements

- LVV-9840 - DMS-LSP-REQ-0035-V-01: System-Availability Indication_1

#### 4.2.34.2 Test Items

Verify that the LSP informs users when services are unavailable due to maintenance or excessive load.

#### 4.2.34.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.35 LVV-T634 - Verify Portal is a web application

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T634 in Jira

#### 4.2.35.1 Verification Elements

- LVV-9841 - DMS-PRTL-REQ-0001-V-01: Portal is a Web Application_1

#### 4.2.35.2 Test Items

Verify that the Portal is a web application that is accessible to users via common web browsers and without downloading and installing local software.

#### 4.2.35.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.36 LVV-T635 - Verify Portal discovery of all data products

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T635 in Jira

#### 4.2.36.1 Verification Elements

- LVV-9847 - DMS-PRTL-REQ-0002-V-01: Portal Discovery of all Data Products_1

#### 4.2.36.2 Test Items

Verify that the Portal enables discovery of all data products released by the Project, including all products enumerated in the DPDD, the calibration database, and the reformatted EFD, as well as user data products to which the user has access.

#### 4.2.36.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.37 LVV-T636 - Verify Portal access to Workspace

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T636 in Jira

#### 4.2.37.1 Verification Elements

- LVV-9846 - DMS-PRTL-REQ-0003-V-01: Portal Access to Workspace_1

#### 4.2.37.2 Test Items

Verify that users can discover and retrieve data and images within their Workspace.

#### 4.2.37.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.38 LVV-T637 - Verify Portal provides semantic linkages between data products

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T637 in Jira

#### 4.2.38.1 Verification Elements

- LVV-9848 - DMS-PRTL-REQ-0004-V-01: Semantic Linkage: Portal Workflows_1

#### 4.2.38.2 Test Items

Verify that the Portal aspect provides users the means to identify and retrieve semantically linked data. The Portal should provide straightforward UI workflows for starting from a selected data item (image or catalog entry) and identifying related data, including both direct data-dependency and provenance linkages and more scientifically oriented linkages such as the ability to navigate from an Object to its associated ForcedSources.

#### 4.2.38.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.39 LVV-T638 - Verify access to calibration products via Portal

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T638 in Jira

#### 4.2.39.1 Verification Elements

- LVV-9842 - DMS-PRTL-REQ-0005-V-01: Access to Calibration Products_1

#### 4.2.39.2 Test Items

Verify that calibration products are accessible from the Portal aspect, both directly and via linkages from science data products that use them. This is a sub-requirement of DMS-PRTL-REQ-0004 (associated test case: LVV-T637).

#### 4.2.39.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.40 LVV-T639 - Verify associations between single images and coadds

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T639 in Jira

#### 4.2.40.1 Verification Elements

- LVV-9845 - DMS-PRTL-REQ-0006-V-01: Coadded Image to Single-Epoch Image Associations_1

#### 4.2.40.2 Test Items

Verify that users can discover the associations between coadded images and the single-epoch images that contributed to the coadds. This is a sub-requirement of DMS-PRTL-REQ-0004 (associated test case: LVV-T637).

#### 4.2.40.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.41 LVV-T640 - Verify access to external archives from Portal

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T640 in Jira

#### 4.2.41.1 Verification Elements

- LVV-9843 - DMS-PRTL-REQ-0007-V-01: Access to External Archives_1

#### 4.2.41.2 Test Items

Verify that an interface to outside catalog and image data is available, that allows a user to determine what external astronomical data are associated with a given location on the sky

and return those data for use within the Portal.

#### 4.2.41.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.42 LVV-T641 - Verify API for Access to Portal Session State

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T641 in Jira

#### 4.2.42.1 Verification Elements

- LVV-9844 - DMS-PRTL-REQ-0008-V-01: API for Access to Portal Session State_1

#### 4.2.42.2 Test Items

Verify that the Portal aspect provides a network API that allows authenticated remote access by a user to aspects of their session state in the Portal. The minimal requirement is for access to the list of queries performed in that session.

#### 4.2.42.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.43 LVV-T642 - Verify Portal supports both synchronous and asynchronous queries

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T642 in Jira

#### 4.2.43.1 Verification Elements

- LVV-9854 - DMS-PRTL-REQ-0009-V-01: Support Synchronous and Asynchronous Queries_1

#### 4.2.43.2 Test Items

Verify that the Portal aspect provides UI models for both synchronous and asynchronous queries. This Portal capability should include an interface to initiate, monitor, and control the execution of both sync and async queries, as well as browse their results. Long running queries may be forced to be asynchronous.

#### 4.2.43.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.44 LVV-T643 - Verify capability to run long queries in the background

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T643 in Jira

#### 4.2.44.1 Verification Elements

- LVV-9849 - DMS-PRTL-REQ-0010-V-01: Long Query Backgrounding_1

#### 4.2.44.2 Test Items

Verify that the Portal aspect will notify the user if a query is estimated to take longer than 60 seconds, and will allow the user to put the query in background if desired.

#### 4.2.44.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.45 LVV-T644 - Verify user notification of query status

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T644 in Jira

#### 4.2.45.1 Verification Elements

- LVV-9853 - DMS-PRTL-REQ-0011-V-01: Query Status and Termination Notification_1

#### 4.2.45.2 Test Items

Verify that the Portal notifies the user of the status of user-initiated queries, including whether the query has been terminated for any reason.

#### 4.2.45.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.46 LVV-T645 - Verify limitation of query results size

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T645 in Jira

#### 4.2.46.1 Verification Elements

- LVV-9851 - DMS-PRTL-REQ-0012-V-01: Query Results Size Limitation_1

#### 4.2.46.2 Test Items

Verify that the Portal aspect estimates query results size, and notifies user if the query result exceeds thresholds and has been disallowed or terminated as a result.

#### 4.2.46.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.47 LVV-T646 - Verify ability to browse query history

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T646 in Jira

#### 4.2.47.1 Verification Elements

- LVV-9850 - DMS-PRTL-REQ-0013-V-01: Query History Inspection_1

#### 4.2.47.2 Test Items

Verify that a user interface exists where users can browse the history of queries they have performed, and subsequently re-execute them if desired.

#### 4.2.47.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.48 LVV-T647 - Verify implementation of saving of queries

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T647 in Jira

#### 4.2.48.1 Verification Elements

- LVV-9852 - DMS-PRTL-REQ-0014-V-01: Query Saving - Portal_1

#### 4.2.48.2 Test Items

The Portal aspect shall provide a UI for the saving of a specification artifact for a user-performed

query, either for downloading or for saving to the Workspace, and a UI for re-executing a saved query found in the Workspace or uploaded remotely.

#### 4.2.48.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.49 LVV-T648 - Verify implementation of generic queries in API aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T648 in Jira

#### 4.2.49.1 Verification Elements

- LVV-9857 - DMS-PRTL-REQ-0015-V-01: Generic Query_1

#### 4.2.49.2 Test Items

The Portal aspect shall enable the generation of queries against any tabular data exposed in the API aspect.

#### 4.2.49.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.50 LVV-T649 - Verify implementation of form-based generic query in API aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T649 in Jira

#### 4.2.50.1 Verification Elements

- LVV-9856 - DMS-PRTL-REQ-0016-V-01: Generic Query - Form-based_1

#### 4.2.50.2 Test Items

The Portal aspect shall provide a search-builder form-based interface for generic table queries. This facility may have reduced functionality for user tables for which the user has not provided full, or accurate, metadata.

#### 4.2.50.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.51 LVV-T650 - Verify implementation of ADQL-based generic query in API aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T650 in Jira

#### 4.2.51.1 Verification Elements

- LVV-9855 - DMS-PRTL-REQ-0017-V-01: Generic Query - ADQL-based_1

#### 4.2.51.2 Test Items

The Portal aspect shall provide a means for entering a query against any table directly in ADQL. This facility shall be available for every table, including user-supplied tables.

#### 4.2.51.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.52 LVV-T651 - Verify estimation of query result size

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T651 in Jira

#### 4.2.52.1 Verification Elements

- LVV-9858 - DMS-PRTL-REQ-0018-V-01: Query Result Size_1

#### 4.2.52.2 Test Items

Verify that UI support exists to estimate (or determine exactly) the size of results that would be returned by a query without returning the full set of results.

#### 4.2.52.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.53 LVV-T652 - Verify query by unique identifier

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T652 in Jira

#### 4.2.53.1 Verification Elements

- LVV-9859 - DMS-PRTL-REQ-0028-V-01: Query by Identifier_1

#### 4.2.53.2 Test Items

Verify that queries can be performed to find data on any LSST data product with a unique ID by that ID.

#### 4.2.53.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.54 LVV-T653 - Verify query by object or source identifier

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T653 in Jira

#### 4.2.54.1 Verification Elements

- LVV-9860 - DMS-PRTL-REQ-0029-V-01: Query by LSST Object and Source Identifiers: Specific Match to Identifier_1

#### 4.2.54.2 Test Items

Verify that queries can be performed for a given object or source ID (e.g., (DIA)Object, (DIA)Source, ForcedSource), and return catalog, image, and metadata associated with measurements of the object/source.

#### 4.2.54.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.55 LVV-T654 - Verify query by Solar System object identifier

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T654 in Jira

#### 4.2.55.1 Verification Elements

- LVV-9861 - DMS-PRTL-REQ-0030-V-01: Query by Solar System Objects: Specific Match to Identifier_1

#### 4.2.55.2 Test Items

Verify that the UI supports queries and returns data associated with a specific Solar System Object.

#### 4.2.55.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.56 LVV-T655 - Verify query by position on the sky

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T655 in Jira

#### 4.2.56.1 Verification Elements

- LVV-9866 - DMS-PRTL-REQ-0020-V-01: Positional Query: Position on the Sky_1

#### 4.2.56.2 Test Items

Verify that the Portal aspect supports queries based on astrophysical coordinates on the sky.

#### 4.2.56.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.57 LVV-T656 - Verify query by list of positions

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T656 in Jira

#### 4.2.57.1 Verification Elements

- LVV-9865 - DMS-PRTL-REQ-0021-V-01: Positional Query: Multiple Positions/Objects_1

#### 4.2.57.2 Test Items

Verify that the Portal supports queries based on a list of object positions. The coordinates may be specified by any of the supported means of specifying positions.

#### 4.2.57.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.58 LVV-T657 - Verify implementation of astrophysical coordinate systems

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T657 in Jira

#### 4.2.58.1 Verification Elements

- LVV-9862 - DMS-PRTL-REQ-0022-V-01: Positional Query: Astrophysical Coordinate Systems_1

#### 4.2.58.2 Test Items

Verify that the Portal aspect supports positional queries based on equatorial, ecliptic, and Galactic astrophysical coordinate systems.

#### 4.2.58.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.59 LVV-T658 - Verify positional query by astrophysical source name

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T658 in Jira

#### 4.2.59.1 Verification Elements

- LVV-9863 - DMS-PRTL-REQ-0023-V-01: Positional Query: Astrophysical Source Name Lookup_1

#### 4.2.59.2 Test Items

Verify that the Portal aspect supports queries based on the use of source names in commonly-used astrophysical source name lookup services (e.g., NED, Simbad, Horizons).

#### 4.2.59.3 Test Procedure

| Step 1-1 from LVV-T849 | Description |
|---|---|

Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/ .

| Expected Result |
|---|

A credential-entry screen should be displayed.

| Step 1-2 from LVV-T849 | Description |
|---|---|

Enter a valid set of credentials for an LSST user with LSP access on the instance under test.

| Expected Result |
|---|

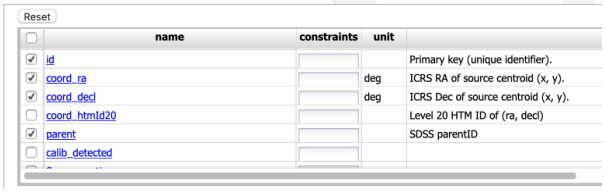
The Portal Aspect UI should be displayed following authentication.

| Step 2-1 from LVV-T851 | Description |
|---|---|

The default catalog (SDSS Stripe 82, 2013 LSST Processing) is fine for this.

Choose columns to return by:
1) unchecking the top box in the column selection box
2) checking columns for id, coord_ra, coord_dec, and parent.

The result should look like the following:




| Expected Result |
|---|

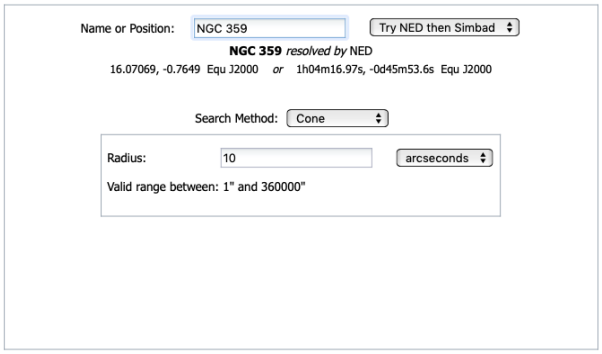
The column box should be configured to return a minimal useful set of columns.

| Step 2-2 from LVV-T851 | Description |
|---|---|

Enter an object name for the portal to resolve. We will use NGC 359, a large elliptical galaxy in the Stripe 82 coverage.

To do this, enter the name “NGC 359” in the “Name or Position” text input box.

Leave the other defaults in place.




## Expected Result

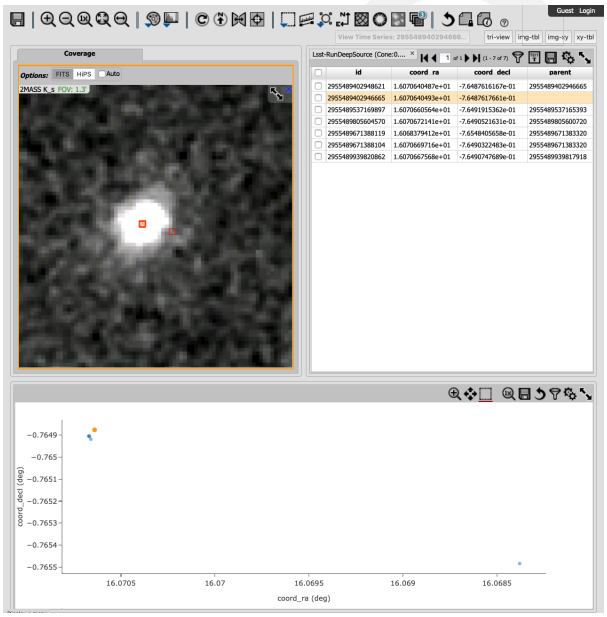
There should be a message like “NGC 359 resolved by NED”. The example coordinates should also changed to the coordinates of NGC 359.

## Step 2-3 from LVV-T851 Description

Submit the query to the portal query engine by clicking the “Search” button in the lower left corner of the interface.

## Expected Result

A firefly app with the summary image overlay and catalog widgets side by side. A plot of RA vs. Dec is displayed below the side by side widgets.




## Step 3-1 from LVV-T850 Description

Currently, there is no logout mechanism on the portal.
This should be updated as the system matures.

Simply close the browser window.

| Expected Result |
| --- |
| Closed browser window. When navigating to the portal endpoint, expect to execute the steps in LVV-T849. |

### 4.2.60 LVV-T659 - Verify positional query by Source or Object name

| Version | Status | Priority | Verification Type | Owner |
| --- | --- | --- | --- | --- |
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T659 in Jira

#### 4.2.60.1 Verification Elements

- LVV-9864 - DMS-PRTL-REQ-0024-V-01: Positional Query: LSST Object and Source Identifiers_1

#### 4.2.60.2 Test Items

Verify that positional queries can be performed for coordinates based on a given object or source ID (e.g., (DIA)Object, (DIA)Source, ForcedSource).

#### 4.2.60.3 Test Procedure

| Step 1 | Description |
| --- | --- |

| Expected Result |
| --- |

### 4.2.61 LVV-T660 - Verify positional query based on Solar System object names

| Version | Status | Priority | Verification Type | Owner |
| --- | --- | --- | --- | --- |
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T660 in Jira

#### 4.2.61.1 Verification Elements

- LVV-9867 - DMS-PRTL-REQ-0025-V-01: Positional Query: Solar System Object Names_1

#### 4.2.61.2 Test Items

Verify that positional queries can be performed for coordinates based on a given Solar System object name.

#### 4.2.61.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.62 LVV-T661 - Verify query by cone search

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T661 in Jira

#### 4.2.62.1 Verification Elements

- LVV-9869 - DMS-PRTL-REQ-0026-V-01: Positional Query by Region: Cone-Search_1

#### 4.2.62.2 Test Items

Verify that Portal supports position-based queries based on a cone-shaped radial search.

#### 4.2.62.3 Test Procedure

| Step 1-1 from LVV-T849 | Description |
|---|---|

Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/ .

| Expected Result |
|---|

A credential-entry screen should be displayed.

| Step 1-2 from LVV-T849 | Description |
|---|---|

Enter a valid set of credentials for an LSST user with LSP access on the instance under test.

| Expected Result |
|---|

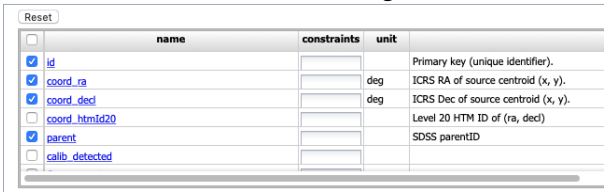
The Portal Aspect UI should be displayed following authentication.

| Step 2 | Description |
|---|---|

The default catalog (SDSS Stripe 82, 2013 LSST Processing) is fine for this.

Choose columns to return by:
1) unchecking the top box in the column selection box
2) checking columns for id, coord_ra, coord_dec, and parent.

The result should look like the following:




| Expected Result |
|---|

The column box should be configured to return a minimal useful set of columns.

| Step 3 | Description |
|---|---|

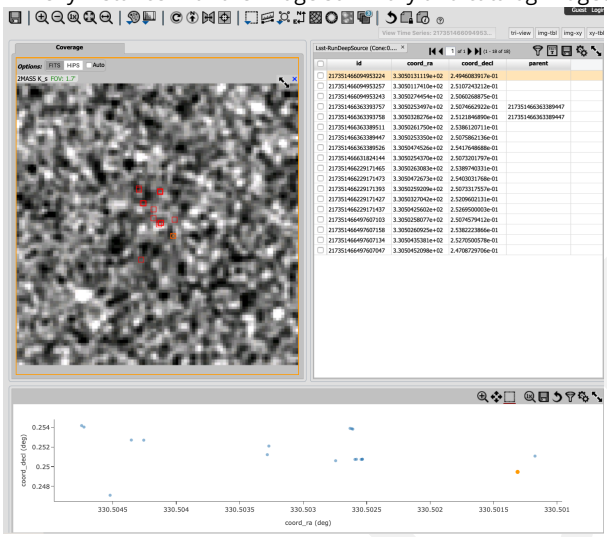
Attempt to access data using sexagesimal format by:

1) entering an arbitrary position in the Stripe 82 footprint into the “Name or Position:” input text box: 22h2m1s 0d15m0.3s
2) change the radius of the query by changing the default value in the “Radius:” box to 15.

| Expected Result |
|---|
| The cone search parameters are expected to be configured in a way as to return data from the service. |

| Step 4 | Description |
|---|---|
| Call the service by clicking the “Search” button in the lower left corner of the interface. | |

| Expected Result |
|---|
| A firefly instance with the image summary and catalog widgets side by side with the plot of sky coordinates below: |



| Step 5 | Description |
|---|---|
| Return to the query interface by clicking the “LSST Data” button in the upper left of the interface. | |

| Expected Result |
|---|
| Expect to be returned to the query interface with the previous search criteria pre-filled in the appropriate boxes. |

| Step 6 | Description |
|---|---|
| Modify the query to use decimal inputs by changing “22h2m1s 0d15m0.3s” to “330.504167 0.250083”. | |

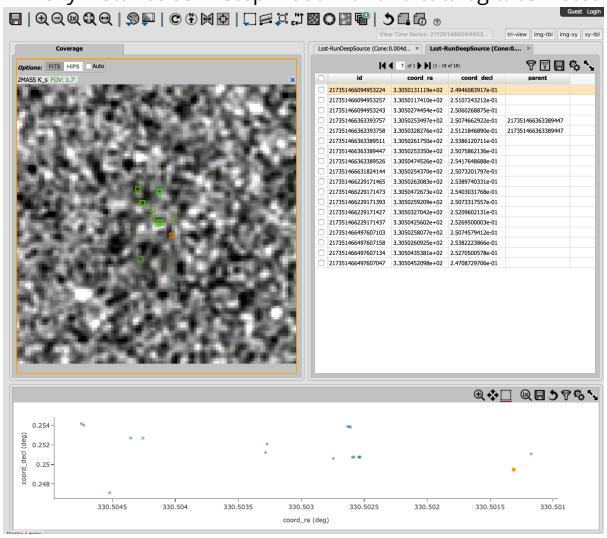
| Expected Result |
|---|
| The parameters updated for the decimal format. |

| Step 7 | Description |
|---|---|
| Execute the modified query by clicking the “Search” button at the bottom left of the interface. | |

Rubin Observatory

| Expected Result |
|---|

A firefly instance as in step 4 but with two catalog tabs instead of just one:



| Step 8 | Description |
|---|---|

Verify the two returned catalogs are the same by clicking between the two catalog tabs.

| Expected Result |
|---|

Identical catalogs from the two queries.

| Step 9-1 from LVV-T850 | Description |
|---|---|

Currently, there is no logout mechanism on the portal.
This should be updated as the system matures.

Simply close the browser window.

| Expected Result |
|---|

Closed browser window. When navigating to the portal endpoint, expect to execute the steps in LVV-T849.

### 4.2.63 LVV-T662 - Verify query by box search

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T662 in Jira

#### 4.2.63.1 Verification Elements

- LVV-9868 - DMS-PRTL-REQ-0027-V-01: Positional Query by Region: Box-Search_1

#### 4.2.63.2 Test Items

Verify that the Portal supports positional queries based on a coordinate system box search.

#### 4.2.63.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.64 LVV-T663 - Verify query by time of observation

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |
| Open LVV-T663 in Jira | | | | |

#### 4.2.64.1 Verification Elements

- LVV-9870 - DMS-PRTL-REQ-0019-V-01: Query by Date and Time: Time Range of Observation_1

#### 4.2.64.2 Test Items

Verify that the Portal supports queries based on time or ranges of date/time values in both

UT and (barycentric) Julian date.

#### 4.2.64.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.65 LVV-T664 - Verify implementation of user-friendly tabular query

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T664 in Jira

#### 4.2.65.1 Verification Elements

- LVV-9874 - DMS-PRTL-REQ-0031-V-01: Tabular Data Query Specifications_1

#### 4.2.65.2 Test Items

The Portal aspect shall provide a user interface to execute queries of the (DIA)Object and (DIA)Source tables, driven by the data dictionary associated with the tables.

#### 4.2.65.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.66 LVV-T666 - Verify query by image metadata

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T666 in Jira

#### 4.2.66.1 Verification Elements

- LVV-9873 - DMS-PRTL-REQ-0032-V-01: Query Tabular Data based upon Image Meta-Data_1

#### 4.2.66.2 Test Items

Verify that the Portal supports queries on image metadata (e.g., airmass, moon angle, etc.) from the images the catalog measurements were made from.

#### 4.2.66.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.67 LVV-T667 - Verify queries on the alerts database

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T667 in Jira

#### 4.2.67.1 Verification Elements

- LVV-9872 - DMS-PRTL-REQ-0033-V-01: Queries on the Alerts Database_1

#### 4.2.67.2 Test Items

Verify that the Portal supports queries on parameters in the Alerts Database.

#### 4.2.67.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.68 LVV-T668 - Verify access to original alert state

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T668 in Jira

#### 4.2.68.1 Verification Elements

- LVV-9871 - DMS-PRTL-REQ-0034-V-01: Access to Original Alert State_1

#### 4.2.68.2 Test Items

Verify that alerts as they were originally raised are accessible via the Portal.

#### 4.2.68.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

### 4.2.69 LVV-T669 - Verify query for single-epoch visit images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T669 in Jira

#### 4.2.69.1 Verification Elements

- LVV-9878 - DMS-PRTL-REQ-0035-V-01: Query for Single Epoch Visit Images_1

#### 4.2.69.2 Test Items

Verify that users with a list of visits (either directly, or from a visit-selection query) can query for single-epoch images corresponding to those visits.

#### 4.2.69.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

### 4.2.70 LVV-T670 - Verify query for single-epoch raft images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T670 in Jira

#### 4.2.70.1 Verification Elements

- LVV-9877 - DMS-PRTL-REQ-0036-V-01: Query for Single Epoch Raft Images_1

#### 4.2.70.2 Test Items

Verify that users of the single-epoch query service (LVV-9878) can limit the returned visit images to only a specified raft.

#### 4.2.70.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.71 LVV-T671 - Verify query for single-epoch CCD images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T671 in Jira

#### 4.2.71.1 Verification Elements

- LVV-9876 - DMS-PRTL-REQ-0037-V-01: Query for Single Epoch CCD Image_1

#### 4.2.71.2 Test Items

Verify that users of the single-epoch query service (LVV-9878) can limit the returned visit im-

ages to only a specified CCD.

#### 4.2.71.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.72 LVV-T672 - Verify metadata query for single-epoch images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T672 in Jira

#### 4.2.72.1 Verification Elements

- LVV-9879 - DMS-PRTL-REQ-0038-V-01: Single-Epoch Image Query Specifications_1

#### 4.2.72.2 Test Items

Verify that the Portal provides an option to query for visits and single-epoch images of a certain type based on image metadata or parameters from the reformatted EFD.

#### 4.2.72.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.73 LVV-T673 - Verify query for coadds by image metadata

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T673 in Jira

#### 4.2.73.1 Verification Elements

- LVV-9875 - DMS-PRTL-REQ-0039-V-01: Coadded Image Query Specifications_1

#### 4.2.73.2 Test Items

Verify that the Portal aspect supports queries based on image metadata describing the provenance of the contributing images, that return the corresponding coadd image(s).

#### 4.2.73.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.74 LVV-T674 - Verify query for coadd image cutouts

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T674 in Jira

#### 4.2.74.1 Verification Elements

- LVV-9880 - DMS-PRTL-REQ-0041-V-01: Query for Coadded Image Cutouts_1

#### 4.2.74.2 Test Items

Verify that Portal users can query based on image metadata for coadds, then obtain a list of sub-images (cutouts) with a specified center position and size.

#### 4.2.74.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.75 LVV-T675 - Verify query for single-epoch image cutouts

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T675 in Jira

#### 4.2.75.1 Verification Elements

- LVV-9881 - DMS-PRTL-REQ-0040-V-01: Query for Single Epoch Image Cutouts_1

#### 4.2.75.2 Test Items

Verify that Portal users can query based on image metadata for single-epoch images, then obtain a list of sub-images (cutouts) with a specified center position and size.

#### 4.2.75.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.76 LVV-T676 - Verify display of native single-visit images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T676 in Jira

#### 4.2.76.1 Verification Elements

- LVV-9905 - DMS-PRTL-REQ-0062-V-01: Display Native Single-Visit Image Data Products_1

#### 4.2.76.2 Test Items

Verify that the Portal aspect provides a means to display the native single-visit image data products, including raw images, Processed Visit Images (PVIs), and difference images, as well as the standard single-exposure calibration images used as inputs for flats, bias frames, etc.

#### 4.2.76.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.77 LVV-T677 - Verify Portal provides visualization of tabular and image data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T677 in Jira

#### 4.2.77.1 Verification Elements

- LVV-9884 - DMS-PRTL-REQ-0042-V-01: Visualization of Tabular and Image Data_1

#### 4.2.77.2 Test Items

Verify that the Portal aspect provides the capability to visualize all tabular and image data defined in the DPDD, as well as user data products.

#### 4.2.77.3 Test Procedure

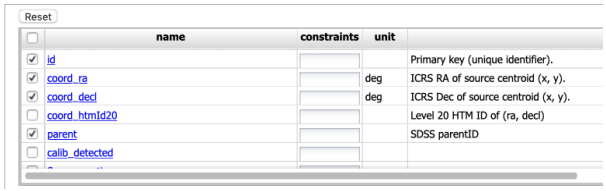
| Step 1-1 from LVV-T849 | Description |
|---|---|
| Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/ . | |
| | Expected Result |
| A credential-entry screen should be displayed. | |

| Step 1-2 from LVV-T849 | Description |
|---|---|
| Enter a valid set of credentials for an LSST user with LSP access on the instance under test. | |
| | Expected Result |
| The Portal Aspect UI should be displayed following authentication. | |

| Step 2-1 from LVV-T851 | Description |
|---|---|
| The default catalog (SDSS Stripe 82, 2013 LSST Processing) is fine for this.<br><br>Choose columns to return by:<br>1) unchecking the top box in the column selection box<br>2) checking columns for id, coord_ra, coord_dec, and parent. | |

Rubin Observatory

The result should look like the following:




### Expected Result

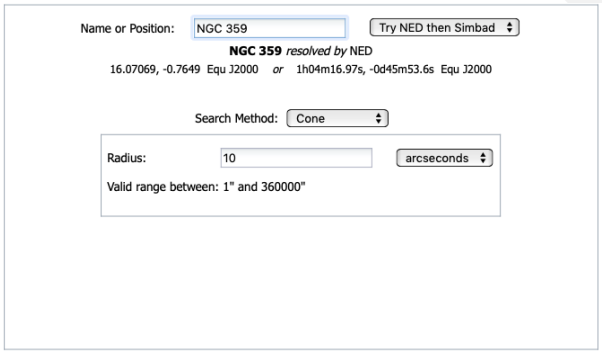
The column box should be configured to return a minimal useful set of columns.

### Step 2-2 from LVV-T851 Description

Enter an object name for the portal to resolve. We will use NGC 359, a large elliptical galaxy in the Stripe 82 coverage.

To do this, enter the name “NGC 359” in the “Name or Position” text input box.

Leave the other defaults in place.




### Expected Result

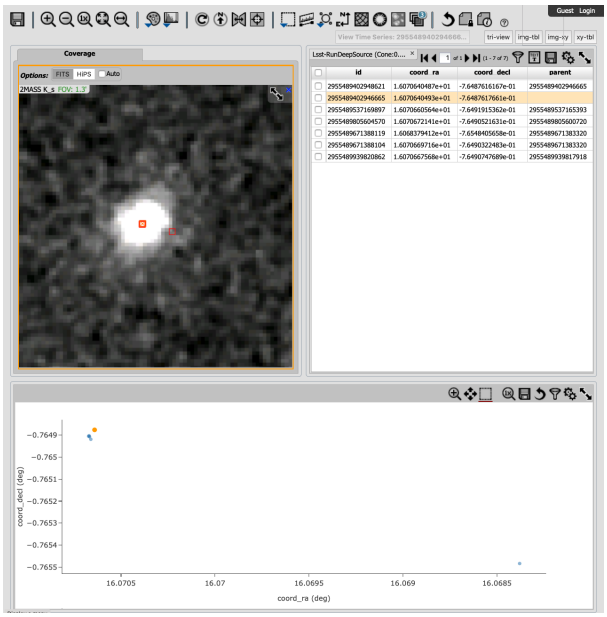
There should be a message like “NGC 359 resolved by NED”. The example coordinates should also changed to the coordinates of NGC 359.

### Step 2-3 from LVV-T851 Description

Submit the query to the portal query engine by clicking the “Search” button in the lower left corner of the interface.

### Expected Result

A firefly app with the summary image overlay and catalog widgets side by side. A plot of RA vs. Dec is displayed below the side by side widgets.




| Step 3 | Description |
|---|---|
| Examine tabular view to verify that the selected quantities are displayed. | |

| Expected Result |
|---|
| An interactive view |

### 4.2.78 LVV-T678 - Verify visualization of ancillary information

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T678 in Jira

#### 4.2.78.1 Verification Elements

- LVV-9883 - DMS-PRTL-REQ-0043-V-01: Visualization of Ancillary Information_1

#### 4.2.78.2 Test Items

Verify that the Portal provides the ability to visualize certain ancillary information produced by the LSST pipeline, including, but not limited to, image regions, image bit-planes, survey footprints, focal-plane footprints and PSF representations.

#### 4.2.78.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.79 LVV-T679 - Verify visualization linking image and tabular data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T679 in Jira

#### 4.2.79.1 Verification Elements

- LVV-9882 - DMS-PRTL-REQ-0044-V-01: Linking Visualization of Image Data to Tabular Data_1

#### 4.2.79.2 Test Items

Verify that the Portal aspect provides a capability for users to navigate between visualization and tabular data for a given tabular entry.

#### 4.2.79.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.80 LVV-T680 - Verify visualization tool for uploaded tabular or image data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T680 in Jira

#### 4.2.80.1 Verification Elements

- LVV-9885 - DMS-PRTL-REQ-0045-V-01: Visualization of Uploaded Tabular and Image Data_1

#### 4.2.80.2 Test Items

Verify that the Portal provides a means of visualizing uploaded tables or images.

#### 4.2.80.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.81 LVV-T681 - Verify visualization of workspace data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T681 in Jira

#### 4.2.81.1 Verification Elements

- LVV-9886 - DMS-PRTL-REQ-0046-V-01: Visualization of Workspace Data_1

#### 4.2.81.2 Test Items

Verify that data selected in a workspace browser can be conveniently visualized.

#### 4.2.81.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.82 LVV-T682 - Verify availability of property sheets for table rows

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T682 in Jira

#### 4.2.82.1 Verification Elements

- LVV-9888 - DMS-PRTL-REQ-0047-V-01: Table Row Property Sheet_1

#### 4.2.82.2 Test Items

Verify that the Portal permits inspection of a row in tabular data query results, summarizing metadata such as units, semantic information, and relationships between columns.

#### 4.2.82.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.83 LVV-T683 - Verify visualization of alerts

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T683 in Jira

#### 4.2.83.1 Verification Elements

- LVV-9887 - DMS-PRTL-REQ-0048-V-01: Alert Visualization_1

#### 4.2.83.2 Test Items

Verify that the Portal aspect provides for the users a “property sheet” for the contents of an alert packet including, but not necessarily limited to, the alert postage stamp image, the postage stamp time series, the photometric time series, the source and object information (e.g., position, brightness).

#### 4.2.83.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.84 LVV-T684 - Verify display of tabular data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T684 in Jira

#### 4.2.84.1 Verification Elements

- LVV-9891 - DMS-PRTL-REQ-0049-V-01: Display of Tabular Data_1

#### 4.2.84.2 Test Items

Verify that the Portal provides an interactive environment that displays table data by columns and rows.

#### 4.2.84.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.85 LVV-T685 - Verify column selection from tables

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T685 in Jira

#### 4.2.85.1 Verification Elements

- LVV-9889 - DMS-PRTL-REQ-0050-V-01: Column Selection of Tabular Data_1

#### 4.2.85.2 Test Items

Verify that the Portal provides the capability to select specific columns from tabular data, for display and download.

#### 4.2.85.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.86 LVV-T686 - Verify capability to re-order columns in displayed tabular data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T686 in Jira

#### 4.2.86.1 Verification Elements

- LVV-9892 - DMS-PRTL-REQ-0051-V-01: Display Order of Columns of Tabular Data_1

#### 4.2.86.2 Test Items

Verify that the Portal provides capability to change the order in which columns of tabular data are displayed.

#### 4.2.86.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.87 LVV-T687 - Verify capability of copying data in tables

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T687 in Jira

#### 4.2.87.1 Verification Elements

- LVV-9890 - DMS-PRTL-REQ-0052-V-01: Copying of Tabular Data_1

#### 4.2.87.2 Test Items

Verify that data can be interactively selected and copied from displayed tables in the Portal aspect.

#### 4.2.87.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.88 LVV-T688 - Verify row selection from tables

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T688 in Jira

#### 4.2.88.1 Verification Elements

- LVV-9894 - DMS-PRTL-REQ-0053-V-01: Row Selection of Tabular Data_1

#### 4.2.88.2 Test Items

Verify that the Portal provides the capability to select specific rows from tabular data, for display and download.

#### 4.2.88.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.89 LVV-T689 - Verify capability to display tabular data in paged format

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T689 in Jira

#### 4.2.89.1 Verification Elements

- LVV-9893 - DMS-PRTL-REQ-0054-V-01: Paging of Tabular Data_1

#### 4.2.89.2 Test Items

Verify that the Portal aspect provides the capability to display tabular data in a paged format,

in the case that database queries return results too large to display on a single page.

#### 4.2.89.3 Test Procedure

| Step 1-1 from LVV-T849 | Description |
|---|---|

Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/ .

| Expected Result |
|---|

A credential-entry screen should be displayed.

| Step 1-2 from LVV-T849 | Description |
|---|---|

Enter a valid set of credentials for an LSST user with LSP access on the instance under test.

| Expected Result |
|---|

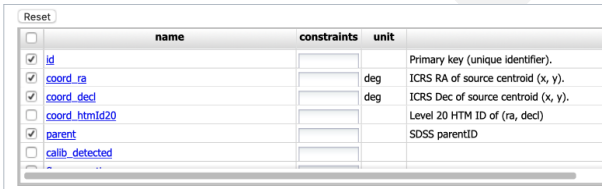
The Portal Aspect UI should be displayed following authentication.

| Step 2-1 from LVV-T851 | Description |
|---|---|

The default catalog (SDSS Stripe 82, 2013 LSST Processing) is fine for this.

Choose columns to return by:
1) unchecking the top box in the column selection box
2) checking columns for id, coord_ra, coord_dec, and parent.

The result should look like the following:




| Expected Result |
|---|

The column box should be configured to return a minimal useful set of columns.

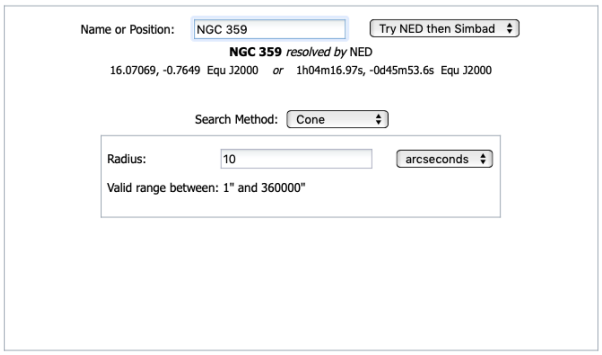
| Step 2-2 from LVV-T851 | Description |
|---|---|

Enter an object name for the portal to resolve. We will use NGC 359, a large elliptical galaxy in the Stripe 82 coverage.

To do this, enter the name “NGC 359” in the “Name or Position” text input box.

Rubin Observatory

Leave the other defaults in place.




## Expected Result

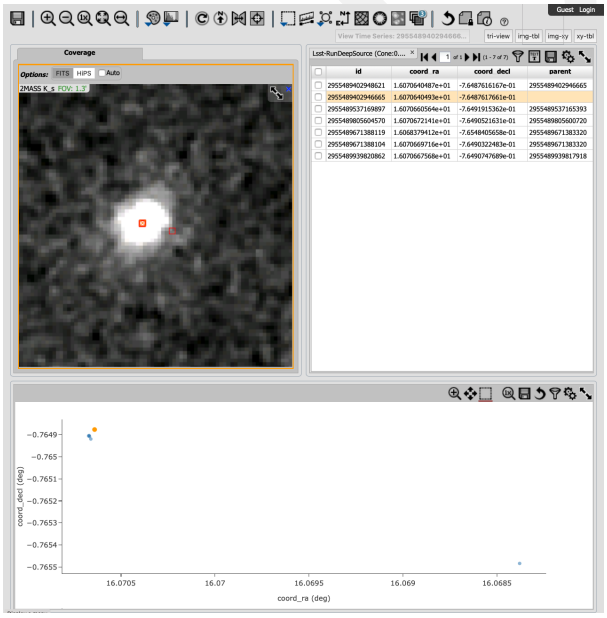
There should be a message like “NGC 359 resolved by NED”. The example coordinates should also changed to the coordinates of NGC 359.

## Step 2-3 from LVV-T851 Description

Submit the query to the portal query engine by clicking the “Search” button in the lower left corner of the interface.

## Expected Result

A firefly app with the summary image overlay and catalog widgets side by side. A plot of RA vs. Dec is displayed below the side by side widgets.



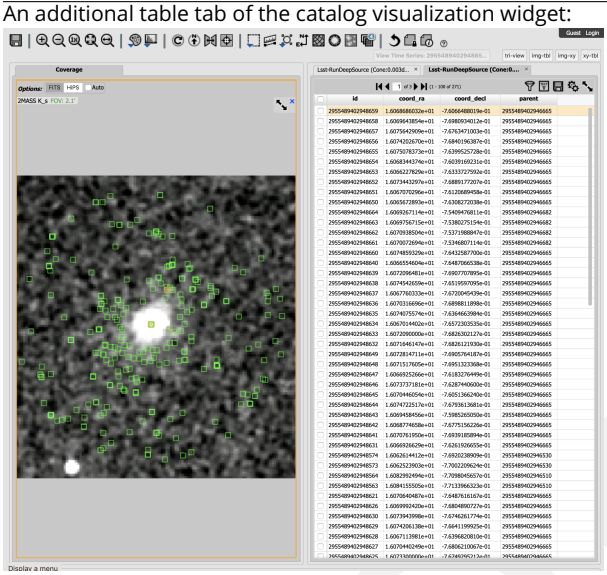
Rubin Observatory

| Step 3 | Description |
|---|---|

Extend the size of the returned table by:
1) returning to the query interface by clicking the “LSST Data” button in the upper left of the interface
2) update the query by increasing the query radius from 10 to 60 arcseconds
3) execute the modified query by clicking the “Search” button in the lower left of the query interface

| Expected Result |
|---|

An additional table tab of the catalog visualization widget:



| Step 4 | Description |
|---|---|

Verify the ability to page through the catalog by using the navigation icons at the upper left of the catalog visualization widget.
Page forward to the end of the catalog. Use the “back to beginning” button.

| Expected Result |
|---|

Expect to be able to page through the catalog and to navigate to the first or last page from any intervening page.

| Step 5-1 from LVV-T850 | Description |
|---|---|

Currently, there is no logout mechanism on the portal.
This should be updated as the system matures.

Simply close the browser window.

| Expected Result |
|---|

Closed browser window. When navigating to the portal endpoint, expect to execute the steps in LVV-T849.

### 4.2.90 LVV-T690 - Verify creation and display of X-Y scatter plots

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T690 in Jira

#### 4.2.90.1 Verification Elements

- LVV-9901 - DMS-PRTL-REQ-0055-V-01: XY Scatter Plots_1

#### 4.2.90.2 Test Items

Verify that the Portal provides the capability to create and display 2-dimensional X-Y scatter plots from tabular data.

#### 4.2.90.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.91 LVV-T691 - Verify creation and display of histogram plots

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T691 in Jira

#### 4.2.91.1 Verification Elements

- LVV-9895 - DMS-PRTL-REQ-0056-V-01: Histograms_1

#### 4.2.91.2 Test Items

Verify that the Portal provides the capability to create and display 1-dimensional and 2-dimensional histogram plots from tabular data.

#### 4.2.91.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.92 LVV-T692 - Verify capability to change symbol shapes, sizes, and colors in XY(Z) scatter plots

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T692 in Jira

#### 4.2.92.1 Verification Elements

- LVV-9900 - DMS-PRTL-REQ-0057-V-01: Symbol Size, Shape, and Color Coding in XY(Z) Scatter Plots_1

#### 4.2.92.2 Test Items

Verify that users can change the shape, size, and color of symbols in XY(Z) scatter plots to indicate information from additional dimensions of tabular data.

#### 4.2.92.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.93 LVV-T693 - Verify visualization of uncertainties in plots

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T693 in Jira

#### 4.2.93.1 Verification Elements

- LVV-9898 - DMS-PRTL-REQ-0058-V-01: Plot Quantitative Uncertainties_1

#### 4.2.93.2 Test Items

Verify the capability to represent uncertainties in plots of tabular data.

#### 4.2.93.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.94 LVV-T694 - Verify visualization of asymmetric uncertainties

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T694 in Jira

#### 4.2.94.1 Verification Elements

- LVV-9897 - DMS-PRTL-REQ-0059-V-01: Plot Asymmetric Quantitative Uncertainties_1

#### 4.2.94.2 Test Items

Verify that the Portal aspect can display uncertainties that are asymmetric (i.e., differ in the positive and negative directions).

#### 4.2.94.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.95 LVV-T695 - Verify visualization of upper and lower limits in plots

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T695 in Jira

#### 4.2.95.1 Verification Elements

- LVV-9899 - DMS-PRTL-REQ-0060-V-01: Plot Upper and Lower Quantitative Limits_1

#### 4.2.95.2 Test Items

Verify that the Portal is capable of displaying quantities that represent upper or lower limits

(provided, for example, for non-detections).

#### 4.2.95.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.96 LVV-T696 - Verify visualization of multiple XY plots on the same display

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T696 in Jira

#### 4.2.96.1 Verification Elements

- LVV-9896 - DMS-PRTL-REQ-0061-V-01: Multiple XY-Plots on the Same Display_1

#### 4.2.96.2 Test Items

Verify that the Portal provides the capability to display multiple XY plots on a single display canvas.

#### 4.2.96.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.97 LVV-T697 - Verify display of raft and full focal-plane single-visit images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T697 in Jira

#### 4.2.97.1 Verification Elements

- LVV-9906 - DMS-PRTL-REQ-0063-V-01: Display Raft- and Focal-Plane-Level Single-Visit Image Data_1

#### 4.2.97.2 Test Items

Verify that the Portal aspect has the ability to generate a single-visit image display of a raft and full focal-plane image.

#### 4.2.97.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.98 LVV-T698 - Verify display of cutout from single-visit image

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T698 in Jira

#### 4.2.98.1 Verification Elements

- LVV-9907 - DMS-PRTL-REQ-0064-V-01: Display Single Visit Image Cut-Out_1

#### 4.2.98.2 Test Items

Verify that the Portal is capable of displaying a cutout from a single-visit image.

#### 4.2.98.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.99 LVV-T699 - Verify display of native coadd images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T699 in Jira

#### 4.2.99.1 Verification Elements

- LVV-9904 - DMS-PRTL-REQ-0065-V-01: Display Native Coadded Image Data Products_1

#### 4.2.99.2 Test Items

Verify that the Portal can display native coadd image products (i.e., patch-level images).

#### 4.2.99.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

### 4.2.100 LVV-T700 - Verify display of coadd cutouts and mosaics

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T700 in Jira

#### 4.2.100.1 Verification Elements

- LVV-9903 - DMS-PRTL-REQ-0066-V-01: Display Coadded Image Cutouts / Mosaics_1

#### 4.2.100.2 Test Items

Verify that the Portal aspect has the capability to display cutout or mosaic images created from coadds.

#### 4.2.100.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

### 4.2.101 LVV-T701 - Verify display of calibration images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T701 in Jira

#### 4.2.101.1 Verification Elements

- LVV-9902 - DMS-PRTL-REQ-0067-V-01: Display Calibration Image Data Products_1

#### 4.2.101.2 Test Items

Verify that the Portal is capable of displaying calibration image data products, including synthetic flats, bias frames, etc.

#### 4.2.101.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.102 LVV-T702 - Verify display of user-provided images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T702 in Jira

#### 4.2.102.1 Verification Elements

- LVV-9908 - DMS-PRTL-REQ-0068-V-01: Display User-provided Images_1

#### 4.2.102.2 Test Items

Verify that the Portal has the capability of displaying user-provided images in widely-used

astronomical data formats, and properly interprets commonly-used WCS specifications from the image headers. This includes FITS format, and may be extended to others.

#### 4.2.102.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.103 LVV-T703 - Verify display of image property sheet

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T703 in Jira

#### 4.2.103.1 Verification Elements

- LVV-9909 - DMS-PRTL-REQ-0069-V-01: Image Property Sheet_1

#### 4.2.103.2 Test Items

Verify that the Portal has the ability to display a property sheet for an image data product or user-provided image, displaying image format and other header data.

#### 4.2.103.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.104 LVV-T704 - Verify that coordinate display tools are provided for images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T704 in Jira

#### 4.2.104.1 Verification Elements

- LVV-9914 - DMS-PRTL-REQ-0070-V-01: Provide Coordinate Display Tools for Images_1

#### 4.2.104.2 Test Items

Verify that the Portal provides all the capabilities in the Coordinate Display Tools section in LDM-554 for image displays. Specific capabilities will depend on the availability of WCS information for an image.

#### 4.2.104.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.105 LVV-T705 - Verify image pixel content display

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T705 in Jira

#### 4.2.105.1 Verification Elements

- LVV-9911 - DMS-PRTL-REQ-0071-V-01: Image Pixel Content Display_1

#### 4.2.105.2 Test Items

Verify that the Portal provides the capability to inspect the pixel contents of an image at the cursor position.

#### 4.2.105.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.106 LVV-T706 - Verify spatial manipulation of images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T706 in Jira

#### 4.2.106.1 Verification Elements

- LVV-9912 - DMS-PRTL-REQ-0072-V-01: Image Spatial Manipulation_1

#### 4.2.106.2 Test Items

Verify that the Portal allows users to spatially manipulate displayed images, including resizing, rescaling, reprojecting, zooming, and cropping.

#### 4.2.106.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.107 LVV-T707 - Verify multi-image scaling and alignment

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T707 in Jira

#### 4.2.107.1 Verification Elements

- LVV-9913 - DMS-PRTL-REQ-0073-V-01: Multi-Image Scaling and Aligning_1

#### 4.2.107.2 Test Items

Verify that the Portal has the capability to display multiple images on a common astrophysical coordinate scale, aligned on the screen in a common orientation.

#### 4.2.107.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.108 LVV-T708 - Verify manipulation of image appearance

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T708 in Jira

#### 4.2.108.1 Verification Elements

- LVV-9910 - DMS-PRTL-REQ-0074-V-01: Image Appearance Manipulation_1

#### 4.2.108.2 Test Items

Verify that the Portal enables users to manipulate the appearance of displayed images, including changing the stretch, color table, or displayed data range.

#### 4.2.108.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.109 LVV-T709 - Verify display of image mask and variance overlays

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T709 in Jira

#### 4.2.109.1 Verification Elements

- LVV-9915 - DMS-PRTL-REQ-0075-V-01: Image Mask and Variance Overlays_1

#### 4.2.109.2 Test Items

Verify that the Portal enables overlaying pixel-based data on top of already displayed images,

including image masks (bit planes) and variance data.

#### 4.2.109.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.110 LVV-T710 - Verify display of plot overlays on images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T710 in Jira

#### 4.2.110.1 Verification Elements

- LVV-9917 - DMS-PRTL-REQ-0076-V-01: Image Plot Overlays_1

#### 4.2.110.2 Test Items

Verify that the Portal has the capability to overlay tabular data on an image, based on input image or astrophysical coordinates, as supported by availability of coordinate system information.

#### 4.2.110.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.111 LVV-T711 - Verify capability to adjust the appearance of plot overlays on images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T711 in Jira

#### 4.2.111.1 Verification Elements

- LVV-9916 - DMS-PRTL-REQ-0077-V-01: Image Overlays: Adjustment of Colors and Positions_1

#### 4.2.111.2 Test Items

Verify that the Portal enables users to adjust the annotations, colors, transparency, and positions of plot overlays displayed on top of images.

#### 4.2.111.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.112 LVV-T712 - Verify display all-sky HEALPix image

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T712 in Jira

#### 4.2.112.1 Verification Elements

- LVV-9918 - DMS-PRTL-REQ-0078-V-01: Display All-Sky HEALPix Image_1

#### 4.2.112.2 Test Items

Verify that the Portal aspect is able to display an all-sky image in the HEALPix format.

#### 4.2.112.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.113 LVV-T713 - Verify ability to zoom in/out on a HEALPix image

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |
| Open LVV-T713 in Jira | | | | |

#### 4.2.113.1 Verification Elements

- LVV-9922 - DMS-PRTL-REQ-0079-V-01: Zoom In and Out on a HEALPix Image_1

#### 4.2.113.2 Test Items

Verify that the Portal enables users to zoom in and out on a displayed HEALPix image, adapting the displayed spatial scale and traversing different levels of the image hierarchy.

#### 4.2.113.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.114 LVV-T714 - Verify panning in HEALPix image display

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T714 in Jira

#### 4.2.114.1 Verification Elements

- LVV-9920 - DMS-PRTL-REQ-0080-V-01: Pan Around on a HEALPix Image_1

#### 4.2.114.2 Test Items

Verify that the Portal enables panning (i.e., moving around within) a displayed HEALPix image, provided that the entire image is not already displayed.

#### 4.2.114.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.115 LVV-T715 - Verify selection of HEALPix pixels

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T715 in Jira

#### 4.2.115.1 Verification Elements

- LVV-9919 - DMS-PRTL-REQ-0081-V-01: HEALPix Pixel Selection_1

#### 4.2.115.2 Test Items

Verify that Portal users can select individual HEALPix pixels or groups of pixels and obtain references from them for use in other LSP aspects.

#### 4.2.115.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.116 LVV-T716 - Verify retrieval of HEALPix-associated data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T716 in Jira

#### 4.2.116.1 Verification Elements

- LVV-9921 - DMS-PRTL-REQ-0082-V-01: Retrieve HEALPix-Associated Data_1

#### 4.2.116.2 Test Items

Verify that the Portal enables users to retrieve metadata and data associated with selected

HEALPixels and display that data in tabular or image form as appropriate.

#### 4.2.116.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.117 LVV-T717 - Verify broad applicability of coordinate display

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T717 in Jira

#### 4.2.117.1 Verification Elements

- LVV-9924 - DMS-PRTL-REQ-0083-V-01: Coordinate Display Applicability_1

#### 4.2.117.2 Test Items

Verify that the Portal aspect provides the coordinate display and measurement tools for all applicable two-dimensional data displays where the two coordinates have a spatial interpretation.

#### 4.2.117.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.118 LVV-T718 - Verify point coordinate display

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T718 in Jira

#### 4.2.118.1 Verification Elements

- LVV-9928 - DMS-PRTL-REQ-0084-V-01: Point Coordinate Display_1

#### 4.2.118.2 Test Items

Verify that the Portal aspect displays the coordinates corresponding to the position of the mouse cursor. When coordinate conversion information is available, all available coordinates should be displayed.

#### 4.2.118.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.119 LVV-T719 - Verify distance measurement tool

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T719 in Jira

#### 4.2.119.1 Verification Elements

- LVV-9926 - DMS-PRTL-REQ-0085-V-01: Distance Measurement Tool_1

#### 4.2.119.2 Test Items

Verify that the Portal provides a tool to measure the distance between two points in an image or a 2-dimensional plot. Distances should be calculated in both image/plot coordinates (electronic or spatial X and Y) and in astrophysical coordinates (if applicable). Calculations shall be performed in spherical geometry where appropriate.

#### 4.2.119.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.120 LVV-T720 - Verify coordinate grid overlays

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T720 in Jira

#### 4.2.120.1 Verification Elements

- LVV-9925 - DMS-PRTL-REQ-0086-V-01: Coordinate Grid Overlays_1

#### 4.2.120.2 Test Items

Verify that the Portal provides the capability to overlay one or more coordinate grids atop images or 2-dimensional plots with known coordinate systems. (For example, it should be

possible to overlay equatorial, Galactic, and ecliptic coordinate grids simultaneously.)

#### 4.2.120.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.121 LVV-T721 - Verify astrophysical compass overlay

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T721 in Jira

#### 4.2.121.1 Verification Elements

- LVV-9923 - DMS-PRTL-REQ-0087-V-01: Astrophysical Compass Overlay_1

#### 4.2.121.2 Test Items

Verify that the Portal provides the capability to overlay a North-East compass atop images or 2-dimensional plots with known astrophysical coordinate systems.

#### 4.2.121.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.122 LVV-T722 - Verify geometric figure overlays

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T722 in Jira

#### 4.2.122.1 Verification Elements

- LVV-9927 - DMS-PRTL-REQ-0088-V-01: Geometric Figure Overlays_1

#### 4.2.122.2 Test Items

Verify that the Portal aspect enables the drawing, display, and selection of a closed 2-dimensional polygon on any 2-dimensional image.

#### 4.2.122.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.123 LVV-T723 - Verify sorting of tabular data by column

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T723 in Jira

#### 4.2.123.1 Verification Elements

- LVV-9934 - DMS-PRTL-REQ-0089-V-01: Sorting of Tabular Data by Column_1

#### 4.2.123.2 Test Items

Verify that the Portal aspect enables users to sort tabular data by a single column within the table and redisplay the sorted data.

#### 4.2.123.3 Test Procedure

| Step 1-1 from LVV-T849 | Description |
|---|---|

Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/ .

| Expected Result |
|---|

A credential-entry screen should be displayed.

| Step 1-2 from LVV-T849 | Description |
|---|---|

Enter a valid set of credentials for an LSST user with LSP access on the instance under test.

| Expected Result |
|---|

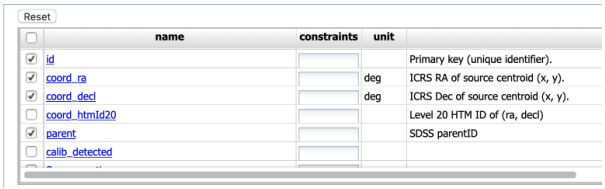
The Portal Aspect UI should be displayed following authentication.

| Step 2-1 from LVV-T851 | Description |
|---|---|

The default catalog (SDSS Stripe 82, 2013 LSST Processing) is fine for this.

Choose columns to return by:
1) unchecking the top box in the column selection box
2) checking columns for id, coord_ra, coord_dec, and parent.

The result should look like the following:



Rubin Observatory

## Expected Result

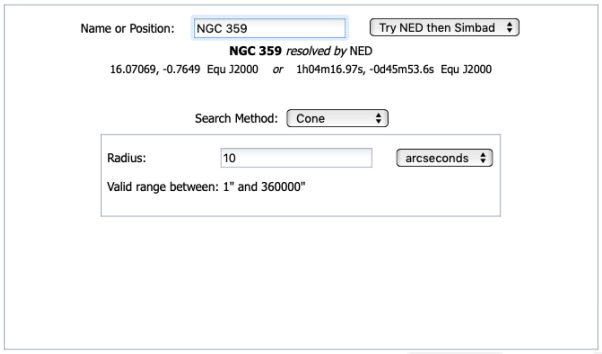
The column box should be configured to return a minimal useful set of columns.

## Step 2-2 from LVV-T851 Description

Enter an object name for the portal to resolve. We will use NGC 359, a large elliptical galaxy in the Stripe 82 coverage.

To do this, enter the name “NGC 359” in the “Name or Position” text input box.

Leave the other defaults in place.




## Expected Result

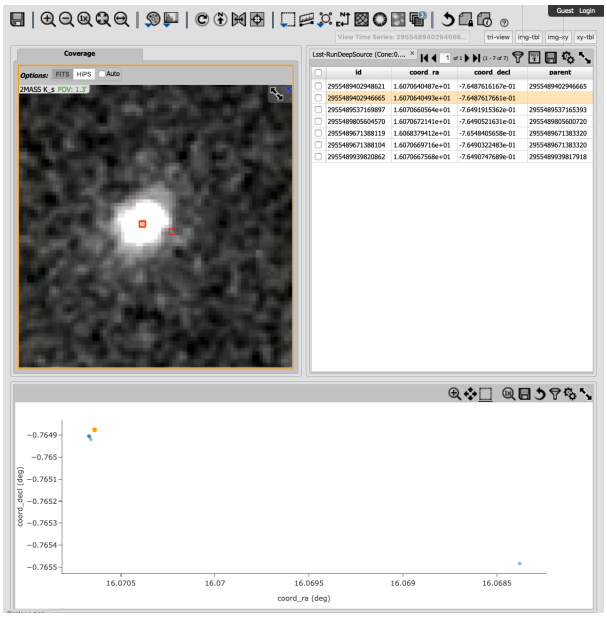
There should be a message like “NGC 359 resolved by NED”. The example coordinates should also changed to the coordinates of NGC 359.

## Step 2-3 from LVV-T851 Description

Submit the query to the portal query engine by clicking the “Search” button in the lower left corner of the interface.

## Expected Result

A firefly app with the summary image overlay and catalog widgets side by side. A plot of RA vs. Dec is displayed below the side by side widgets.

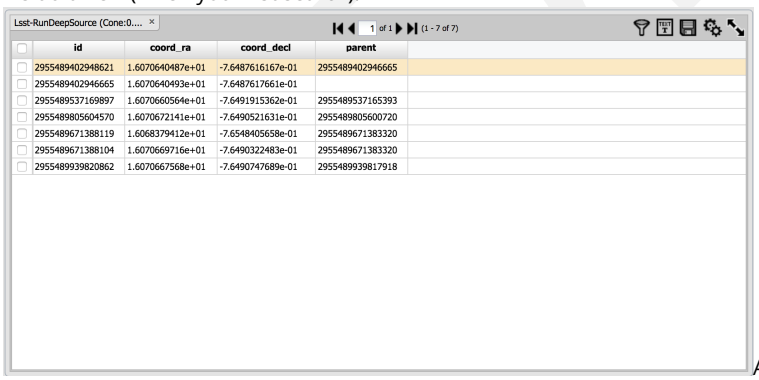



## Step 3 Description

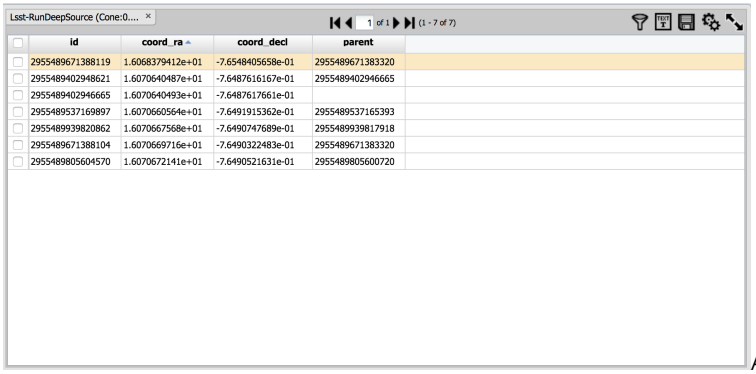
Click on the column header that reads “coord_ra”. This should re-sort the table so that objects are sorted in ascending order by RA. Click on the “coord_ra” header again, and the sorting should change to descending order by RA.

## Expected Result

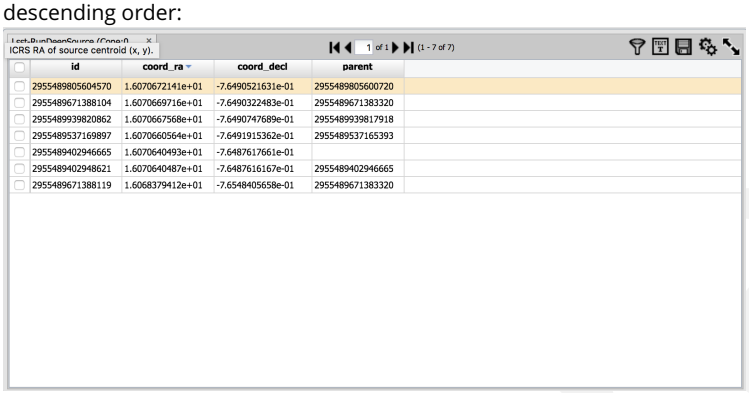
Default view (when you first search):




After clicking once on “coord_ra”, it sorts by RA in ascending order:




After clicking again on “coord_ra”, it sorts by RA in descending order:




| Step 4 | Description |
|---|---|

Try sorting by another column (e.g., “Id”) by clicking on that column header, and confirm that the table updates.

| Expected Result |
|---|

Table now sorted by the column that was clicked.

| Step 5-1 from LVV-T850 | Description |
|---|---|

Currently, there is no logout mechanism on the portal.
This should be updated as the system matures.

Simply close the browser window.

| Expected Result |
|---|

Closed browser window. When navigating to the portal endpoint, expect to execute the steps in LVV-T849.

### 4.2.124 LVV-T724 - Verify simple filtering of tabular data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T724 in Jira

#### 4.2.124.1 Verification Elements

- LVV-9933 - DMS-PRTL-REQ-0090-V-01: Simple Filtering of Tabular Data_1

#### 4.2.124.2 Test Items

Verify that the Portal aspect provides the capability to filter tabular data by a single column, including but not limited to less than (<), less than or equal (<=), greater than (>), greater than or equal (=>), equal (=), not equal (!=) and not null (!=null).

#### 4.2.124.3 Test Procedure

| Step 1-1 from LVV-T849 | Description |
|---|---|

Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/ .

| Expected Result |
|---|

A credential-entry screen should be displayed.

| Step 1-2 from LVV-T849 | Description |
|---|---|

Enter a valid set of credentials for an LSST user with LSP access on the instance under test.

| Expected Result |
|---|

The Portal Aspect UI should be displayed following authentication.

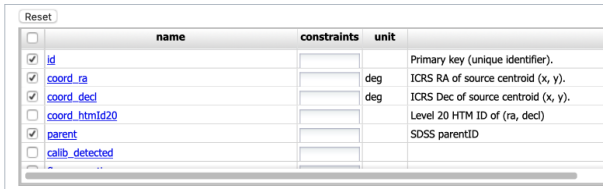
| Step 2-1 from LVV-T851 | Description |
|---|---|

The default catalog (SDSS Stripe 82, 2013 LSST Processing) is fine for this.

Choose columns to return by:
1) unchecking the top box in the column selection box
2) checking columns for id, coord_ra, coord_dec, and parent.

Rubin Observatory

The result should look like the following:




## Expected Result

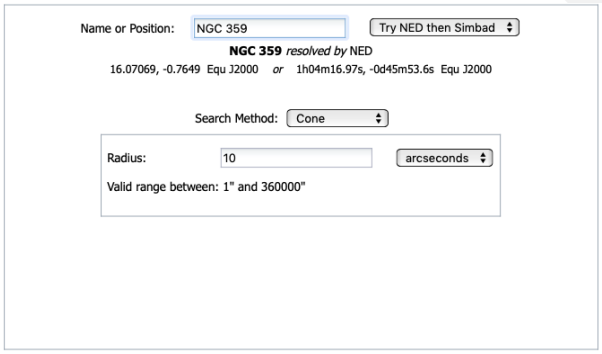
The column box should be configured to return a minimal useful set of columns.

## Step 2-2 from LVV-T851 Description

Enter an object name for the portal to resolve. We will use NGC 359, a large elliptical galaxy in the Stripe 82 coverage.

To do this, enter the name “NGC 359” in the “Name or Position” text input box.

Leave the other defaults in place.




## Expected Result

There should be a message like “NGC 359 resolved by NED”. The example coordinates should also changed to the coordinates of NGC 359.

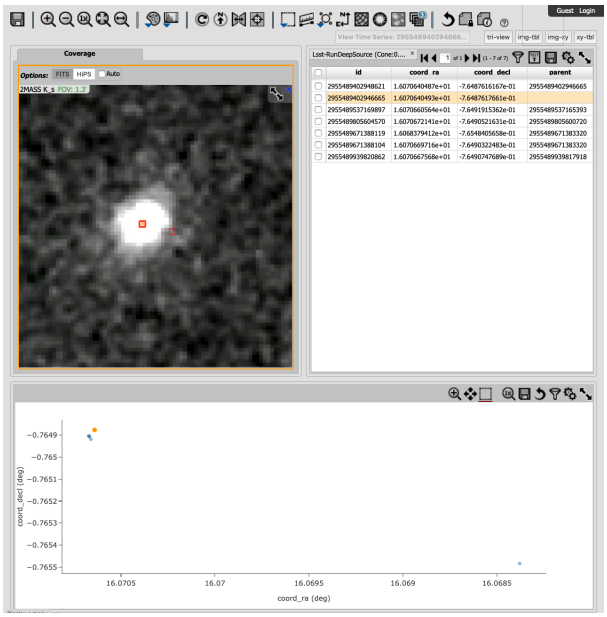
## Step 2-3 from LVV-T851 Description

Submit the query to the portal query engine by clicking the “Search” button in the lower left corner of the interface.

## Expected Result

A firefly app with the summary image overlay and catalog widgets side by side. A plot of RA vs. Dec is displayed below the side by side widgets.

Rubin Observatory



| Step 3 | Description |
|---|---|

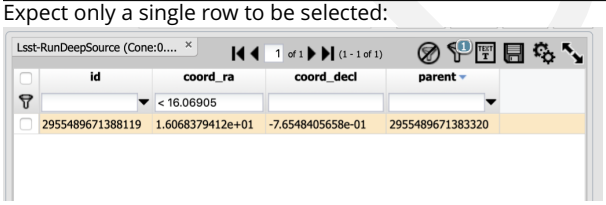
Verify the table can be filtered by:

1. choosing the “filter” icon:

2. entering a filter criterion in the filter box: e.g. coadd_ra is less than 16.06905.
3. pressing return to execute the filtering

| Expected Result |
|---|

Expect only a single row to be selected:




| Step 4-1 from LVV-T850 | Description |
|---|---|

Currently, there is no logout mechanism on the portal.
This should be updated as the system matures.

Simply close the browser window.

| Expected Result |
|---|

Closed browser window. When navigating to the portal endpoint, expect to execute the steps in LVV-T849.

### 4.2.125 LVV-T725 - Verify calculated filtering of tabular data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T725 in Jira

#### 4.2.125.1 Verification Elements

- LVV-9929 - DMS-PRTL-REQ-0091-V-01: Calculated Filtering of Tabular Data_1

#### 4.2.125.2 Test Items

Verify that the Portal aspect provides the capability to filter a table by single column where the filter has simple arithmetic calculations applied to the column values, including but not limited to sqrt, log, log10, exponentials and trigonometric functions.

#### 4.2.125.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.126 LVV-T726 - Verify filtering data by multiple table columns

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T726 in Jira

#### 4.2.126.1 Verification Elements

- LVV-9931 - DMS-PRTL-REQ-0092-V-01: Filtering of Tabular Data by Multiple Columns_1

#### 4.2.126.2 Test Items

Verify that the Portal aspect provides the capability to filter tabular data by multiple columns within the table and redisplay the filtered table.

#### 4.2.126.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.127 LVV-T727 - Verify calculated tabular data columns

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T727 in Jira

#### 4.2.127.1 Verification Elements

- LVV-9930 - DMS-PRTL-REQ-0093-V-01: Calculated Quantities on Tabular Data_1

#### 4.2.127.2 Test Items

Verify that the Portal enables the arithmetic calculation and display of new tabular data columns based on existing columns in a table.

#### 4.2.127.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.128 LVV-T728 - Verify statistical measurements on tabular data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T728 in Jira

#### 4.2.128.1 Verification Elements

- LVV-9935 - DMS-PRTL-REQ-0094-V-01: Statistical Measurements on Tabular Data_1

#### 4.2.128.2 Test Items

Verify that the Portal aspect enables the capability to perform a set of statistical measurements (e.g., mean, median, RMS, skew, kurtosis) on tabular data selected by the user.

#### 4.2.128.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.129 LVV-T729 - Verify saving of displayed tabular data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T729 in Jira

#### 4.2.129.1 Verification Elements

- LVV-9932 - DMS-PRTL-REQ-0095-V-01: Saving Displayed Tabular Data_1

#### 4.2.129.2 Test Items

Verify that the Portal aspect provides the capability to save and or download tabular data as it is displayed in the interface maintaining the content, filtering, and sorting.

#### 4.2.129.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.130 LVV-T730 - Verify creation and display of false-color images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T730 in Jira

#### 4.2.130.1 Verification Elements

- LVV-9936 - DMS-PRTL-REQ-0096-V-01: False-color Images Creation and Display_1

#### 4.2.130.2 Test Items

Verify that the Portal aspect has the capability to create and display false-color images com-

posed from any user-selectable set of filters from multiple filter views of the same region.

#### 4.2.130.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.131 LVV-T731 - Verify statistical measurements on user-selected regions of images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T731 in Jira

#### 4.2.131.1 Verification Elements

- LVV-9937 - DMS-PRTL-REQ-0097-V-01: Statistical Measurements on Image Data_1

#### 4.2.131.2 Test Items

Verify that the Portal aspect enables the capability to perform a set of statistical measurements (e.g., mean, median, RMS, skew, kurtosis) on user-selected regions in images.

#### 4.2.131.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.132 LVV-T732 - Verify overlay of catalog sources/objects on images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T732 in Jira

#### 4.2.132.1 Verification Elements

- LVV-9942 - DMS-PRTL-REQ-0098-V-01: Overlay Catalog of Sources and Objects on Images_1

#### 4.2.132.2 Test Items

Verify that the Portal aspect enables the overlay of positions of catalog sources and objects on a displayed image based upon astrophysically-based or observatory-based coordinates.

#### 4.2.132.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.133 LVV-T733 - Verify overlay of LSST-derived orbits on images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T733 in Jira

#### 4.2.133.1 Verification Elements

- LVV-9943 - DMS-PRTL-REQ-0099-V-01: Overlay LSST-Derived Orbits_1

#### 4.2.133.2 Test Items

Verify that the Portal aspect has the capability to overlay predicted positions from the orbits of solar system objects in the LSST catalog on to images.

#### 4.2.133.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.134 LVV-T734 - Verify overlay of user-supplied catalogs on images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T734 in Jira

#### 4.2.134.1 Verification Elements

- LVV-9944 - DMS-PRTL-REQ-0100-V-01: Overlay User-provided Catalogs on Images_1

#### 4.2.134.2 Test Items

Verify that the Portal enables users to overlay the positions of objects in user-supplied catalogs on top of images.

#### 4.2.134.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.135 LVV-T735 - Verify overlay of user-supplied region files on images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T735 in Jira

#### 4.2.135.1 Verification Elements

- LVV-9945 - DMS-PRTL-REQ-0101-V-01: Overlay User-provided Region Files on Images_1

#### 4.2.135.2 Test Items

Verify that Portal users can upload a region file and overlay the region on a displayed image.

#### 4.2.135.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.136 LVV-T736 - Verify overlay of camera artifacts on images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T736 in Jira

#### 4.2.136.1 Verification Elements

- LVV-9940 - DMS-PRTL-REQ-0102-V-01: Display of Camera Artifacts as Overlays_1

#### 4.2.136.2 Test Items

Verify that the Portal aspect has the capability to display as image overlays camera artifacts including but not limited to image crosstalk matrices, ghost image identifications, saturation, and column bleeding.

#### 4.2.136.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.137 LVV-T737 - Verify single-object time-domain image view

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T737 in Jira

#### 4.2.137.1 Verification Elements

- LVV-9948 - DMS-PRTL-REQ-0103-V-01: Single-Object Time-Domain Image View_1

#### 4.2.137.2 Test Items

Verify that the Portal provides the capability to view an image time series that maintains the same physical scale, photometric scale, and image size display of a cutout area centered on an LSST object. If the object moves, then the images should stay centered on the object.

#### 4.2.137.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.138 LVV-T738 - Verify position-based time-domain image view

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T738 in Jira

#### 4.2.138.1 Verification Elements

- LVV-9946 - DMS-PRTL-REQ-0104-V-01: Position-based Time-Domain Image View_1

#### 4.2.138.2 Test Items

Verify that the Portal provides the capability to view an image time series that maintains the same physical scale, photometric scale, and image size display of a specified region on the sky. If the object moves, then the images should stay centered on the sky and the object will appear to move.

#### 4.2.138.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.139 LVV-T739 - Verify display of light curves

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T739 in Jira

##### 4.2.139.1 Verification Elements

- LVV-9938 - DMS-PRTL-REQ-0105-V-01: Brightness Light Curves_1

##### 4.2.139.2 Test Items

Verify that the Portal can display graphically the brightness/flux/magnitude of an LSST Object, Source, or ForcedSource as a function of time.

##### 4.2.139.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.140 LVV-T740 - Verify linked tables, plots, and images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T740 in Jira

#### 4.2.140.1 Verification Elements

- LVV-9941 - DMS-PRTL-REQ-0106-V-01: Linked Tables, Plots, and Images_1

#### 4.2.140.2 Test Items

Verify that the Portal aspect has the capability to have tabular data, plots, and images with overlays connected via brushing and linking, so that updates to the data in any one visualization tool (e.g., plot, image, table) creates an update in other visualization tools.

#### 4.2.140.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.141 LVV-T741 - Verify capability to select data from a plot or image

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T741 in Jira

#### 4.2.141.1 Verification Elements

- LVV-9939 - DMS-PRTL-REQ-0107-V-01: Data Selection from a Plot or Image_1

#### 4.2.141.2 Test Items

Verify that the Portal aspect enables the selection of data contained inside or outside a closed 2-dimensional polygon on an xy-plot, 2-dimension data structure (e.g., density plot), and a 2-dimensional image.

#### 4.2.141.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.142 LVV-T742 - Verify saving data selection from a plot or image

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T742 in Jira

#### 4.2.142.1 Verification Elements

- LVV-9947 - DMS-PRTL-REQ-0108-V-01: Saving Data Selection from a Plot or Image_1

#### 4.2.142.2 Test Items

Verify that the Portal aspect enables the saving of data selected via a polygon selection across the linked images, tables, and plots.

#### 4.2.142.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.143 LVV-T743 - Verify access to user databases

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T743 in Jira

#### 4.2.143.1 Verification Elements

- LVV-9949 - DMS-PRTL-REQ-0109-V-01: Access to User Databases_1

#### 4.2.143.2 Test Items

Verify that the Portal aspect provides read/write access to user databases (Level 3 tabular data products) and has implemented any access restrictions placed on such data.

#### 4.2.143.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.144 LVV-T744 - Verify tabular data download

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T744 in Jira

#### 4.2.144.1 Verification Elements

- LVV-9954 - DMS-PRTL-REQ-0110-V-01: Tabular Data Download_1

#### 4.2.144.2 Test Items

Verify that the Portal aspect includes a mechanism for a user to download to a remote site, Workspace, or to an existing or new user database the tabular results from a database query, including for catalog or image metadata.

#### 4.2.144.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.145 LVV-T745 - Verify image data download

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T745 in Jira

#### 4.2.145.1 Verification Elements

- LVV-9951 - DMS-PRTL-REQ-0111-V-01: Image Data Download_1

#### 4.2.145.2 Test Items

Verify that the Portal aspect includes mechanisms for a user to download image data to a remote site or to the Workspace, from both screens displaying images and screens displaying lists of image metadata.

#### 4.2.145.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.146 LVV-T746 - Verify selected image download

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T746 in Jira

#### 4.2.146.1 Verification Elements

- LVV-9953 - DMS-PRTL-REQ-0112-V-01: Selected Image Download_1

#### 4.2.146.2 Test Items

Verify that the Portal aspect supports user selection for download of a subset of the images in an image metadata table or image cutout table.

#### 4.2.146.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.147 LVV-T747 - Verify estimation of data download volume

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T747 in Jira

#### 4.2.147.1 Verification Elements

- LVV-9950 - DMS-PRTL-REQ-0113-V-01: Download Volume Estimation_1

#### 4.2.147.2 Test Items

Verify that the Portal provides an estimate of the volume of a data download before the user confirms the download option.

#### 4.2.147.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.148 LVV-T748 - Verify notification of long download completion

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T748 in Jira

#### 4.2.148.1 Verification Elements

- LVV-9952 - DMS-PRTL-REQ-0114-V-01: Long Download Completion Notification_1

#### 4.2.148.2 Test Items

Verify that the Portal aspect notifies the user with an estimate of how long a download is

expected to take. The user can continue to monitor the download; verify that an option has been provided to notify the user when the download has completed.

#### 4.2.148.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.149 LVV-T749 - Verify API for visualization components

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T749 in Jira

#### 4.2.149.1 Verification Elements

- LVV-9955 - DMS-PRTL-REQ-0115-V-01: APIs for Visualization Components_1

#### 4.2.149.2 Test Items

Verify that the Portal aspect provides a documented application program interface that allows users and services at any location to access and manipulate the Portal's visualization services. This is intended to enable API control of the visualization components and tool-level visualization services to be called and controlled through an API. There will be a Web API as well as a Python wrapper for it.

#### 4.2.149.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.150 LVV-T750 - Verify implementation of storage quotas status

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T750 in Jira

##### 4.2.150.1 Verification Elements

- LVV-9958 - DMS-PRTL-REQ-0116-V-01: Storage Quotas User Interface_1

##### 4.2.150.2 Test Items

Verify that the Portal aspect provides a summary of the current status of users' storage allocations.

##### 4.2.150.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.151 LVV-T751 - Verify implementation of computational quotas status

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T751 in Jira

#### 4.2.151.1 Verification Elements

- LVV-9956 - DMS-PRTL-REQ-0117-V-01: Computational Quotas User Interface_1

#### 4.2.151.2 Test Items

Verify that the Portal aspect provides a summary of the current status of users' allocations of computational resources.

#### 4.2.151.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.152 LVV-T752 - Verify saved Portal display preferences

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T752 in Jira

#### 4.2.152.1 Verification Elements

- LVV-9957 - DMS-PRTL-REQ-0118-V-01: Portal Display Preferences_1

#### 4.2.152.2 Test Items

Verify that the Portal aspect enables a user to establish and save viewing preferences, in-

cluding, but not limited to, which tabular data columns to view, how tables should be sorted by default, which calculated quantities appear within a table, what image stretch and color tables, what types of plots are generated, how data are overlaid on images.

#### 4.2.152.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.153 LVV-T753 - Verify alert subscription service

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T753 in Jira

#### 4.2.153.1 Verification Elements

- LVV-9960 - DMS-PRTL-REQ-0119-V-01: Alert Subscription Service_1

#### 4.2.153.2 Test Items

Verify that the Portal aspect provides an interface to the alert subscription service that allows authenticated users with LSST data rights to subscribe to a stream of alert events.

#### 4.2.153.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.154 LVV-T754 - Verify availability of pre-defined alert filters

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T754 in Jira

#### 4.2.154.1 Verification Elements

- LVV-9961 - DMS-PRTL-REQ-0120-V-01: Pre-defined Alert Filters_1

#### 4.2.154.2 Test Items

Verify that the Portal provides an interface to permit alert subscriptions to be configured with Project-provided alert filters.

#### 4.2.154.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.155 LVV-T755 - Verify availability of user-defined alert filters

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T755 in Jira

#### 4.2.155.1 Verification Elements

- LVV-9962 - DMS-PRTL-REQ-0121-V-01: User-defined Alert Filters_1

#### 4.2.155.2 Test Items

Verify that the Portal provides an interface to permit alert subscriptions to be configured with user-provided alert filters.

#### 4.2.155.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.156 LVV-T756 - Verify monitoring of alert subscription

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T756 in Jira

#### 4.2.156.1 Verification Elements

- LVV-9959 - DMS-PRTL-REQ-0127-V-01: Alert Subscription Monitoring_1

#### 4.2.156.2 Test Items

Verify that the Portal provides feedback about the status and performance of a user's filters in the alert subscription service.

#### 4.2.156.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.157 LVV-T757 - Verify access to survey documentation

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T757 in Jira

#### 4.2.157.1 Verification Elements

- LVV-9963 - DMS-PRTL-REQ-0122-V-01: Access to Observatory Documentation_1

#### 4.2.157.2 Test Items

Verify that the Portal provides access to Project-provided documentation on the design, construction, and operation of the LSST.

#### 4.2.157.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.158 LVV-T758 - Verify access to Portal documentation

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T758 in Jira

#### 4.2.158.1 Verification Elements

- LVV-9965 - DMS-PRTL-REQ-0123-V-01: Portal User Documentation_1

#### 4.2.158.2 Test Items

Verify that the Portal provides access to documentation on the use of the Portal (i.e., a user guide, or similar).

#### 4.2.158.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.159 LVV-T759 - Verify access to Portal API documentation

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T759 in Jira

#### 4.2.159.1 Verification Elements

- LVV-9964 - DMS-PRTL-REQ-0124-V-01: Portal API Documentation_1

#### 4.2.159.2 Test Items

Verify that the Portal provides access to reference manual-style documentation of its public

network and programmatic APIs.

#### 4.2.159.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.160 LVV-T760 - Verify tolerance of database changes

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T760 in Jira

#### 4.2.160.1 Verification Elements

- LVV-9967 - DMS-PRTL-REQ-0125-V-01: Tolerance of Production Database Changes_1

#### 4.2.160.2 Test Items

Verify that the Portal aspect facilitates accommodation of database expansion and changes and metadata extension and changes associated with the evolution of the Level 1 data, Level 2 data releases, and other planned data sources.

#### 4.2.160.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.161 LVV-T761 - Verify implementation of system-busy notification

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T761 in Jira

#### 4.2.161.1 Verification Elements

- LVV-9966 - DMS-PRTL-REQ-0126-V-01: System-Busy Indication_1

#### 4.2.161.2 Test Items

Verify that the Portal provides a means to inform users when the elements of the system are unavailable due to maintenance or excessive load.

#### 4.2.161.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.162 LVV-T762 - Verify availability of interactive Python environment

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Simon Krughoff |

Open LVV-T762 in Jira

#### 4.2.162.1 Verification Elements

- LVV-9971 - DMS-NB-REQ-0005-V-01: Interactive Python Environment_1

#### 4.2.162.2 Test Items

Verify that the Notebook aspect provides an interactive Python environment through both a notebook interface and via a Python interactive interpreter.

#### 4.2.162.3 Test Procedure

| Step 1-1 from LVV-T837 | Description |
|---|---|
| Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb. | |
| | Expected Result |
| Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor. | |

| Step 1-2 from LVV-T837 | Description |
|---|---|
| Spawn a container by:<br>1) choosing an appropriate stack version: e.g. the latest weekly.<br>2) choosing an appropriate machine flavor: e.g. medium<br>3) click “Spawn” | |
| | Expected Result |
| Redirection to the JupyterLab environment served from the chosen container containing the correct stack version. | |

| Step 2-1 from LVV-T838 | Description |
|---|---|
| Open a new launcher by navigating in the top menu bar “File” -> “New Launcher” | |
| | Expected Result |
| A launcher window with several sections, potentially with several kernel versions for each. | |

| Step 2-2 from LVV-T838 | Description |
|---|---|
| Select the option under “Notebook” labeled “LSST” by clicking on the icon. | |
| | Expected Result |
| An empty notebook with a single empty cell. The kernel show up as “LSST” in the top right of the notebook. | |

| Step 3 | Description |
|---|---|
| Click in the empty cell to get a cursor.<br>Enter the example code.<br>Execute the example code by pressing shift+enter on the keyboard. | |

| Example Code |
|---|
| import lsst.afw.image as afw_image<br>im = afw_image.ImageF(10, 10)<br>isinstance(im, afw_image.ImageF) |

| Expected Result |
|---|
| The expected result of this code is the value True without error or warning. |

| Step 4 | Description |
|---|---|
| From the “File” menu, select “Save All, Exit, and Log Out” to exit the Notebook Aspect. | |

| Expected Result |
|---|
| Notification of successful logout, OK to close browser window. |

#### 4.2.163 LVV-T763 - Verify availability of Unix shell access

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Simon Krughoff |

Open LVV-T763 in Jira

##### 4.2.163.1 Verification Elements

- LVV-9976 - DMS-NB-REQ-0006-V-01: Unix Shell Access_1

##### 4.2.163.2 Test Items

Verify that the Notebook aspect provides command-line access to a Unix shell with the same environment as the interactive Python environment.

#### 4.2.163.3 Test Procedure

| Step 1-1 from LVV-T837 | Description |
|---|---|

Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb.

| Expected Result |
|---|

Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor.

| Step 1-2 from LVV-T837 | Description |
|---|---|

Spawn a container by:
1) choosing an appropriate stack version: e.g. the latest weekly.
2) choosing an appropriate machine flavor: e.g. medium
3) click “Spawn”

| Expected Result |
|---|

Redirection to the JupyterLab environment served from the chosen container containing the correct stack version.

| Step 2-1 from LVV-T839 | Description |
|---|---|

Open a new launcher by navigating in the top menu bar “File” -> “New Launcher”.

| Expected Result |
|---|

A launcher window with several sections, potentially with several kernel versions for each.

| Step 2-2 from LVV-T839 | Description |
|---|---|

Select the option under “Other” labeled “Terminal” by clicking on the icon.

| Expected Result |
|---|

A terminal window appears with command line access to the user’s file system.

| Step 3 | Description |
|---|---|

Verify that the STDOUT and STDERR output streams are attached to an interactive terminal using the example test code.

| Example Code |
|---|

```
case “$-” in
*i*)    echo This shell is interactive ;;
*)    echo This shell is not interactive ;;
esac
```

| Expected Result |
|---|

The shell should print “This shell is interactive” to the terminal window.

| Step 4 | Description |
|---|---|
| From the “File” menu, select “Save All, Exit, and Log Out” to exit the Notebook Aspect. | |

| Expected Result |
|---|
| Notification of successful logout, OK to close browser window. |

#### 4.2.164 LVV-T764 - Verify availability of containerized software releases

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Simon Krughoff |

Open LVV-T764 in Jira

##### 4.2.164.1 Verification Elements

- LVV-9974 - DMS-NB-REQ-0007-V-01: Pre-installed Containerized Software Releases_1

##### 4.2.164.2 Test Items

Verify that users of the Notebook aspect are able to choose from a curated list of pre-built containers (including version of LSST stack) for their notebooks (and any other provided interactive environment) to execute in.

##### 4.2.164.3 Test Procedure

| Step 1-1 from LVV-T837 | Description |
|---|---|
| Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb. | |

| Expected Result |
|---|
| Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor. |

| Step 1-2 from LVV-T837 | Description |
|---|---|
| Spawn a container by: | |

1) choosing an appropriate stack version: e.g. the latest weekly.
2) choosing an appropriate machine flavor: e.g. medium
3) click “Spawn”

### Expected Result

Redirection to the JupyterLab environment served from the chosen container containing the correct stack version.

### Step 2-1 from LVV-T838 Description

Open a new launcher by navigating in the top menu bar “File” -> “New Launcher”

### Expected Result

A launcher window with several sections, potentially with several kernel versions for each.

### Step 2-2 from LVV-T838 Description

Select the option under “Notebook” labeled “LSST” by clicking on the icon.

### Expected Result

An empty notebook with a single empty cell. The kernel show up as “LSST” in the top right of the notebook.

### Step 3 Description

Click in the empty cell to get a cursor.
Enter the example code.
Execute the example code by pressing shift+enter on the keyboard, and confirm that the version listed on the screen is the one you requested.

### Example Code

```
!eups list -s | grep lsst_distrib
```

### Expected Result

The expected result of this code is something similar to the following:

```
lsst_distrib          17.0+10        current w_2019_11 setup
```

### Step 4 Description

Enter the example code.
Execute the example code by pressing shift+enter on the keyboard.

### Example Code

```
import lsst.afw.image as afw_image
```

```
im = afw_image.ImageF(10, 10)
isinstance(im, afw_image.ImageF)
```

| Expected Result |
|---|
| The expected result of this code is the value True without error or warning. |

| Step 5 | Description |
|---|---|
| From the “File” menu, select “Save All, Exit, and Log Out” to exit the Notebook Aspect. | |

| Expected Result |
|---|
| Notification of successful logout, OK to close browser window. |

| Step 6 | Description |
|---|---|
| After logging out, log back into the Notebook Aspect, and try a container with a different stack version. | |

| Expected Result |
|---|
| |

| Step 7-1 from LVV-T837 | Description |
|---|---|
| Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb. | |

| Expected Result |
|---|
| Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor. |

| Step 7-2 from LVV-T837 | Description |
|---|---|
| Spawn a container by:<br>1) choosing an appropriate stack version: e.g. the latest weekly.<br>2) choosing an appropriate machine flavor: e.g. medium<br>3) click “Spawn” | |

| Expected Result |
|---|
| Redirection to the JupyterLab environment served from the chosen container containing the correct stack version. |

| Step 8-1 from LVV-T838 | Description |
|---|---|
| Open a new launcher by navigating in the top menu bar “File” -> “New Launcher” | |

| Expected Result |
|---|
| A launcher window with several sections, potentially with several kernel versions for each. |

| Step 8-2 from LVV-T838 | Description |
|---|---|
| Select the option under “Notebook” labeled “LSST” by clicking on the icon. | |

Rubin Observatory

| Expected Result |
|---|
| An empty notebook with a single empty cell. The kernel show up as “LSST” in the top right of the notebook. |

| Step 9 | Description |
|---|---|
| Click in the empty cell to get a cursor.<br>Enter the example code.<br>Execute the example code by pressing shift+enter on the keyboard, and confirm that the version listed on the screen is the one you requested. | |

| Example Code |
|---|
| !eups list -s \| grep lsst_distrib |

| Expected Result |
|---|
| The expected result of this code is something similar to the following: |

```
lsst_distrib          17.0+10        current w_2019_11 setup
```

| Step 10 | Description |
|---|---|
| Click in the empty cell to get a cursor.<br>Enter the example code.<br>Execute the example code by pressing shift+enter on the keyboard. | |

| Example Code |
|---|
| import lsst.afw.image as afw_image<br>im = afw_image.ImageF(10, 10)<br>isinstance(im, afw_image.ImageF) |

| Expected Result |
|---|
| The expected result of this code is the value True without error or warning. |

| Step 11 | Description |
|---|---|
| From the “File” menu, select “Save All, Exit, and Log Out” to exit the Notebook Aspect. | |

| Expected Result |
|---|
| Notification of successful logout, OK to close browser window. |

### 4.2.165 LVV-T765 - Verify latency of release deployment

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Draft | Normal | Demonstration | Jeffrey Carlin |

Open LVV-T765 in Jira

#### 4.2.165.1 Verification Elements

- LVV-9975 - DMS-NB-REQ-0008-V-01: Release Deployment Latency_1

#### 4.2.165.2 Test Items

Verify that it is possible to add a new environment (with a new version of the LSST stack) to the curated list of available execution environments in less than four hours.

#### 4.2.165.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.166 LVV-T766 - Verify availability of data access middleware

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T766 in Jira

#### 4.2.166.1 Verification Elements

- LVV-9969 - DMS-NB-REQ-0009-V-01: Data Access Middleware Availability_1

#### 4.2.166.2 Test Items

Verify that users of the Notebook Aspect are able to make use of the LSST Python I/O middleware layer to perform data discovery, data access and any other supported functions (e.g., provenance information). Notably, the Data Butler is available in the Notebook Python environment, with full access to all authorized data products available on that instance of the Science Platform.

#### 4.2.166.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.167 LVV-T767 - Verify availability of standard astronomy software

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T767 in Jira

#### 4.2.167.1 Verification Elements

- LVV-9968 - DMS-NB-REQ-0010-V-01: Common Astronomy Package Availability_1

#### 4.2.167.2 Test Items

Verify that the Notebook Aspect provides select standard astronomy packages in the interactive environments. These may include, for example, Astropy and S-Extractor.

#### 4.2.167.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.168 LVV-T768 - Verify availability of user package installation

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Simon Krughoff |

Open LVV-T768 in Jira

#### 4.2.168.1 Verification Elements

- LVV-9978 - DMS-NB-REQ-0011-V-01: User Package Installation_1

#### 4.2.168.2 Test Items

Verify that the Notebook Aspect has a process that allows users to add new packages to their environment It is intended that operations like “pip install” will be usable.

#### 4.2.168.3 Test Procedure

| Step 1-1 from LVV-T837 | Description |
|---|---|
| Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb. | |
| | Expected Result |
| Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor. | |
| Step 1-2 from LVV-T837 | Description |
| Spawn a container by:<br>1) choosing an appropriate stack version: e.g. the latest weekly.<br>2) choosing an appropriate machine flavor: e.g. medium<br>3) click “Spawn” | |

| Expected Result |
|---|
| Redirection to the JupyterLab environment served from the chosen container containing the correct stack version. |

| Step 2-1 from LVV-T838 | Description |
|---|---|
| Open a new launcher by navigating in the top menu bar “File” -> “New Launcher” | |

| Expected Result |
|---|
| A launcher window with several sections, potentially with several kernel versions for each. |

| Step 2-2 from LVV-T838 | Description |
|---|---|
| Select the option under “Notebook” labeled “LSST” by clicking on the icon. | |

| Expected Result |
|---|
| An empty notebook with a single empty cell. The kernel show up as “LSST” in the top right of the notebook. |

| Step 3 | Description |
|---|---|
| Verify the pip based module is not already installed by:<br>1) entering the example code in the empty cell<br>2) running the cell by pressing shift+enter on the keyboard. | |

| Example Code |
|---|
| import pip_install_test |

| Expected Result |
|---|
| The expected result is a ModuleNotFoundError exception with a second empty cell under the first. |

| Step 4 | Description |
|---|---|
| Verify the local file module is not already installed by:<br>1) entering the example code in the second empty cell<br>2) running the cell by pressing shift+enter on the keyboard. | |

| Example Code |
|---|
| import local_file_test |

| Expected Result |
|---|
| The expected result is a ModuleNotFoundError exception with a third empty cell under the first two. |

| Step 5 | Description |
|---|---|
| Open a new terminal window by navigating the top menu bar “File” -> “New” -> “Terminal”. | |

| Expected Result |
|---|
| A shell prompt (bash by default) with cursor focus. |

| Step 6 | Description |
|---|---|
| Install the pip test package by entering the example code at the shell prompt. | |

| Example Code |
|---|
| pip install –user pip-install-test |

| Expected Result |
|---|
| A message in the terminal indicating success installing the package. |

| Step 7 | Description |
|---|---|
| Install a local python package on the PYTHONPATH in the notebook by executing the example code at the shell prompt. | |

| Example Code |
|---|
| TMPDIR=‘mktemp -d‘<br>echo ‘print(“Hello: this is a test of the user import system”)’ > ${TMPDIR}/local_file_test.py<br>if [ -e ${HOME}/notebooks/.user_setups ]; then<br>  mv ${HOME}/notebooks/.user_setups ${TMPDIR}<br>fi<br>echo ‘export PYTHONPATH=‘${TMPDIR}’:${PYTHONPATH}’ > $HOME/notebooks/.user_setups |

| Expected Result |
|---|
| The example code should complete without error or warning. |

| Step 8 | Description |
|---|---|
| Select the notebook created in Step 2 by clicking on the appropriate tab. | |

| Expected Result |
|---|
| |

| Step 9 | Description |
|---|---|
| Clear all errors by navigating the top menu bar “Kernel” -> “Restart Kernel and Clear All Outputs…” | |

| Expected Result |
|---|
| Three cells with code from Step 3 in the first cell, code from Step 4 in the second cell, and an empty third cell. |

| Step 10 | Description |
|---|---|
| Check the pip install by:<br>1) selecting the first cell in the notebook<br>2) executing the cell by pressing shift+enter on the keyboard. | |

| Expected Result |
| --- |
| The cell should execute without error or warning. A message may be displayed indicating the success of import. |

| Step 11 | Description |
| --- | --- |
| Check the local file install by:<br>1) selecting the second cell in the notebook<br>2) executing teh cell by pressing shift+enter on the keyboard | |

| Expected Result |
| --- |
| The cell should execute without error or warning. A message saying “Hello: this is a test of the user import system” will be displayed. |

| Step 12 | Description |
| --- | --- |
| Navigate back to the terminal window by selecting the appropriate tab. Clean up the test installs by executing the example code in the terminal window. | |

| Example Code |
| --- |

```
rm -r ${TMPDIR}
rm ${HOME}/notebooks/.user_setups
if [ -e ${TMPDIR}/.user_setups ]; then
   mv ${TMPDIR}/.user_setups ${HOME}/notebooks/
fi
pip uninstall -y pip-install-test
```

| Expected Result |
| --- |
| The example code should execute without error or warning. |

| Step 13 | Description |
| --- | --- |
| Delete the notebook by:<br>1) right clicking the notebook in the file browser<br>2) selecting delete from the dropdown. | |

| Expected Result |
| --- |
| The notebook should disappear from the file browser. |

| Step 14 | Description |
| --- | --- |
| From the “File” menu, select “Save All, Exit, and Log Out” to exit the Notebook Aspect. | |

| Expected Result |
| --- |
| Notification of successful logout, OK to close browser window. |

### 4.2.169 LVV-T769 - Verify availability of user development environment

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T769 in Jira

#### 4.2.169.1 Verification Elements

- LVV-9977 - DMS-NB-REQ-0012-V-01: User Development Environment_1

#### 4.2.169.2 Test Items

Verify that the Notebook Aspect environment permits a user to edit and build their own version of any LSST science pipeline package in their container. This implies the availability of both a C++ and a Python development environment.

#### 4.2.169.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.170 LVV-T770 - Verify availability of persistent user home file space

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Simon Krughoff |

Open LVV-T770 in Jira

#### 4.2.170.1 Verification Elements

- LVV-9973 - DMS-NB-REQ-0013-V-01: Persistent User Home File Space_1

#### 4.2.170.2 Test Items

Verify that the Notebook Aspect provides a persistent home space such that per user configuration survives shutdown and restart of the environment. This space appears as a home directory from Python and in the Unix shell environment. This includes things like .bashrc, .pythonrc, and user installed python libs.

#### 4.2.170.3 Test Procedure

| Step 1-1 from LVV-T837 | Description |
|---|---|
| Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb. | |
| | Expected Result |
| Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor. | |

| Step 1-2 from LVV-T837 | Description |
|---|---|
| Spawn a container by:<br>1) choosing an appropriate stack version: e.g. the latest weekly.<br>2) choosing an appropriate machine flavor: e.g. medium<br>3) click “Spawn” | |
| | Expected Result |
| Redirection to the JupyterLab environment served from the chosen container containing the correct stack version. | |

| Step 2-1 from LVV-T839 | Description |
|---|---|
| Open a new launcher by navigating in the top menu bar “File” -> “New Launcher”. | |
| | Expected Result |
| A launcher window with several sections, potentially with several kernel versions for each. | |

| Step 2-2 from LVV-T839 | Description |
|---|---|
| Select the option under “Other” labeled “Terminal” by clicking on the icon. | |
| | Expected Result |
| A terminal window appears with command line access to the user’s file system. | |

| Step 3 | Description |
|---|---|

Create a dummy ASCII text file in your home directory by typing the following at the command line. The second line confirms that the file was created with some text.

| Example Code |
|---|

```
$ echo '1 2 3 4 5' > tmp.txt
$ cat tmp.txt
```

| Expected Result |
|---|

The file ('tmp.txt' in this example) is present in the home directory, and its contents print to the screen ('1 2 3 4 5' in this example).

| Step 4 | Description |
|---|---|

Check to see that a .bashrc file exists by typing "ls .bashrc" at the command line. If it does not exist, create one by typing "touch .bashrc".

Then make a change to the .bashrc file by opening it with your favorite text editor, and adding the example code below. Save the .bashrc file.

Confirm that the new line is in your .bashrc file by typing "cat .bashrc".

| Example Code |
|---|

```
echo "This is a test. This is only a test."
```

| Expected Result |
|---|

User's .bashrc file exists, and contains a line with the example code.

| Step 5 | Description |
|---|---|

From the "File" menu, select "Save All, Exit, and Log Out" to exit the Notebook Aspect.

| Expected Result |
|---|

Notification of successful logout, OK to close browser window.

| Step 6-1 from LVV-T837 | Description |
|---|---|

Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb.

| Expected Result |
|---|

Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor.

| Step 6-2 from LVV-T837 | Description |
|---|---|

Spawn a container by:

1) choosing an appropriate stack version: e.g. the latest weekly.
2) choosing an appropriate machine flavor: e.g. medium
3) click “Spawn”

| Expected Result |
|---|
| Redirection to the JupyterLab environment served from the chosen container containing the correct stack version. |

| Step 7 | Description |
|---|---|
| After logging back in, check whether your changes have been retained. | |

Open a terminal, and confirm that the message entered into your .bashrc file prints to the screen.

Confirm that the temporary file you created is still present (e.g., by typing “cat tmp.txt” and observing that the contents print to the screen).

| Expected Result |
|---|
| The message entered into the .bashrc file prints to the screen upon opening a terminal, and the dummy text placed in the .txt file displays when the “cat” command is executed. |

| Step 8 | Description |
|---|---|
| Remove the file created above (using “rm test.txt” from the command line), and delete the added line from .bashrc. | |

| Expected Result |
|---|
| Notification of successful logout, OK to close browser window. |

| Step 9 | Description |
|---|---|
| From the “File” menu, select “Save All, Exit, and Log Out” to exit the Notebook Aspect. | |

| Expected Result |
|---|
| Notification of successful logout, OK to close browser window. |

### 4.2.171 LVV-T771 - Verify availability of Notebook aspect documentation

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T771 in Jira

#### 4.2.171.1 Verification Elements

- LVV-9970 - DMS-NB-REQ-0014-V-01: Documentation_1

#### 4.2.171.2 Test Items

Verify that the Notebook Aspect provides documentation of each of the constituent features as well as tutorial notebooks demonstrating the use of the Aspect.

#### 4.2.171.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.172 LVV-T772 - Verify new-user onboarding

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T772 in Jira

#### 4.2.172.1 Verification Elements

- LVV-9972 - DMS-NB-REQ-0015-V-01: New-User Onboarding_1

#### 4.2.172.2 Test Items

Verify that the Notebook Aspect provides clear documentation on how to obtain credentials

for accessing the Notebook Aspect.

#### 4.2.172.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.173 LVV-T773 - Verify availability of shared file space

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T773 in Jira

#### 4.2.173.1 Verification Elements

- LVV-9983 - DMS-NB-REQ-0016-V-01: Shared File Space_1

#### 4.2.173.2 Test Items

Verify that the Notebook Aspect provides access to a shared read/write filesystem visible to all users of an instance of the Science Platform.

#### 4.2.173.3 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

### 4.2.174 LVV-T774 - Verify API and Portal aspects accessible from Notebook

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T774 in Jira

#### 4.2.174.1 Verification Elements

- LVV-9980 - DMS-NB-REQ-0017-V-01: Access to the API and Portal Aspects_1

#### 4.2.174.2 Test Items

Verify that the Notebook Aspect is able to utilise the data access services provided by other Aspects. In particular, a Notebook user can use standard VO services to access LSST Data Releases.

#### 4.2.174.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.175 LVV-T775 - Verify access to User File Workspace

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T775 in Jira

#### 4.2.175.1 Verification Elements

- LVV-9985 - DMS-NB-REQ-0018-V-01: User File Workspace Access_1

#### 4.2.175.2 Test Items

Verify that users of the Notebook Aspect are able to access the User File Workspace available as a POSIX filesystem from within the Python kernels and shell-prompt sessions it supports.

#### 4.2.175.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.176 LVV-T776 - Verify access to VOSpace services from Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T776 in Jira

#### 4.2.176.1 Verification Elements

- LVV-9986 - DMS-NB-REQ-0019-V-01: VOSpace Access_1

#### 4.2.176.2 Test Items

Verify that users of the Notebook Aspect are able to interact with VOSpace services available through project or external services. Users will be able to directly use VOSpace APIs within a Notebook.

#### 4.2.176.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.177 LVV-T777 - Verify user database workspace access from Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T777 in Jira

#### 4.2.177.1 Verification Elements

- LVV-9984 - DMS-NB-REQ-0020-V-01: User Database Workspace Access_1

#### 4.2.177.2 Test Items

Verify that users are able to interact with their User Database through the Notebook Aspect to insert, delete, and control access to their tables. This will be possible via TAP, at least, and possibly through lower-level access.

#### 4.2.177.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.178 LVV-T778 - Verify access to batch system

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T778 in Jira

#### 4.2.178.1 Verification Elements

- LVV-9981 - DMS-NB-REQ-0021-V-01: Batch System Access_1

#### 4.2.178.2 Test Items

Verify that the Notebook aspect provides access to a batch processing system via shell access.

#### 4.2.178.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.179 LVV-T779 - Verify implementation of quotas in Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T779 in Jira

#### 4.2.179.1 Verification Elements

- LVV-9982 - DMS-NB-REQ-0022-V-01: Compute and Storage Quotas_1

#### 4.2.179.2 Test Items

Verify that the Notebook Aspect has a quota system for compute and storage authorized access via an authentication system.

#### 4.2.179.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.180 LVV-T780 - Verify access to all data products from Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T780 in Jira

#### 4.2.180.1 Verification Elements

- LVV-9979 - DMS-NB-REQ-0023-V-01: Access to All Data Products_1

#### 4.2.180.2 Test Items

Verify that an authorized user of the Notebook Aspect is able to access the reformatted Engineering and Facilities Database (EFD) and and all other LSST released data products.

#### 4.2.180.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.181 LVV-T781 - Verify ease of Notebook aspect deployment

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T781 in Jira

##### 4.2.181.1 Verification Elements

- LVV-9988 - DMS-NB-REQ-0024-V-01: Ease of Deployment_1

##### 4.2.181.2 Test Items

Verify that the Notebook Aspect is deployable to multiple instances and contexts, both private and public.

##### 4.2.181.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.182 LVV-T782 - Verify workload for deployment in Kubernetes

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Demonstration | Jeffrey Carlin |

Open LVV-T782 in Jira

#### 4.2.182.1 Verification Elements

- LVV-9987 - DMS-NB-REQ-0025-V-01: Deployment Workload in Kubernetes_1

#### 4.2.182.2 Test Items

Given a Kubernetes cluster with a configuration meeting a documented standard set of specifications, verify that it takes an engineer with admin rights no more than 2 days to deploy the Notebook Aspect in that context. The specification is expected to constrain factors such as software versions for Kubernetes and related packages, available storage, a shared file system, and an authentication system.

#### 4.2.182.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.183 LVV-T783 - Verify monitoring of Notebook system health

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T783 in Jira

#### 4.2.183.1 Verification Elements

- LVV-9989 - DMS-NB-REQ-0026-V-01: System Health Monitoring_1

#### 4.2.183.2 Test Items

Verify that the Notebook Aspect provides a service health microservice and a dynamic web page hostable on separate resources that provides a view of the health status.

#### 4.2.183.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.184 LVV-T784 - Verify visualization of images in Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T784 in Jira

#### 4.2.184.1 Verification Elements

- LVV-9990 - DMS-NB-REQ-0032-V-01: Image Visualization_1

#### 4.2.184.2 Test Items

Verify that the Notebook aspect provides tools for visualization of images produced by the LSST stack tools.

#### 4.2.184.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.185 LVV-T785 - Verify availability of scientific plotting tools in Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T785 in Jira

##### 4.2.185.1 Verification Elements

- LVV-9991 - DMS-NB-REQ-0033-V-01: Scientific Plotting_1

##### 4.2.185.2 Test Items

Verify that the Notebook Aspect provides common plotting methods including scatter plots, raster images, histograms, 2D histograms, contours, line traces, polygons, compositions of these (contours on scatter plots), density images.

##### 4.2.185.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.186 LVV-T786 - Verify linkage of visualization tools in Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T786 in Jira

#### 4.2.186.1 Verification Elements

- LVV-9993 - DMS-NB-REQ-0034-V-01: Visualization Linkage_1

#### 4.2.186.2 Test Items

Verify that the Notebook Aspect provides “drill down” functionality in plots, including brushing and linking between plots, interactive discovery of metadata about particular points, drill down to imaging from measurements.

#### 4.2.186.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.187 LVV-T787 - Verify interactivity of visualizations in Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T787 in Jira

#### 4.2.187.1 Verification Elements

- LVV-9992 - DMS-NB-REQ-0035-V-01: Visualization Interactivity_1

#### 4.2.187.2 Test Items

Verify that the Notebook Aspect provides interactive plots for certain visualizations, including linked axes on multiple plots, zoom, pan, and data point selection.

#### 4.2.187.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.188 LVV-T788 - Verify interactive scaling of visualizations in Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T788 in Jira

#### 4.2.188.1 Verification Elements

- LVV-9994 - DMS-NB-REQ-0036-V-01: Visualization Scaling_1

#### 4.2.188.2 Test Items

Verify that the Notebook Aspect provides interactive plots that scale to include at least 1E6 datapoints. This may be done through an adaptive refinement scheme like datashader.

#### 4.2.188.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.189 LVV-T789 - Verify access to Portal queries from Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T789 in Jira

#### 4.2.189.1 Verification Elements

- LVV-9996 - DMS-NB-REQ-0029-V-01: Access to Portal-Initiated Queries_1

#### 4.2.189.2 Test Items

Verify that a user of the Notebook Aspect can access search queries they performed in the Portal Aspect.

#### 4.2.189.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.190 LVV-T790 - Verify access to Portal visualization API from Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T790 in Jira

#### 4.2.190.1 Verification Elements

- LVV-9995 - DMS-NB-REQ-0030-V-01: Access to Portal Visualization API_1

#### 4.2.190.2 Test Items

Verify that the Notebook Aspect provides a mechanism for "pushing" specific types of data to the Portal API. For instance, this allows a user to plot a catalog of coordinates over an image display using the Portal's Firefly components. This is supported by DMS-PRTL-REQ-0115 on the Portal side.

#### 4.2.190.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.191 LVV-T791 - Verify ability to launch a notebook with access to Portal query results

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |
| Open LVV-T791 in Jira | | | | |

#### 4.2.191.1 Verification Elements

- LVV-9997 - DMS-NB-REQ-0031-V-01: Notebook-Launching Interface_1

#### 4.2.191.2 Test Items

Verify that the Notebook Aspect provides a means to trigger the opening of a notebook with access to the results of a query performed in the Portal. This is intended to permit a Portal

user to perform a query and then quickly obtain a Notebook session with that data available for further analysis.

#### 4.2.191.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.192 LVV-T792 - Verify implementation of secure protocol for Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T792 in Jira

#### 4.2.192.1 Verification Elements

- LVV-10000 - DMS-NB-REQ-0001-V-01: Secure Protocol_1

#### 4.2.192.2 Test Items

Verify that the Notebook Aspect is accessible through an HTTPS endpoint.

#### 4.2.192.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.193 LVV-T793 - Verify implementation of authentication and authorization service in Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T793 in Jira

#### 4.2.193.1 Verification Elements

- LVV-9998 - DMS-NB-REQ-0002-V-01: Authentication and Authorization_1

#### 4.2.193.2 Test Items

Verify that the Notebook Aspect provides a means to authenticate users for the purpose of establishing authorized use and only permit access to authenticated users using the LSST Data Facility authentication and authorization service.

#### 4.2.193.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.194 LVV-T794 - Verify secure implementation of Notebook aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T794 in Jira

#### 4.2.194.1 Verification Elements

- LVV-9999 - DMS-NB-REQ-0003-V-01: Secure Implementation_1

#### 4.2.194.2 Test Items

Verify that the Notebook aspect does not allow users to circumvent authorizing controls.

#### 4.2.194.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.195 LVV-T795 - Verify access to Notebook aspect via IPv6

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T795 in Jira

#### 4.2.195.1 Verification Elements

- LVV-10001 - DMS-NB-REQ-0004-V-01: IPV6 Access_1

#### 4.2.195.2 Test Items

Verify that the Notebook Aspect supports access using IPv6 protocols.

#### 4.2.195.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.196 LVV-T796 - Verify web APIs use CAOM2

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T796 in Jira

##### 4.2.196.1 Verification Elements

- LVV-10011 - DMS-API-REQ-0021-V-01: Use of CAOM2_1

##### 4.2.196.2 Test Items

Verify that the API Aspect Web APIs present image and visit metadata organized in accordance with the CAOM2 data model.

##### 4.2.196.3 Test Procedure

| Step 1 | Description |
|---|---|

| Expected Result |
|---|

#### 4.2.197 LVV-T797 - Verify API access to image and visit metadata

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T797 in Jira

#### 4.2.197.1 Verification Elements

- LVV-10003 - DMS-API-REQ-0022-V-01: Access to Image and Visit Metadata_1

#### 4.2.197.2 Test Items

Verify that the API Aspect provides for retrieval of image and visit metadata via TAP ADQL queries.

#### 4.2.197.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.198 LVV-T798 - Verify API access to catalog data products

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Colin Slater |

Open LVV-T798 in Jira

#### 4.2.198.1 Verification Elements

- LVV-10002 - DMS-API-REQ-0023-V-01: Access to Catalog Data Products_1

#### 4.2.198.2 Test Items

Verify that the API Aspect provides for retrieval of all Prompt and Data Release catalog data

via TAP ADQL queries.

#### 4.2.198.3 Test Procedure

| Step 1 | Description |
|---|---|

Create a Jupyer Notebook session in the LSP.

| | Expected Result |
|---|---|

| Step 2 | Description |
|---|---|

Instantiate a connection to the TAP service with the pyVO library.

| | Example Code |
|---|---|

```
import pyvo

service = pyvo.dal.TAPService('https://lsst-lsp-stable.ncsa.illinois.edu/api/tap')

service.describe()
```

| | Expected Result |
|---|---|

A description of the TAP service should be printed, with no errors.

| Step 3 | Description |
|---|---|

List the available tables.

| | Example Code |
|---|---|

```
service.tables.describe()
```

| | Expected Result |
|---|---|

A list of available tables should be printed, including both DRP and Prompt Processing data products.

| Step 4 | Description |
|---|---|

Execute an example query on one of the DRP tables, such as the Object table (inserting the correct table name from Step 3):

| Example Code |
| --- |
| results = service.search("SELECT * from DRP_schema.example_DRP_table LIMIT 5")<br>results.to_table().show_in_notebook() |

| Expected Result |
| --- |
| Rows from the DRP data products should be displayed properly. |

| Step 5 | Description |
| --- | --- |
| Repeat Step 4 but with an example Prompt Products table (such as DIAObject) from Step 3. | |

| Expected Result |
| --- |
| Rows from the Prompt Products table should be displayed properly. |

### 4.2.199 LVV-T799 - Verify API access to observatory metadata

| Version | Status | Priority | Verification Type | Owner |
| --- | --- | --- | --- | --- |
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T799 in Jira

#### 4.2.199.1 Verification Elements

- LVV-10005 - DMS-API-REQ-0024-V-01: Access to Observatory Metadata_1

#### 4.2.199.2 Test Items

Verify that the API Aspect provides for retrieval of observatory metadata (including the Transformed EFD) via TAP ADQL queries.

#### 4.2.199.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.200 LVV-T800 - Verify API enforcement of information classification

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T800 in Jira

#### 4.2.200.1 Verification Elements

- LVV-10009 - DMS-API-REQ-0025-V-01: Enforcement of Information Classification_1

#### 4.2.200.2 Test Items

Verify that the API Aspect does NOT allow access to Sensitive or Highly Sensitive (per LPM-122) observatory metadata.

#### 4.2.200.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.201 LVV-T801 - Verify API access to reference catalogs

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T801 in Jira

#### 4.2.201.1 Verification Elements

- LVV-10006 - DMS-API-REQ-0026-V-01: Access to Reference Catalogs_1

#### 4.2.201.2 Test Items

Verify that the API Aspect provides for retrieval of all reference catalog data via TAP ADQL queries. For the purposes of this requirement a “reference catalog” is an externally sourced catalog used during data production activities.

#### 4.2.201.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.202 LVV-T802 - Verify API access to virtual data products

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T802 in Jira

#### 4.2.202.1 Verification Elements

- LVV-10007 - DMS-API-REQ-0027-V-01: Access to Virtual Data Products_1

#### 4.2.202.2 Test Items

Verify that the API Aspect provides services to initiate regeneration of, and facilitate retrieval of, virtual data products on demand.

#### 4.2.202.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.203 LVV-T803 - Verify API access to FITS image data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T803 in Jira

#### 4.2.203.1 Verification Elements

- LVV-10004 - DMS-API-REQ-0028-V-01: Access to Image Data in FITS Format_1

#### 4.2.203.2 Test Items

Verify that the API Aspect delivers image data in FITS format.

#### 4.2.203.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.204 LVV-T804 - Verify API access to multiple data releases

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T804 in Jira

#### 4.2.204.1 Verification Elements

- LVV-10010 - DMS-API-REQ-0029-V-01: Multiple Data Releases_1

#### 4.2.204.2 Test Items

Verify that the API Aspect Web APIs provide unambiguous access to data products and metadata from more than one Data Release simultaneously.

#### 4.2.204.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.205 LVV-T805 - Verify API provides catalog metadata

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T805 in Jira

#### 4.2.205.1 Verification Elements

- LVV-10008 - DMS-API-REQ-0030-V-01: Catalog Metadata Service_1

#### 4.2.205.2 Test Items

Verify that the API Aspect provides complete metadata for all tables within each data release, including a per-column description, IVOA UCD when appropriate, units when appropriate, and any relationship with other columns.

#### 4.2.205.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.206 LVV-T806 - Verify availability of TAP service

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T806 in Jira

#### 4.2.206.1 Verification Elements

- LVV-10015 - DMS-API-REQ-0006-V-01: TAP Service for Tabular Queries_1

#### 4.2.206.2 Test Items

Verify that the API Aspect Web APIs include an endpoint conforming to IVOA TAP 1.1 for the purpose of accessing tabularly structured data.

#### 4.2.206.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.207 LVV-T808 - Verify asynchronous TAP queries

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T808 in Jira

#### 4.2.207.1 Verification Elements

- LVV-10013 - DMS-API-REQ-0008-V-01: Asynchronous TAP Support_1

#### 4.2.207.2 Test Items

Verify that the API Aspect TAP endpoint supports asynchronous queries as described by the IVOA TAP 1.1 specification.

#### 4.2.207.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.208 LVV-T809 - Verify availability of ADQL for queries

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Colin Slater |

Open LVV-T809 in Jira

#### 4.2.208.1 Verification Elements

- LVV-10012 - DMS-API-REQ-0009-V-01: ADQL Support_1

#### 4.2.208.2 Test Items

Verify that the API Aspect TAP endpoint supports IVOA ADQL 2.1 as a query language.

#### 4.2.208.3 Test Procedure

| Step 1 | Description |
|---|---|

Create a Jupyer Notebook session in the LSP.

| Expected Result |
|---|

| Step 2 | Description |
|---|---|

Instantiate a connection to the TAP service with the pyVO library by running:

```
import pyvo

service = pyvo.dal.TAPService('http://lsst-lsp-stable.ncsa.illinois.edu/api/tap')

service.describe()
```

| Expected Result |
|---|

A description of the TAP service should be printed, with no errors.

| Step 3 | Description |
|---|---|

Execute:

```
service.tables.describe()
```

| Expected Result |
|---|
| A list of available tables should be printed. |

| Step 4 | Description |
|---|---|
| Execute an example query on one of the available tables (inserting the correct table name from Step 3): | |

results = service.search("SELECT * from schema.example_table LIMIT 5")
results.to_table().show_in_notebook()

| Expected Result |
|---|
| Rows from the test table should be correctly displayed. |

| Step 5 | Description |
|---|---|
| Execute an example cone search to verify the correct parsing of ADQL. The example table must have ra and decl columns, and the target center of 1.0 and -1.0 in the example query should be replaced with coordinates inside the data footprint. Execute: | |

```
results = service.search("SELECT ra, decl FROM schema.example_table WHERE CONTAINS(POINT('ICRS', ra, decl), CIRCLE('ICRS', 1.0, -1.0, 0.5)) =
results.to_table().show_in_notebook()
```

| Expected Result |
|---|
| Rows should be returned from the example table, and all of them should be within 0.5 degrees of the specified center coordinate. |

### 4.2.209 LVV-T810 - Verify SIA service for image availability

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T810 in Jira

#### 4.2.209.1 Verification Elements

- LVV-10016 - DMS-API-REQ-0016-V-01: SIA Service for Image Availability_1

#### 4.2.209.2 Test Items

Verify that the API Aspect Web APIs include an endpoint conforming to IVOA SIA V2 for the purpose of locating available images.

#### 4.2.209.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.210 LVV-T811 - Verify availability of SODA service for image data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T811 in Jira

#### 4.2.210.1 Verification Elements

- LVV-10018 - DMS-API-REQ-0017-V-01: SODA Service for Image Data_1

#### 4.2.210.2 Test Items

Verify that the API Aspect Web APIs include an endpoint conforming to IVOA SODA 1.0 for the purpose of retrieving image data.

#### 4.2.210.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.211 LVV-T812 - Verify API SODA cutout image support

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Colin Slater |

Open LVV-T812 in Jira

#### 4.2.211.1 Verification Elements

- LVV-10017 - DMS-API-REQ-0018-V-01: Cutout Service_1

#### 4.2.211.2 Test Items

Verify that the API Aspect SODA endpoint supports performing cutouts on all released image data types.

#### 4.2.211.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.212 LVV-T813 - Verify query history retrieval

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T813 in Jira

#### 4.2.212.1 Verification Elements

- LVV-10020 - DMS-API-REQ-0038-V-01: Query History Retrieval_1

#### 4.2.212.2 Test Items

Verify that the API aspect provides interfaces for retrieving the history of queries for a user.

#### 4.2.212.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.213 LVV-T814 - Verify availability of cached query result retrieval

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |
| Open LVV-T814 in Jira | | | | |

#### 4.2.213.1 Verification Elements

- LVV-10019 - DMS-API-REQ-0039-V-01: Cached Query Result Retrieval_1

#### 4.2.213.2 Test Items

Verify that the API Aspect provides for the caching of results of queries for a limited time, and

their retrieval based on information from the query history or on query identifiers previously returned from asynchronous query services.

#### 4.2.213.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.214 LVV-T815 - Verify retrieval of query specifications

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T815 in Jira

#### 4.2.214.1 Verification Elements

- LVV-10021 - DMS-API-REQ-0040-V-01: Query Specification Retrieval_1

#### 4.2.214.2 Test Items

Verify that the API Aspect provides interfaces that return an artifact containing a complete specification for a query, and that permit that artifact to be used at a later time to re-execute the same query.

#### 4.2.214.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.215 LVV-T816 - Verify Butler interface to data products

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T816 in Jira

#### 4.2.215.1 Verification Elements

- LVV-10022 - DMS-API-REQ-0034-V-01: Butler Interface to Data Products_1

#### 4.2.215.2 Test Items

Verify that the API Aspect provides a connection between the Data Butler (Generation 3) instances within notebooks hosted in a LDF instance and backend file system, database, and object data stores within that same LDF instance, for the purpose of allowing notebook aspect users to access data release data products and user generated data products as Python objects.

#### 4.2.215.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.216 LVV-T817 - Verify availability of VOSpace service

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T817 in Jira

#### 4.2.216.1 Verification Elements

- LVV-10023 - DMS-API-REQ-0019-V-01: VOSpace Service_1

#### 4.2.216.2 Test Items

Verify that the API Aspect Web APIs include an endpoint conforming to IVOA VOSpace 2.0 for the purpose of persistence and retrieval of user-generated file-oriented data products in the User Workspace defined in DMS-LSP-REQ-0011.

#### 4.2.216.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.217 LVV-T818 - Verify availability of WebDAV service

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T818 in Jira

#### 4.2.217.1 Verification Elements

- LVV-10024 - DMS-API-REQ-0020-V-01: WebDAV Service_1

#### 4.2.217.2 Test Items

Verify that the API Aspect Web APIs include an endpoint conforming to WebDAV for the purpose of persistence and retrieval of user-generated file-oriented data products in the User Workspace defined in DMS-LSP-REQ-0011.

#### 4.2.217.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.218 LVV-T819 - Verify VOTable 1.3 support

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Colin Slater |

Open LVV-T819 in Jira

#### 4.2.218.1 Verification Elements

- LVV-10029 - DMS-API-REQ-0010-V-01: VOTable Output for TAP_1

#### 4.2.218.2 Test Items

Verify that the API Aspect TAP endpoint supports IVOA VOTable 1.3 as an available output format.

#### 4.2.218.3 Test Procedure

| Step 1 | Description |
|---|---|
| Open a Terminal window on the Science Platform. | |
| | Expected Result |

| Step 2 | Description |
|---|---|

Retrieve the TAP capabilities description by executing:

curl https://lsst-lsp-stable.ncsa.illinois.edu/api/tap/capabilities

| Expected Result |
|---|

| Step 3 | Description |
|---|---|

Inspect the capabilities file. Under the TAP capability, one of the outputFormat elements should correspond to VOTable.

| Expected Result |
|---|

The expected XML looks like:

```
<outputFormat ivo-id="ivo://ivoa.net/std/TAPRegExt#output-votable-td">
  <mime>application/x-votable+xml</mime>
  <alias>votable</alias>
</outputFormat>
```

| Step 4 | Description |
|---|---|

Create a Notebook instance in the Science Platform.

| Expected Result |
|---|

| Step 5 | Description |
|---|---|

Make a request to the TAP service and print the raw output returned by executing:

```
import pyvo
service = pyvo.dal.TAPService('https://lsst-lsp-stable.ncsa.illinois.edu/api/tap')
query = service.create_query("SELECT * FROM TAP_SCHEMA.tables", )
output = q.execute_raw()
print(output)
```

| Expected Result |
|---|

The result should be a VOTable file; which is indicated by these initial elements in the XML:

```
<?xml version="1.0" encoding="UTF-8"?>
```

<VOTABLE xmlns="http://www.ivoa.net/xml/VOTable/v1.3" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.3">

#### 4.2.219 LVV-T820 - Verify support for VOTable TABLEDATA payload

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T820 in Jira

##### 4.2.219.1 Verification Elements

- LVV-10030 - DMS-API-REQ-0011-V-01: VOTable TABLEDATA Payload_1

##### 4.2.219.2 Test Items

Verify that API Aspect services that support returning results in VOTable format support the return of a VOTable data payload in the XML-based TABLEDATA serialization.

##### 4.2.219.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

#### 4.2.220 LVV-T821 - Verify support for VOTable BINARY2 payload

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T821 in Jira

#### 4.2.220.1 Verification Elements

- LVV-10028 - DMS-API-REQ-0012-V-01: VOTable BINARY2 Payload_1

#### 4.2.220.2 Test Items

Verify that the API Aspect services that support returning results in VOTable format support the return of a VOTable data payload in the BINARY2 serialization.

#### 4.2.220.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.221 LVV-T822 - Verify JSON support for TAP outputs

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T822 in Jira

#### 4.2.221.1 Verification Elements

- LVV-10026 - DMS-API-REQ-0013-V-01: JSON Output for TAP_1

#### 4.2.221.2 Test Items

Verify that the API Aspect TAP endpoint supports JSON as an alternative available output

format.

#### 4.2.221.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.222 LVV-T823 - Verify CSV support for TAP outputs

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T823 in Jira

#### 4.2.222.1 Verification Elements

- LVV-10025 - DMS-API-REQ-0014-V-01: CSV Output for TAP_1

#### 4.2.222.2 Test Items

Verify that the API Aspect TAP endpoint supports CSV as an alternative available output format. This output format is not required to meet requirements otherwise in force on the return of table and column metadata.

#### 4.2.222.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.223 LVV-T824 - Verify SQLite support for TAP outputs

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T824 in Jira

#### 4.2.223.1 Verification Elements

- LVV-10027 - DMS-API-REQ-0015-V-01: SQLite Output for TAP_1

#### 4.2.223.2 Test Items

Verify that the API Aspect TAP endpoint supports SQLite as an alternative available output format.

#### 4.2.223.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.224 LVV-T825 - Verify support for tabular result download to Workspace

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T825 in Jira

#### 4.2.224.1 Verification Elements

- LVV-10032 - DMS-API-REQ-0031-V-01: Tabular Result Download to Workspace_1

#### 4.2.224.2 Test Items

Verify that the API Aspect provides a capability for users to save their query results as VOTables in their allocated VOSpace, subject to limitations of a resource quota system.

#### 4.2.224.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.225 LVV-T826 - Verify support for tabular upload to Workspace

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T826 in Jira

#### 4.2.225.1 Verification Elements

- LVV-10033 - DMS-API-REQ-0032-V-01: Tabular Upload to Workspace_1

#### 4.2.225.2 Test Items

Verify that the API Aspect provides a capability for users to upload catalog data products (formatted as VOTables) residing within their allocated VOSpace, such that the catalog products after upload may be joined in queries against data release catalog products, subject to limitations of a resource quota system.

#### 4.2.225.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.226 LVV-T827 - Verify ability to drop catalogs from Workspace

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T827 in Jira

#### 4.2.226.1 Verification Elements

- LVV-10031 - DMS-API-REQ-0033-V-01: Deletion from Workspace_1

#### 4.2.226.2 Test Items

Verify that the API Aspect provides a capability for users to drop previously uploaded user catalog data products.

#### 4.2.226.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.227 LVV-T828 - Verify API uses secure protocols

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T828 in Jira

#### 4.2.227.1 Verification Elements

- LVV-10037 - DMS-API-REQ-0001-V-01: Secure Protocols_1

#### 4.2.227.2 Test Items

Verify that the API Aspect Web APIs are accessible through HTTPS endpoints.

#### 4.2.227.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.228 LVV-T829 - Verify API authentication

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |
| Open LVV-T829 in Jira | | | | |

#### 4.2.228.1 Verification Elements

- LVV-10034 - DMS-API-REQ-0003-V-01: Authentication_1

#### 4.2.228.2 Test Items

Verify that the API Aspect Web APIs accept authenticated requests for the purpose of establishing user identity.

#### 4.2.228.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.229 LVV-T830 - Verify API uses project authorization infrastructure

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T830 in Jira

#### 4.2.229.1 Verification Elements

- LVV-10035 - DMS-API-REQ-0004-V-01: Authorization_1

#### 4.2.229.2 Test Items

Verify that the API Aspect Web APIs interact with project authorization infrastructure for the purpose of establishing authorized use.

#### 4.2.229.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.230 LVV-T831 - Verify secure implementation of APIs

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T831 in Jira

#### 4.2.230.1 Verification Elements

- LVV-10036 - DMS-API-REQ-0005-V-01: Secure Implementation_1

#### 4.2.230.2 Test Items

Verify that the API Aspect Web APIs prevent users from circumventing authorization controls.

#### 4.2.230.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.231 LVV-T832 - Verify containerized deployment of API services

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |
| Open LVV-T832 in Jira | | | | |

#### 4.2.231.1 Verification Elements

- LVV-10038 - DMS-API-REQ-0035-V-01: Containerized Deployment_1

#### 4.2.231.2 Test Items

Verify that the API Aspect services are delivered as containerized applications.

#### 4.2.231.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.232 LVV-T833 - Verify support for compression of API results

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T833 in Jira

#### 4.2.232.1 Verification Elements

- LVV-10040 - DMS-API-REQ-0002-V-01: Result Compression_1

#### 4.2.232.2 Test Items

Verify that the API Aspect Web APIs support gzip HTTP content-encoding for the purpose of returning compressed data.

#### 4.2.232.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.233 LVV-T834 - Verify API upgradeability

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T834 in Jira

#### 4.2.233.1 Verification Elements

- LVV-10041 - DMS-API-REQ-0036-V-01: Upgradability_1

#### 4.2.233.2 Test Items

Verify that the API Aspect service software are upgradable in place with minimal user down-time.

#### 4.2.233.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.234 LVV-T835 - Verify API logging and monitoring

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Inspection | Jeffrey Carlin |

Open LVV-T835 in Jira

#### 4.2.234.1 Verification Elements

- LVV-10039 - DMS-API-REQ-0037-V-01: Logging and Monitoring_1

#### 4.2.234.2 Test Items

Verify that the API Aspect services provide logging and monitoring capabilities for the purpose

of supporting service operators.

#### 4.2.234.3 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

### 4.2.235 LVV-T1824 - Portal Aspect access to processed HSC data in the LSP

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T1824 in Jira

#### 4.2.235.1 Verification Elements

None.

#### 4.2.235.2 Test Items

Verify the availability through the Portal Aspect of a dataset of Rubin/LSST-processed HSC public release data, including DRP-style products such as an Object-like catalog, coadded images, and calibrated single-epoch images, with image metadata. Access will be based on TAP service of catalogs and image metadata (ObsTAP-style) and through that to images.

If additional data products are available, such as DIA* outputs or Source/ForcedSource, testing those should be represented by an additional stretch-goal test case.

#### 4.2.235.3 Environment Needs

#### 4.2.235.3.1 Software

Testing will largely be performed using a web browser to access the Portal Aspect.

### 4.2.235.4 Test Procedure

| Step 1 | Description |
|---|---|
| | Expected Result |

## 4.2.236 LVV-T1825 - Notebook Aspect access to processed HSC data in the LSP

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T1825 in Jira

### 4.2.236.1 Verification Elements

None.

### 4.2.236.2 Test Items

Verify the availability through the Notebook Aspect of a dataset of Rubin/LSST-processed HSC public release data, including DRP-style products such as an Object-like catalog, coadded images, and calibrated single-epoch images, with image metadata.

If additional data products are available, such as DIA* outputs or Source/ForcedSource, testing those should be represented by an additional stretch-goal test case.

### 4.2.236.3 Environment Needs

#### 4.2.236.3.1 Software

Testing will largely be performed using a web browser to access the Notebook Aspect.

### 4.2.236.4 Test Procedure

| Step 1 | Description |
|---|---|
| | |
| | Expected Result |

# 5 Reusable Test Cases

Test cases in this section are made up of commonly encountered steps that have been factored out into modular, reusable scripts. These test cases are meant solely for the building of actual tests used for verification, to be inserted in test scripts via the "Call to Test" functionality in Jira/ATM. They streamline the process of writing test scripts by providing pre-designed steps, while also ensuring homogeneity throughout the test suite. These reusable modules are not themselves verifying requirements. Also, these test cases shall not call other reusable test cases in their script.

## 5.1 LVV-T837 - Authenticate to Notebook Aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T837 in Jira

#### 5.1.0.1 Test Items

Not specifically a test – modular script to be used in multiple other Test Scripts.

#### 5.1.0.2 Input Specification

Must have a user account on the LSP.

#### 5.1.0.3 Test Procedure

| Step 1 | Description |
|---|---|
| Authenticate to the notebook aspect of the LSST Science Platform (NB-LSP). This is currently at https://lsst-lsp-stable.ncsa.illinois.edu/nb. | |
| | Expected Result |
| Redirection to the spawner page of the NB-LSP allowing selection of the containerized stack version and machine flavor. | |
| Step 2 | Description |
| Spawn a container by:<br>1) choosing an appropriate stack version: e.g. the latest weekly.<br>2) choosing an appropriate machine flavor: e.g. medium<br>3) click "Spawn" | |

| Expected Result |
| --- |
| Redirection to the JupyterLab environment served from the chosen container containing the correct stack version. |

## 5.2 LVV-T838 - Access an empty notebook in the Notebook Aspect

| Version | Status | Priority | Verification Type | Owner |
| --- | --- | --- | --- | --- |
| 1 | Draft | Normal | Test | Simon Krughoff |

Open LVV-T838 in Jira

#### 5.2.0.1 Test Items

The steps here cover just those necessary to gain access to an empty notebook after authentication is complete.

#### 5.2.0.2 Input Specification

Authentication to the Notebook aspect.

#### 5.2.0.3 Test Procedure

| Step 1 | Description |
| --- | --- |
| Open a new launcher by navigating in the top menu bar “File” -> “New Launcher” | |

| Expected Result |
| --- |
| A launcher window with several sections, potentially with several kernel versions for each. |

| Step 2 | Description |
| --- | --- |
| Select the option under “Notebook” labeled “LSST” by clicking on the icon. | |

| Expected Result |
| --- |
| An empty notebook with a single empty cell. The kernel show up as “LSST” in the top right of the notebook. |

## 5.3 LVV-T839 - Access a terminal in the Notebook Aspect

| Version | Status | Priority | Verification Type | Owner |
| --- | --- | --- | --- | --- |
| 1 | Draft | Normal | Test | Jeffrey Carlin |

Open LVV-T839 in Jira

#### 5.3.0.1 Test Items

The steps here cover just those necessary to gain access to a terminal after authentication is complete.

#### 5.3.0.2 Input Specification

Authentication to the Notebook aspect.

#### 5.3.0.3 Test Procedure

| Step 1 | Description |
|---|---|
| Open a new launcher by navigating in the top menu bar “File” -> “New Launcher”. | |
| | Expected Result |
| A launcher window with several sections, potentially with several kernel versions for each. | |

| Step 2 | Description |
|---|---|
| Select the option under “Other” labeled “Terminal” by clicking on the icon. | |
| | Expected Result |
| A terminal window appears with command line access to the user’s file system. | |

### 5.4 LVV-T849 - Authenticate to the portal aspect of the LSP

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 2 | Draft | Normal | Test | Simon Krughoff |

Open LVV-T849 in Jira

#### 5.4.0.1 Test Items

Obtain an authenticated session in the portal aspect of the LSST Science Platform

#### 5.4.0.2 Test Procedure

| Step 1 | Description |
|---|---|
| Navigate to the Portal Aspect endpoint. The stable version should be used for this test and is currently located at: https://lsst-lsp-stable.ncsa.illinois.edu/portal/app/ . | |

| Expected Result |
|---|
| A credential-entry screen should be displayed. |

| Step 2 | Description |
|---|---|
| Enter a valid set of credentials for an LSST user with LSP access on the instance under test. | |

| Expected Result |
|---|
| The Portal Aspect UI should be displayed following authentication. |

## 5.5 LVV-T850 - Log out of the portal aspect of the LSP

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Test | Simon Krughoff |

Open LVV-T850 in Jira

#### 5.5.0.1 Test Items

Leave the portal aspect of the LSST Science Platform in a clean state

#### 5.5.0.2 Test Procedure

| Step 1 | Description |
|---|---|
| Currently, there is no logout mechanism on the portal.<br>This should be updated as the system matures. | |
| Simply close the browser window. | |

| Expected Result |
|---|
| Closed browser window. When navigating to the portal endpoint, expect to execute the steps in LVV-T849. |

## 5.6 LVV-T851 - Query Stripe 82 (LSST stack processing) for NGC 359 via Portal aspect

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Draft | Normal | Demonstration | Jeffrey Carlin |

Open LVV-T851 in Jira

#### 5.6.0.1 Test Items

Execute a Portal query by astronomical source name for elliptical galaxy NGC 359, returning LSST stack-processed Stripe 82 data for this object.

#### 5.6.0.2 Input Specification

LVV-T849 - authenticate to Portal aspect

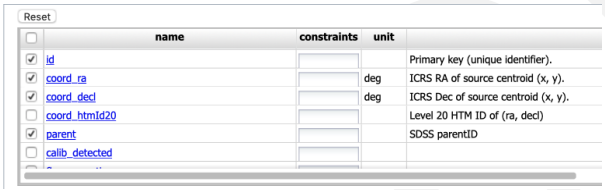
#### 5.6.0.3 Test Procedure

| Step 1 | Description |
|---|---|

The default catalog (SDSS Stripe 82, 2013 LSST Processing) is fine for this.

Choose columns to return by:
1) unchecking the top box in the column selection box
2) checking columns for id, coord_ra, coord_dec, and parent.

The result should look like the following:




| Expected Result |
|---|

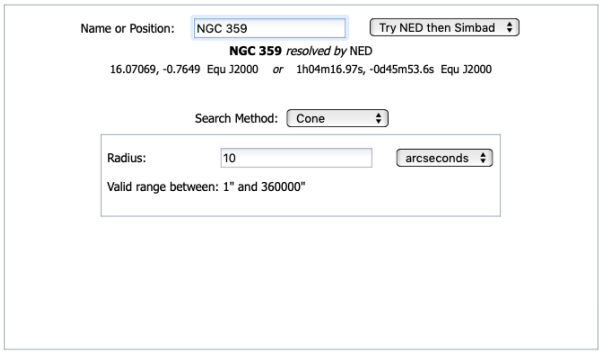
The column box should be configured to return a minimal useful set of columns.

| Step 2 | Description |
|---|---|

Enter an object name for the portal to resolve. We will use NGC 359, a large elliptical galaxy in the Stripe 82 coverage.

To do this, enter the name “NGC 359” in the “Name or Position” text input box.

Leave the other defaults in place.




| Expected Result |
|---|

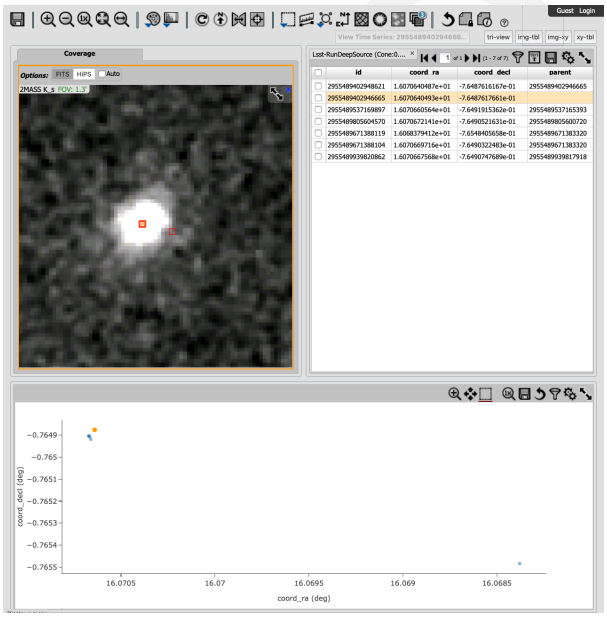
There should be a message like “NGC 359 resolved by NED”. The example coordinates should also changed to the coordinates of NGC 359.

| Step 3 | Description |
|---|---|

Submit the query to the portal query engine by clicking the “Search” button in the lower left corner of the interface.

| Expected Result |
|---|

A firefly app with the summary image overlay and catalog widgets side by side. A plot of RA vs. Dec is displayed below the side by side widgets.




## 5.7 LVV-T1591 - Obtain an access token for the TAP service in an LSP instance

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Approved | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T1591 in Jira

#### 5.7.0.1 Test Items

Obtain an access token for the TAP service in an LSP instance, enabling subsequent test steps to connect to the TAP service as an authorized user.

#### 5.7.0.2 Environment Needs

##### 5.7.0.2.1 Software

An up-to-date Web browser

#### 5.7.0.3 Input Specification

The tester must have credentials for LSP access. Either NCSA or federated non-project credentials may be used.

#### 5.7.0.4 Test Procedure

| Step 1 | Description |
|---|---|
| Using a Web browser, navigate to the "/auth/tokens" endpoint of the LSP instance under test. | |

| | Expected Result |
|---|---|
| A credential-entry screen should be displayed, unless the test user is already logged in in another window or tab of the browser. | |

| Step 2 | Description |
|---|---|
| If necessary, enter a valid set of credentials. They may be NCSA or non-NCSA credentials. | |

| | Expected Result |
|---|---|
| The token-request UI is displayed. | |

| Step 3 | Description |
|---|---|
| Request a token for the “read:tap” capability. | |

| Expected Result |
|---|
| A screen confirming the creation of the token. |

| Step 4 | Description |
|---|---|
| Leave the resulting page’s browser tab/window open for use in subsequent test steps. | |

In many cases you may be asked in a subsequent step to use the “copy token to clipboard” UI element on this page in order to transfer your token to a prompt in another window.

| Expected Result |
|---|

# 6 Deprecated Test Cases

This section includes all test cases that have been marked as deprecated. These test cases will never be executed again, but have been in the past. For this reason it is important to keep them in the baseline as a reference.

## 6.1 LVV-T2 - LSP-00-00: Verification of the presence of the expected WISE data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Deprecated | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T2 in Jira

### 6.1.1 Verification Elements

- LVV-9807 - DMS-LSP-REQ-0001-V-01: Access to All Released or Authorized Data Products_1
- LVV-9809 - DMS-LSP-REQ-0005-V-01: Linkage of Aspects_1

### 6.1.2 Test Items

This test will check:

- That the expected tables are present in the database and accessible via the API Aspect and the Portal Aspect;
- That the tables are present with the expected schema as documented in the IPAC- provided WISE documentation;
- That the row counts in the tables are as expected;
- That the tables cover essentially the entire sky, as expected from the characteristics of the WISE mission.

**Requirements (to be removed when Reqs are synchronized from magic draw)**

- DMS-LSP-REQ-0001
- DMS-LSP-REQ-0005

## 6.2 LVV-T3 - LSP-00-05: Demonstration of low-volume and/or indexed queries against the WISE data via API

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Deprecated | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T3 in Jira

### 6.2.1 Verification Elements

- LVV-9808 - DMS-LSP-REQ-0004-V-01: API (Data Access) Aspect_1

### 6.2.2 Test Items

This test will check that the following low-volume queries can be performed against the WISE catalogs via the API Aspect.

- Small cone searches against the Object-like, ForcedSource-like, and Source-like tables; and
- Searches by exact ID matching against the Object-like, ForcedSource-like, and Source-like tables

The tests will record their performance for comparison against similar queries in the production WISE archive at IRSA, and the returned data will be compared to that for similar queries against the API services provided by IRSA.

**Requirement (to remove once requirements are synchronized from magic draw)**
DMS-LSP-REQ-004

## 6.3 LVV-T4 - LSP-00-10: Demonstration of table-scan queries against the WISE data via API

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Deprecated | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T4 in Jira

### 6.3.1 Verification Elements

- LVV-9824 - DMS-LSP-REQ-0028-V-01: Peak Volume for Moderate-Sized Queries_1
- LVV-9825 - DMS-LSP-REQ-0029-V-01: Peak Volume for Queries on all Objects_1

### 6.3.2 Test Items

This test exercises a range of table-scan-type queries against the WISE data. Queries shall be performed against the Object-like table, the Forced-Source-like table, and against at least one of the Source-like tables. A range of query result sizes should be exercised, and shall include at least:

- Queries returning a very small amount of data, fewer than 100 rows, and a small subset of columns;
- Queries matching a scaled version of the “low volume” query definition from the Data Access White Paper; and
- Queries matching a scaled version of the “high volume” query definition from the Data Access White Paper.

The scaling of the “low volume” query definition (“50 simultaneous queries against 10 million objects in the catalog, response 10 sec, result data set: 0.1 GB”) is based on a assumption that the “against 10 million objects” is applied against the O(20 billion) rows anticipated in the Object table, and that it contemplates reducing the scope of any non-indexed portion of the WHERE clause of the query to that fraction of one in ~ 2000 of the rows in the table. Scaled to the ~ 750 million rows in the WISE Object-like (AllWISE “Source Catalog”) table, this would

be ~ 375,000 rows. Similarly scaling the result set size suggests a result set of ~ 3.7 MB. Successful completion will be evaluated based on the system's ability to perform the query at all and to return a result with characteristics corresponding to plausible estimates or extrapolations from scaled-down queries against the IRSA WISE archive. Exact verification may not be realistic because of the lack of a system capable of performing the equivalent queries in the production WISE archive.
At a later date it may be possible to attempt equivalent queries using a non-database system and verify the exact correspondence of results, but the non-database system does not presently exist1.

**Requirements (to be removed when Reqs are synchronized from magic draw)**

- DMS-LSP-REQ-0028
- DMS-LSP-REQ-0029

## 6.4 LVV-T5 - LSP-00-15: Execution of basic catalog queries in the Portal

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Deprecated | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T5 in Jira

### 6.4.1 Verification Elements

- LVV-9811 - DMS-LSP-REQ-0002-V-01: Portal Aspect_1
- LVV-9819 - DMS-LSP-REQ-0014-V-01: Download Data_1
- LVV-9862 - DMS-PRTL-REQ-0022-V-01: Positional Query: Astrophysical Coordinate Systems_1
- LVV-9865 - DMS-PRTL-REQ-0021-V-01: Positional Query: Multiple Positions/Objects_1
- LVV-9869 - DMS-PRTL-REQ-0026-V-01: Positional Query by Region: Cone-Search_1

- LVV-9868 - DMS-PRTL-REQ-0027-V-01: Positional Query by Region: Box-Search_1
- LVV-9859 - DMS-PRTL-REQ-0028-V-01: Query by Identifier_1
- LVV-9856 - DMS-PRTL-REQ-0016-V-01: Generic Query - Form-based_1

### 6.4.2 Test Items

This test will test the functional requirements to be able to perform a range of basic queries through the Portal Aspect of the LSP:

- Cone searches on the Object-like, ForcedSource-like, and Source-like WISE tables;
- Multi-target cone searches;
- Form-based searches for exact equality, e.g., for row IDs; and
- Form-based searches for sets of object attributes.

In addition, it tests the ability to download tabular query results from the Portal Aspect.

## 6.5 LVV-T6 - LSP-00-20: Operation of the UI for interaction with tabular data results

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Deprecated | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T6 in Jira

### 6.5.1 Verification Elements

- LVV-9895 - DMS-PRTL-REQ-0056-V-01: Histograms_1
- LVV-9901 - DMS-PRTL-REQ-0055-V-01: XY Scatter Plots_1
- LVV-9893 - DMS-PRTL-REQ-0054-V-01: Paging of Tabular Data_1
- LVV-9889 - DMS-PRTL-REQ-0050-V-01: Column Selection of Tabular Data_1
- LVV-9894 - DMS-PRTL-REQ-0053-V-01: Row Selection of Tabular Data_1

- LVV-9891 - DMS-PRTL-REQ-0049-V-01: Display of Tabular Data_1
- LVV-9819 - DMS-LSP-REQ-0014-V-01: Download Data_1
- LVV-9821 - DMS-LSP-REQ-0017-V-01: Tabular Data Download File Formats_1

### 6.5.2 Test Items

This test will test the functional requirements to be able to perform certain basic exploratory data analysis functions on tabular data results in the Portal Aspect UI:

- Sort tabular results;
- Filter tabular results based on the contents of columns;
- Perform per-row selections from a table;
- Display 1D histograms of selected attributes;
- Display 2D scatter plots of selected attributes;
- Perform graphical selections of rows from plots; and
- Download tabular query results reflecting sorting and selection.

This test does not address the limits of scaling of these capabilities to large query results. That will be addressed in future test specifications. The test report should include notes on the sizes of results that were used.

## 6.6 LVV-T7 - LSP-00-25: Image metadata, image, and image cutout queries

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Deprecated | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T7 in Jira

### 6.6.1 Verification Elements

- LVV-9819 - DMS-LSP-REQ-0014-V-01: Download Data_1
- LVV-9820 - DMS-LSP-REQ-0018-V-01: Image Data Download File Format_1

- LVV-9881 - DMS-PRTL-REQ-0040-V-01: Query for Single Epoch Image Cutouts_1
- LVV-9880 - DMS-PRTL-REQ-0041-V-01: Query for Coadded Image Cutouts_1

### 6.6.2 Test Items

This test will check basic functionality related to image search and retrieval, via both the API Aspect and the Portal Aspect of the LSST Science Platform:

- Searching for images containing a specified point;
- Displaying selected images;
- Obtaining and displaying image cutouts at a specified point; and
- Downloading selected images and image cutouts.

Because of limited staff resources, these tests will be based on the original PDAC dataset, the LSST Summer 2013 processing of the SDSS Stripe 82 data. The image data for the WISE and NEOWISE missions have not been loaded into PDAC.

## 6.7 LVV-T8 - LSP-00-30: Linkage of catalog query results with associated images

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Deprecated | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T8 in Jira

### 6.7.1 Verification Elements

- LVV-9848 - DMS-PRTL-REQ-0004-V-01: Semantic Linkage: Portal Workflows_1
- LVV-9814 - DMS-LSP-REQ-0008-V-01: Semantic Linkage_1

### 6.7.2 Test Items

This test will check for the ability, in the Portal Aspect of the LSST Science Platform, to match catalog data with the image data on which the measurements were performed, specifically:

- Navigating from a catalog query result to the associated images; and
- Overlaying catalog query results on associated images.

Because of limited staff resources, these tests will be based on the original PDAC dataset, the LSST Summer 2013 processing of the SDSS Stripe 82 data. The image data for the WISE and NEOWISE missions have not been loaded into PDAC.

## 6.8 LVV-T9 - LSP-00-35: Linkage of catalog query results to related catalog data

| Version | Status | Priority | Verification Type | Owner |
|---|---|---|---|---|
| 1 | Deprecated | Normal | Test | Gregory Dubois-Felsmann |

Open LVV-T9 in Jira

### 6.8.1 Verification Elements

- LVV-9814 - DMS-LSP-REQ-0008-V-01: Semantic Linkage_1

### 6.8.2 Test Items

This test will check for the ability, in the Portal Aspect of the LSST Science Platform, to match catalog data with related catalog data. Specifically, the test verifies the ability to navigate from a coadded source catalog entry to the associated forced photometry.

**Requirements (to be removed when Reqs are synchronized from magic draw)**

- DMS-LSP-REQ-0008

# A Traceability

| Verification Elements | High Level Requirements | Test Cases |
|---|---|---|
| LVV-9807 - DMS-LSP-REQ-0001-V-01: Access to All Released or Authorized Data Products_1 | | LVV-T2<br>LVV-T598 |
| LVV-9809 - DMS-LSP-REQ-0005-V-01: Linkage of Aspects_1 | | LVV-T2<br>LVV-T603<br>LVV-T1334<br>LVV-T1436<br>LVV-T1437 |
| LVV-9808 - DMS-LSP-REQ-0004-V-01: API (Data Access) Aspect_1 | | LVV-T3<br>LVV-T602<br>LVV-T1437 |
| LVV-9824 - DMS-LSP-REQ-0028-V-01: Peak Volume for Moderate-Sized Queries_1 | | LVV-T4<br>LVV-T617 |
| LVV-9825 - DMS-LSP-REQ-0029-V-01: Peak Volume for Queries on all Objects_1 | | LVV-T4<br>LVV-T618 |
| LVV-9811 - DMS-LSP-REQ-0002-V-01: Portal Aspect_1 | | LVV-T5<br>LVV-T600<br>LVV-T1334 |
| LVV-9819 - DMS-LSP-REQ-0014-V-01: Download Data_1 | | LVV-T5<br>LVV-T6<br>LVV-T7<br>LVV-T612 |
| LVV-9862 - DMS-PRTL-REQ-0022-V-01: Positional Query: Astrophysical Coordinate Systems_1 | | LVV-T5<br>LVV-T657 |
| LVV-9865 - DMS-PRTL-REQ-0021-V-01: Positional Query: Multiple Positions/Objects_1 | | LVV-T5<br>LVV-T656 |
| LVV-9869 - DMS-PRTL-REQ-0026-V-01: Positional Query by Region: ConeSearch_1 | | LVV-T5<br>LVV-T661<br>LVV-T1334 |
| LVV-9868 - DMS-PRTL-REQ-0027-V-01: Positional Query by Region: BoxSearch_1 | | LVV-T5<br>LVV-T662 |
| LVV-9859 - DMS-PRTL-REQ-0028-V-01: Query by Identifier_1 | | LVV-T5<br>LVV-T652 |
| LVV-9856 - DMS-PRTL-REQ-0016-V-01: Generic Query - Form-based_1 | | LVV-T5<br>LVV-T649<br>LVV-T1334 |
| LVV-9895 - DMS-PRTL-REQ-0056-V-01: Histograms_1 | | LVV-T6<br>LVV-T691 |
| LVV-9901 - DMS-PRTL-REQ-0055-V-01: XY Scatter Plots_1 | | LVV-T6<br>LVV-T690 |
| LVV-9893 - DMS-PRTL-REQ-0054-V-01: Paging of Tabular Data_1 | | LVV-T6<br>LVV-T689 |
| LVV-9889 - DMS-PRTL-REQ-0050-V-01: Column Selection of Tabular Data_1 | | LVV-T6<br>LVV-T685 |

| Verification Elements | High Level Requirements | Test Cases |
|---|---|---|
| LVV-9894 - DMS-PRTL-REQ-0053-V-01: Row Selection of Tabular Data_1 | | LVV-T6<br>LVV-T688 |
| LVV-9891 - DMS-PRTL-REQ-0049-V-01: Display of Tabular Data_1 | | LVV-T6<br>LVV-T684<br>LVV-T1334 |
| LVV-9821 - DMS-LSP-REQ-0017-V-01: Tabular Data Download File Formats_1 | | LVV-T6<br>LVV-T615 |
| LVV-9820 - DMS-LSP-REQ-0018-V-01: Image Data Download File Format_1 | | LVV-T7<br>LVV-T616 |
| LVV-9881 - DMS-PRTL-REQ-0040-V-01: Query for Single Epoch Image Cutouts_1 | | LVV-T7<br>LVV-T675 |
| LVV-9880 - DMS-PRTL-REQ-0041-V-01: Query for Coadded Image Cutouts_1 | | LVV-T7<br>LVV-T674 |
| LVV-9848 - DMS-PRTL-REQ-0004-V-01: Semantic Linkage: Portal Workflows_1 | | LVV-T8<br>LVV-T637 |
| LVV-9814 - DMS-LSP-REQ-0008-V-01: Semantic Linkage_1 | | LVV-T8<br>LVV-T9<br>LVV-T606 |
| LVV-9810 - DMS-LSP-REQ-0003-V-01: Notebook Aspect_1 | | LVV-T601<br>LVV-T1436 |
| LVV-9812 - DMS-LSP-REQ-0006-V-01: Use of VO Standards_1 | | LVV-T604<br>LVV-T1334<br>LVV-T1436<br>LVV-T1437 |
| LVV-9806 - DMS-LSP-REQ-0007-V-01: Abide by the Data Access Policies_1 | | LVV-T605 |
| LVV-9813 - DMS-LSP-REQ-0009-V-01: Semantic Linkage: Uncertainties_1 | | LVV-T607 |
| LVV-9815 - DMS-LSP-REQ-0010-V-01: Transfer of Portal Data References to Notebook_1 | | LVV-T608 |
| LVV-9817 - DMS-LSP-REQ-0011-V-01: User File Workspace_1 | | LVV-T609 |
| LVV-9816 - DMS-LSP-REQ-0012-V-01: User Database Workspace_1 | | LVV-T610 |
| LVV-9818 - DMS-LSP-REQ-0013-V-01: User Workspace Access Controls_1 | | LVV-T611 |
| LVV-9823 - DMS-LSP-REQ-0015-V-01: Upload Data_1 | | LVV-T613 |
| LVV-9822 - DMS-LSP-REQ-0016-V-01: Transfer Data to Workspace_1 | | LVV-T614 |
| LVV-9826 - DMS-LSP-REQ-0030-V-01: Peak Volume of In-process Queries_1 | | LVV-T619 |
| LVV-9827 - DMS-LSP-REQ-0031-V-01: Query Result Download Bandwidth_1 | | LVV-T620 |
| LVV-9828 - DMS-LSP-REQ-0019-V-01: Documentation_1 | | LVV-T621 |
| LVV-9830 - DMS-LSP-REQ-0020-V-01: Authenticated User Access_1 | | LVV-T622<br>LVV-T1334<br>LVV-T1436<br>LVV-T1437 |
| LVV-9832 - DMS-LSP-REQ-0021-V-01: New-user Support_1 | | LVV-T623 |
| LVV-9831 - DMS-LSP-REQ-0022-V-01: Common Identity_1 | | LVV-T624<br>LVV-T1334<br>LVV-T1436<br>LVV-T1437 |

| Verification Elements | High Level Requirements | Test Cases |
|---|---|---|
| LVV-9834 - DMS-LSP-REQ-0023-V-01: Use of External Identity Providers_1 | | LVV-T625<br>LVV-T1334<br>LVV-T1436<br>LVV-T1437 |
| LVV-9835 - DMS-LSP-REQ-0024-V-01: Use of Multiple Sets of Credentials_1 | | LVV-T626<br>LVV-T1334<br>LVV-T1436<br>LVV-T1437 |
| LVV-9829 - DMS-LSP-REQ-0025-V-01: Acceptable Use Policy_1 | | LVV-T627 |
| LVV-9836 - DMS-LSP-REQ-0026-V-01: Using secure protocols_1 | | LVV-T628<br>LVV-T1436 |
| LVV-9833 - DMS-LSP-REQ-0027-V-01: Privacy of User Activities_1 | | LVV-T629 |
| LVV-9839 - DMS-LSP-REQ-0032-V-01: Multiple installations_1 | | LVV-T630 |
| LVV-9837 - DMS-LSP-REQ-0033-V-01: Internet-Accessible (IPv4)_1 | | LVV-T631 |
| LVV-9838 - DMS-LSP-REQ-0034-V-01: Internet-Accessible (IPv6)_1 | | LVV-T632 |
| LVV-9840 - DMS-LSP-REQ-0035-V-01: System-Availability Indication_1 | | LVV-T633 |
| LVV-9841 - DMS-PRTL-REQ-0001-V-01: Portal is a Web Application_1 | | LVV-T634<br>LVV-T1334 |
| LVV-9847 - DMS-PRTL-REQ-0002-V-01: Portal Discovery of all Data Products_1 | | LVV-T635 |
| LVV-9846 - DMS-PRTL-REQ-0003-V-01: Portal Access to Workspace_1 | | LVV-T636<br>LVV-T1818 |
| LVV-9842 - DMS-PRTL-REQ-0005-V-01: Access to Calibration Products_1 | | LVV-T638 |
| LVV-9845 - DMS-PRTL-REQ-0006-V-01: Coadded Image to Single-Epoch Image Associations_1 | | LVV-T639 |
| LVV-9843 - DMS-PRTL-REQ-0007-V-01: Access to External Archives_1 | | LVV-T640 |
| LVV-9844 - DMS-PRTL-REQ-0008-V-01: API for Access to Portal Session State_1 | | LVV-T641 |
| LVV-9854 - DMS-PRTL-REQ-0009-V-01: Support Synchronous and Asynchronous Queries_1 | | LVV-T642 |
| LVV-9849 - DMS-PRTL-REQ-0010-V-01: Long Query Backgrounding_1 | | LVV-T643 |
| LVV-9853 - DMS-PRTL-REQ-0011-V-01: Query Status and Termination Notification_1 | | LVV-T644 |
| LVV-9851 - DMS-PRTL-REQ-0012-V-01: Query Results Size Limitation_1 | | LVV-T645 |
| LVV-9850 - DMS-PRTL-REQ-0013-V-01: Query History Inspection_1 | | LVV-T646 |
| LVV-9852 - DMS-PRTL-REQ-0014-V-01: Query Saving - Portal_1 | | LVV-T647 |
| LVV-9857 - DMS-PRTL-REQ-0015-V-01: Generic Query_1 | | LVV-T648<br>LVV-T1334 |
| LVV-9855 - DMS-PRTL-REQ-0017-V-01: Generic Query - ADQL-based_1 | | LVV-T650<br>LVV-T1334 |
| LVV-9858 - DMS-PRTL-REQ-0018-V-01: Query Result Size_1 | | LVV-T651 |
| LVV-9860 - DMS-PRTL-REQ-0029-V-01: Query by LSST Object and Source Identifiers: Specific Match to Identifier_1 | | LVV-T653 |
| LVV-9861 - DMS-PRTL-REQ-0030-V-01: Query by Solar System Objects: Specific Match to Identifier_1 | | LVV-T654 |
| LVV-9866 - DMS-PRTL-REQ-0020-V-01: Positional Query: Position on the Sky_1 | | LVV-T655<br>LVV-T1334 |

| Verification Elements | High Level Requirements | Test Cases |
|---|---|---|
| LVV-9863 - DMS-PRTL-REQ-0023-V-01: Positional Query: Astrophysical Source Name Lookup_1 | | LVV-T658 |
| LVV-9864 - DMS-PRTL-REQ-0024-V-01: Positional Query: LSST Object and Source Identifiers_1 | | LVV-T659 |
| LVV-9867 - DMS-PRTL-REQ-0025-V-01: Positional Query: Solar System Object Names_1 | | LVV-T660 |
| LVV-9870 - DMS-PRTL-REQ-0019-V-01: Query by Date and Time: Time Range of Observation_1 | | LVV-T663 |
| LVV-9874 - DMS-PRTL-REQ-0031-V-01: Tabular Data Query Specifications_1 | | LVV-T664 |
| LVV-9873 - DMS-PRTL-REQ-0032-V-01: Query Tabular Data based upon Image MetaData_1 | | LVV-T666 |
| LVV-9872 - DMS-PRTL-REQ-0033-V-01: Queries on the Alerts Database_1 | | LVV-T667 |
| LVV-9871 - DMS-PRTL-REQ-0034-V-01: Access to Original Alert State_1 | | LVV-T668 |
| LVV-9878 - DMS-PRTL-REQ-0035-V-01: Query for Single Epoch Visit Images_1 | | LVV-T669 |
| LVV-9877 - DMS-PRTL-REQ-0036-V-01: Query for Single Epoch Raft Images_1 | | LVV-T670 |
| LVV-9876 - DMS-PRTL-REQ-0037-V-01: Query for Single Epoch CCD Image_1 | | LVV-T671 |
| LVV-9879 - DMS-PRTL-REQ-0038-V-01: Single-Epoch Image Query Specifications_1 | | LVV-T672 |
| LVV-9875 - DMS-PRTL-REQ-0039-V-01: Coadded Image Query Specifications_1 | | LVV-T673 |
| LVV-9905 - DMS-PRTL-REQ-0062-V-01: Display Native Single-Visit Image Data Products_1 | | LVV-T676 |
| LVV-9884 - DMS-PRTL-REQ-0042-V-01: Visualization of Tabular and Image Data_1 | | LVV-T677 |
| LVV-9883 - DMS-PRTL-REQ-0043-V-01: Visualization of Ancillary Information_1 | | LVV-T678 |
| LVV-9882 - DMS-PRTL-REQ-0044-V-01: Linking Visualization of Image Data to Tabular Data_1 | | LVV-T679 |
| LVV-9885 - DMS-PRTL-REQ-0045-V-01: Visualization of Uploaded Tabular and Image Data_1 | | LVV-T680 |
| LVV-9886 - DMS-PRTL-REQ-0046-V-01: Visualization of Workspace Data_1 | | LVV-T681<br>LVV-T1818 |
| LVV-9888 - DMS-PRTL-REQ-0047-V-01: Table Row Property Sheet_1 | | LVV-T682 |
| LVV-9887 - DMS-PRTL-REQ-0048-V-01: Alert Visualization_1 | | LVV-T683 |
| LVV-9892 - DMS-PRTL-REQ-0051-V-01: Display Order of Columns of Tabular Data_1 | | LVV-T686 |
| LVV-9890 - DMS-PRTL-REQ-0052-V-01: Copying of Tabular Data_1 | | LVV-T687 |
| LVV-9900 - DMS-PRTL-REQ-0057-V-01: Symbol Size, Shape, and Color Coding in XY(Z) Scatter Plots_1 | | LVV-T692 |
| LVV-9898 - DMS-PRTL-REQ-0058-V-01: Plot Quantitative Uncertainties_1 | | LVV-T693 |
| LVV-9897 - DMS-PRTL-REQ-0059-V-01: Plot Asymmetric Quantitative Uncertainties_1 | | LVV-T694 |
| LVV-9899 - DMS-PRTL-REQ-0060-V-01: Plot Upper and Lower Quantitative Limits_1 | | LVV-T695 |
| LVV-9896 - DMS-PRTL-REQ-0061-V-01: Multiple XY-Plots on the Same Display_1 | | LVV-T696 |
| LVV-9906 - DMS-PRTL-REQ-0063-V-01: Display Raft- and Focal-Plane-Level Single-Visit Image Data_1 | | LVV-T697 |

| Verification Elements | High Level Requirements | Test Cases |
|---|---|---|
| LVV-9907 - DMS-PRTL-REQ-0064-V-01: Display Single Visit Image Cut-Out_1 | | LVV-T698 |
| LVV-9904 - DMS-PRTL-REQ-0065-V-01: Display Native Coadded Image Data Products_1 | | LVV-T699 |
| LVV-9903 - DMS-PRTL-REQ-0066-V-01: Display Coadded Image Cutouts / Mosaics_1 | | LVV-T700 |
| LVV-9902 - DMS-PRTL-REQ-0067-V-01: Display Calibration Image Data Products_1 | | LVV-T701 |
| LVV-9908 - DMS-PRTL-REQ-0068-V-01: Display User-provided Images_1 | | LVV-T702 |
| LVV-9909 - DMS-PRTL-REQ-0069-V-01: Image Property Sheet_1 | | LVV-T703 |
| LVV-9914 - DMS-PRTL-REQ-0070-V-01: Provide Coordinate Display Tools for Images_1 | | LVV-T704 |
| LVV-9911 - DMS-PRTL-REQ-0071-V-01: Image Pixel Content Display_1 | | LVV-T705 |
| LVV-9912 - DMS-PRTL-REQ-0072-V-01: Image Spatial Manipulation_1 | | LVV-T706 |
| LVV-9913 - DMS-PRTL-REQ-0073-V-01: Multi-Image Scaling and Aligning_1 | | LVV-T707 |
| LVV-9910 - DMS-PRTL-REQ-0074-V-01: Image Appearance Manipulation_1 | | LVV-T708 |
| LVV-9915 - DMS-PRTL-REQ-0075-V-01: Image Mask and Variance Overlays_1 | | LVV-T709 |
| LVV-9917 - DMS-PRTL-REQ-0076-V-01: Image Plot Overlays_1 | | LVV-T710 |
| LVV-9916 - DMS-PRTL-REQ-0077-V-01: Image Overlays: Adjustment of Colors and Positions_1 | | LVV-T711 |
| LVV-9918 - DMS-PRTL-REQ-0078-V-01: Display All-Sky HEALPix Image_1 | | LVV-T712 |
| LVV-9922 - DMS-PRTL-REQ-0079-V-01: Zoom In and Out on a HEALPix Image_1 | | LVV-T713 |
| LVV-9920 - DMS-PRTL-REQ-0080-V-01: Pan Around on a HEALPix Image_1 | | LVV-T714 |
| LVV-9919 - DMS-PRTL-REQ-0081-V-01: HEALPix Pixel Selection_1 | | LVV-T715 |
| LVV-9921 - DMS-PRTL-REQ-0082-V-01: Retrieve HEALPix-Associated Data_1 | | LVV-T716 |
| LVV-9924 - DMS-PRTL-REQ-0083-V-01: Coordinate Display Applicability_1 | | LVV-T717 |
| LVV-9928 - DMS-PRTL-REQ-0084-V-01: Point Coordinate Display_1 | | LVV-T718 |
| LVV-9926 - DMS-PRTL-REQ-0085-V-01: Distance Measurement Tool_1 | | LVV-T719 |
| LVV-9925 - DMS-PRTL-REQ-0086-V-01: Coordinate Grid Overlays_1 | | LVV-T720 |
| LVV-9923 - DMS-PRTL-REQ-0087-V-01: Astrophysical Compass Overlay_1 | | LVV-T721 |
| LVV-9927 - DMS-PRTL-REQ-0088-V-01: Geometric Figure Overlays_1 | | LVV-T722 |
| LVV-9934 - DMS-PRTL-REQ-0089-V-01: Sorting of Tabular Data by Column_1 | | LVV-T723 |
| LVV-9933 - DMS-PRTL-REQ-0090-V-01: Simple Filtering of Tabular Data_1 | | LVV-T724 |
| LVV-9929 - DMS-PRTL-REQ-0091-V-01: Calculated Filtering of Tabular Data_1 | | LVV-T725 |
| LVV-9931 - DMS-PRTL-REQ-0092-V-01: Filtering of Tabular Data by Multiple Columns_1 | | LVV-T726 |
| LVV-9930 - DMS-PRTL-REQ-0093-V-01: Calculated Quantities on Tabular Data_1 | | LVV-T727 |
| LVV-9935 - DMS-PRTL-REQ-0094-V-01: Statistical Measurements on Tabular Data_1 | | LVV-T728 |
| LVV-9932 - DMS-PRTL-REQ-0095-V-01: Saving Displayed Tabular Data_1 | | LVV-T729<br>LVV-T1334<br>LVV-T1818 |
| LVV-9936 - DMS-PRTL-REQ-0096-V-01: False-color Images Creation and Display_1 | | LVV-T730 |
| LVV-9937 - DMS-PRTL-REQ-0097-V-01: Statistical Measurements on Image Data_1 | | LVV-T731 |

| Verification Elements | High Level Requirements | Test Cases |
|---|---|---|
| LVV-9942 - DMS-PRTL-REQ-0098-V-01: Overlay Catalog of Sources and Objects on Images_1 | | LVV-T732 |
| LVV-9943 - DMS-PRTL-REQ-0099-V-01: Overlay LSST-Derived Orbits_1 | | LVV-T733 |
| LVV-9944 - DMS-PRTL-REQ-0100-V-01: Overlay User-provided Catalogs on Images_1 | | LVV-T734 |
| LVV-9945 - DMS-PRTL-REQ-0101-V-01: Overlay User-provided Region Files on Images_1 | | LVV-T735 |
| LVV-9940 - DMS-PRTL-REQ-0102-V-01: Display of Camera Artifacts as Overlays_1 | | LVV-T736 |
| LVV-9948 - DMS-PRTL-REQ-0103-V-01: Single-Object Time-Domain Image View_1 | | LVV-T737 |
| LVV-9946 - DMS-PRTL-REQ-0104-V-01: Position-based Time-Domain Image View_1 | | LVV-T738 |
| LVV-9938 - DMS-PRTL-REQ-0105-V-01: Brightness Light Curves_1 | | LVV-T739 |
| LVV-9941 - DMS-PRTL-REQ-0106-V-01: Linked Tables, Plots, and Images_1 | | LVV-T740 |
| LVV-9939 - DMS-PRTL-REQ-0107-V-01: Data Selection from a Plot or Image_1 | | LVV-T741 |
| LVV-9947 - DMS-PRTL-REQ-0108-V-01: Saving Data Selection from a Plot or Image_1 | | LVV-T742 |
| LVV-9949 - DMS-PRTL-REQ-0109-V-01: Access to User Databases_1 | | LVV-T743 |
| LVV-9954 - DMS-PRTL-REQ-0110-V-01: Tabular Data Download_1 | | LVV-T744<br>LVV-T1818 |
| LVV-9951 - DMS-PRTL-REQ-0111-V-01: Image Data Download_1 | | LVV-T745<br>LVV-T1818 |
| LVV-9953 - DMS-PRTL-REQ-0112-V-01: Selected Image Download_1 | | LVV-T746 |
| LVV-9950 - DMS-PRTL-REQ-0113-V-01: Download Volume Estimation_1 | | LVV-T747 |
| LVV-9952 - DMS-PRTL-REQ-0114-V-01: Long Download Completion Notification_1 | | LVV-T748 |
| LVV-9955 - DMS-PRTL-REQ-0115-V-01: APIs for Visualization Components_1 | | LVV-T749 |
| LVV-9958 - DMS-PRTL-REQ-0116-V-01: Storage Quotas User Interface_1 | | LVV-T750 |
| LVV-9956 - DMS-PRTL-REQ-0117-V-01: Computational Quotas User Interface_1 | | LVV-T751 |
| LVV-9957 - DMS-PRTL-REQ-0118-V-01: Portal Display Preferences_1 | | LVV-T752 |
| LVV-9960 - DMS-PRTL-REQ-0119-V-01: Alert Subscription Service_1 | | LVV-T753 |
| LVV-9961 - DMS-PRTL-REQ-0120-V-01: Pre-defined Alert Filters_1 | | LVV-T754 |
| LVV-9962 - DMS-PRTL-REQ-0121-V-01: User-defined Alert Filters_1 | | LVV-T755 |
| LVV-9959 - DMS-PRTL-REQ-0127-V-01: Alert Subscription Monitoring_1 | | LVV-T756 |
| LVV-9963 - DMS-PRTL-REQ-0122-V-01: Access to Observatory Documentation_1 | | LVV-T757 |
| LVV-9965 - DMS-PRTL-REQ-0123-V-01: Portal User Documentation_1 | | LVV-T758 |
| LVV-9964 - DMS-PRTL-REQ-0124-V-01: Portal API Documentation_1 | | LVV-T759 |
| LVV-9967 - DMS-PRTL-REQ-0125-V-01: Tolerance of Production Database Changes_1 | | LVV-T760 |
| LVV-9966 - DMS-PRTL-REQ-0126-V-01: System-Busy Indication_1 | | LVV-T761 |
| LVV-9971 - DMS-NB-REQ-0005-V-01: Interactive Python Environment_1 | | LVV-T762<br>LVV-T1436 |
| LVV-9976 - DMS-NB-REQ-0006-V-01: Unix Shell Access_1 | | LVV-T763<br>LVV-T1436 |

| Verification Elements | High Level Requirements | Test Cases |
|---|---|---|
| LVV-9974 - DMS-NB-REQ-0007-V-01: Pre-installed Containerized Software Releases_1 | | LVV-T764 |
| LVV-9975 - DMS-NB-REQ-0008-V-01: Release Deployment Latency_1 | | LVV-T765 |
| LVV-9969 - DMS-NB-REQ-0009-V-01: Data Access Middleware Availability_1 | | LVV-T766 |
| LVV-9968 - DMS-NB-REQ-0010-V-01: Common Astronomy Package Availability_1 | | LVV-T767 |
| LVV-9978 - DMS-NB-REQ-0011-V-01: User Package Installation_1 | | LVV-T768 |
| LVV-9977 - DMS-NB-REQ-0012-V-01: User Development Environment_1 | | LVV-T769 |
| LVV-9973 - DMS-NB-REQ-0013-V-01: Persistent User Home File Space_1 | | LVV-T770<br>LVV-T1436 |
| LVV-9970 - DMS-NB-REQ-0014-V-01: Documentation_1 | | LVV-T771 |
| LVV-9972 - DMS-NB-REQ-0015-V-01: New-User Onboarding_1 | | LVV-T772 |
| LVV-9983 - DMS-NB-REQ-0016-V-01: Shared File Space_1 | | LVV-T773 |
| LVV-9980 - DMS-NB-REQ-0017-V-01: Access to the API and Portal Aspects_1 | | LVV-T774<br>LVV-T1436 |
| LVV-9985 - DMS-NB-REQ-0018-V-01: User File Workspace Access_1 | | LVV-T775 |
| LVV-9986 - DMS-NB-REQ-0019-V-01: VOSpace Access_1 | | LVV-T776 |
| LVV-9984 - DMS-NB-REQ-0020-V-01: User Database Workspace Access_1 | | LVV-T777 |
| LVV-9981 - DMS-NB-REQ-0021-V-01: Batch System Access_1 | | LVV-T778 |
| LVV-9982 - DMS-NB-REQ-0022-V-01: Compute and Storage Quotas_1 | | LVV-T779 |
| LVV-9979 - DMS-NB-REQ-0023-V-01: Access to All Data Products_1 | | LVV-T780 |
| LVV-9988 - DMS-NB-REQ-0024-V-01: Ease of Deployment_1 | | LVV-T781 |
| LVV-9987 - DMS-NB-REQ-0025-V-01: Deployment Workload in Kubernetes_1 | | LVV-T782 |
| LVV-9989 - DMS-NB-REQ-0026-V-01: System Health Monitoring_1 | | LVV-T783 |
| LVV-9990 - DMS-NB-REQ-0032-V-01: Image Visualization_1 | | LVV-T784 |
| LVV-9991 - DMS-NB-REQ-0033-V-01: Scientific Plotting_1 | | LVV-T785 |
| LVV-9993 - DMS-NB-REQ-0034-V-01: Visualization Linkage_1 | | LVV-T786 |
| LVV-9992 - DMS-NB-REQ-0035-V-01: Visualization Interactivity_1 | | LVV-T787 |
| LVV-9994 - DMS-NB-REQ-0036-V-01: Visualization Scaling_1 | | LVV-T788 |
| LVV-9996 - DMS-NB-REQ-0029-V-01: Access to Portal-Initiated Queries_1 | | LVV-T789<br>LVV-T1436 |
| LVV-9995 - DMS-NB-REQ-0030-V-01: Access to Portal Visualization API_1 | | LVV-T790 |
| LVV-9997 - DMS-NB-REQ-0031-V-01: Notebook-Launching Interface_1 | | LVV-T791 |
| LVV-10000 - DMS-NB-REQ-0001-V-01: Secure Protocol_1 | | LVV-T792<br>LVV-T1436 |
| LVV-9998 - DMS-NB-REQ-0002-V-01: Authentication and Authorization_1 | | LVV-T793<br>LVV-T1436 |
| LVV-9999 - DMS-NB-REQ-0003-V-01: Secure Implementation_1 | | LVV-T794 |
| LVV-10001 - DMS-NB-REQ-0004-V-01: IPV6 Access_1 | | LVV-T795 |
| LVV-10011 - DMS-API-REQ-0021-V-01: Use of CAOM2_1 | | LVV-T796 |
| LVV-10003 - DMS-API-REQ-0022-V-01: Access to Image and Visit Metadata_1 | | LVV-T797 |
| LVV-10002 - DMS-API-REQ-0023-V-01: Access to Catalog Data Products_1 | | LVV-T798<br>LVV-T1437 |
| LVV-10005 - DMS-API-REQ-0024-V-01: Access to Observatory Metadata_1 | | LVV-T799 |
| LVV-10009 - DMS-API-REQ-0025-V-01: Enforcement of Information Classification_1 | | LVV-T800 |
| LVV-10006 - DMS-API-REQ-0026-V-01: Access to Reference Catalogs_1 | | LVV-T801 |

| Verification Elements | High Level Requirements | Test Cases |
|---|---|---|
| LVV-10007 - DMS-API-REQ-0027-V-01: Access to Virtual Data Products_1 | | LVV-T802 |
| LVV-10004 - DMS-API-REQ-0028-V-01: Access to Image Data in FITS Format_1 | | LVV-T803 |
| LVV-10010 - DMS-API-REQ-0029-V-01: Multiple Data Releases_1 | | LVV-T804 |
| LVV-10008 - DMS-API-REQ-0030-V-01: Catalog Metadata Service_1 | | LVV-T805 |
| LVV-10015 - DMS-API-REQ-0006-V-01: TAP Service for Tabular Queries_1 | | LVV-T806<br>LVV-T1437 |
| LVV-10014 - DMS-API-REQ-0007-V-01: Synchronous TAP Support_1 | | LVV-T807<br>LVV-T1437 |
| LVV-10013 - DMS-API-REQ-0008-V-01: Asynchronous TAP Support_1 | | LVV-T808<br>LVV-T1437 |
| LVV-10012 - DMS-API-REQ-0009-V-01: ADQL Support_1 | | LVV-T809<br>LVV-T1437 |
| LVV-10016 - DMS-API-REQ-0016-V-01: SIA Service for Image Availability_1 | | LVV-T810 |
| LVV-10018 - DMS-API-REQ-0017-V-01: SODA Service for Image Data_1 | | LVV-T811 |
| LVV-10017 - DMS-API-REQ-0018-V-01: Cutout Service_1 | | LVV-T812 |
| LVV-10020 - DMS-API-REQ-0038-V-01: Query History Retrieval_1 | | LVV-T813 |
| LVV-10019 - DMS-API-REQ-0039-V-01: Cached Query Result Retrieval_1 | | LVV-T814<br>LVV-T1437 |
| LVV-10021 - DMS-API-REQ-0040-V-01: Query Specification Retrieval_1 | | LVV-T815 |
| LVV-10022 - DMS-API-REQ-0034-V-01: Butler Interface to Data Products_1 | | LVV-T816 |
| LVV-10023 - DMS-API-REQ-0019-V-01: VOSpace Service_1 | | LVV-T817 |
| LVV-10024 - DMS-API-REQ-0020-V-01: WebDAV Service_1 | | LVV-T818 |
| LVV-10029 - DMS-API-REQ-0010-V-01: VOTable Output for TAP_1 | | LVV-T819 |
| LVV-10030 - DMS-API-REQ-0011-V-01: VOTable TABLEDATA Payload_1 | | LVV-T820 |
| LVV-10028 - DMS-API-REQ-0012-V-01: VOTable BINARY2 Payload_1 | | LVV-T821 |
| LVV-10026 - DMS-API-REQ-0013-V-01: JSON Output for TAP_1 | | LVV-T822 |
| LVV-10025 - DMS-API-REQ-0014-V-01: CSV Output for TAP_1 | | LVV-T823 |
| LVV-10027 - DMS-API-REQ-0015-V-01: SQLite Output for TAP_1 | | LVV-T824 |
| LVV-10032 - DMS-API-REQ-0031-V-01: Tabular Result Download to Workspace_1 | | LVV-T825 |
| LVV-10033 - DMS-API-REQ-0032-V-01: Tabular Upload to Workspace_1 | | LVV-T826 |
| LVV-10031 - DMS-API-REQ-0033-V-01: Deletion from Workspace_1 | | LVV-T827 |
| LVV-10037 - DMS-API-REQ-0001-V-01: Secure Protocols_1 | | LVV-T828<br>LVV-T1437 |
| LVV-10034 - DMS-API-REQ-0003-V-01: Authentication_1 | | LVV-T829<br>LVV-T1437 |
| LVV-10035 - DMS-API-REQ-0004-V-01: Authorization_1 | | LVV-T830<br>LVV-T1437 |
| LVV-10036 - DMS-API-REQ-0005-V-01: Secure Implementation_1 | | LVV-T831 |
| LVV-10038 - DMS-API-REQ-0035-V-01: Containerized Deployment_1 | | LVV-T832 |
| LVV-10040 - DMS-API-REQ-0002-V-01: Result Compression_1 | | LVV-T833 |
| LVV-10041 - DMS-API-REQ-0036-V-01: Upgradability_1 | | LVV-T834 |
| LVV-10039 - DMS-API-REQ-0037-V-01: Logging and Monitoring_1 | | LVV-T835 |