

Large Synoptic Survey Telescope (LSST) Data Management

LDM-503-10a: LSP with Authentication and TAP Test Plan and Report

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DMTR-161

Latest Revision: 2020-01-20

Abstract

This is the test plan and report for LDM-503-10a: (LSP with Authentication and TAP), an LSST level 2 milestone pertaining to the Data Management Subsystem.



Change Record

Version	Date	Description	Owner name
	2019-09-09	First Draft	G. Dubois-Felsmann
0.1	2019-11-18	LVV-P48 approved in DM-19211, ticket branch merged to master	G. Dubois-Felsmann
1.0	2020-01-14	LVV-P48 Completed. Test Campaign reviewed and approved in DM-19209	G. Dubois-Felsmann

Document curator: Gregory Dubois-Felsmann

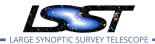
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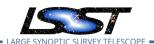


Contents

1	Introduction	1
	1.1 Objectives	1
	1.2 Scope	1
	1.3 System Overview	2
	1.4 Document Overview	2
	1.5 References	2
2	Test Configuration	3
	2.1 Data Collection	3
	2.2 Verification Environment	3
3	Personnel	4
4	Test Campaign Overview	5
	4.1 Summary	5
	4.2 Overall Assessment	6
	4.3 Recommended Improvements	6
5	Detailed Test Results	8
	5.1 Test Cycle LVV-C85	8
	5.1.1 Software Version/Baseline	8
	5.1.2 Configuration	8
	5.1.3 Test Cases in LVV-C85 Test Cycle	9
	5.1.3.1 Test Case LVV-T807 - Verify synchronous TAP queries	9
	5.1.3.2 Test Case LVV-T622 - Verify LSP only available to authenticated	
	users	11
	5.1.3.3 Test Case LVV-T1334 - LDM-503-10a: Portal Aspect tests for LSP	
	with Authentication and TAP milestone	16
	5.1.3.4 Test Case LVV-T1436 - LDM-503-10a: Notebook Aspect tests for	
	LSP with Authentication and TAP milestone	22



B Acronyms used in this document	37
A Traceability	34
Authentication and TAP milestone	29
5.1.3.5 Test Case LVV-T1437 - LDM-503-10a: API Aspect tests for LSP with	



LDM-503-10a: LSP with Authentication and TAP Test Plan and Report

1 Introduction

1.1 Objectives

Verify the integration of federated authentication and authorization into the LSST science platform, and the availability of an IVOA TAP service.

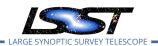
Milestone Description

This test demonstrates the successful integration of a single-sign-on federated authentication system, and a basic authorization system, with the three Aspects of the LSST Science Platform (Portal, Notebook, and API), with the API Aspect containing at least a TAP service. It will be demonstrated on a Kubernetes cluster provided by NCSA. It is not required for authorization to be applied at the database level; it is sufficient for this milestone for it to apply only at the TAP level. Data served will remain that from the original PDAC work, i.e., SDSS Stripe 82 and/or WISE.

1.2 Scope

The overall strategy for testing and verification within LSST Data Management is described in LDM-503.

This test plan specifically verifies successful completion of milestone LDM-503-10a.



1.3 System Overview

The LSST Science Platform (see LSE-319, LDM-554, and LDM-542) is the means of access for science users to the LSST data. It also serves project-internal users for a wide variety of data access needs during construction (using prototypes and early versions), commissioning, and operations.

1.4 Document Overview

This document was generated from Jira, obtaining the relevant information from the LVV-P48 Jira Test Plan and related Test Cycles (LVV-C85).

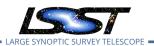
Section 1 provides an overview of the test campaign, the system under test (LSP Services), the applicable documentation, and explains how this document is organized. Section 2 describes the configuration used for this test. Section 3 describes the necessary roles and lists the individuals assigned to them. including all relevant information that fully describes the test campaign.

Section 4 provides a summary of the test results, including an overview in Table 2, an overall assessment statement and suggestions for possible improvements. Section 5 provides detailed results for each step in each test case.

The current status of test plan LVV-P48 in Jira is **Completed**.

1.5 References

- [1] **[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
- [2] **[LDM-554]**, Dubois-Felsmann, G., Ciardi, D., Mueller, F., Economou, F., 2018, *Science Plat-form Requirements*, LDM-554, URL https://ls.st/LDM-554
- [3] **[LSE-319]**, Jurić, M., Ciardi, D., Dubois-Felsmann, G., 2017, *LSST Science Platform Vision Document*, LSE-319, URL https://ls.st/LSE-319



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

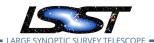
2 Test Configuration

2.1 Data Collection

Observing is not required for this test campaign.

2.2 Verification Environment

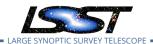
The "lsst-lsp-stable" instance of the LSP, hosted at the LDF.



3 Personnel

The personnel involved in the test campaign are shown in the following table.

Test Pla	an (LVV-P48) owner:	Gregory Dubois-	Felsmann
	LVV-C85 owner:	Gregory Dubois-	Felsmann
Test Case	Assigned to	Executed by	Additional Test Personnel
LVV-T807	Jeffrey Carlin	Gregory Dubois-	
		Felsmann	
LVV-T622	Jeffrey Carlin	Gregory Dubois-	
		Felsmann	
LVV-T1334	Gregory Dubois-	Gregory Dubois-	
	Felsmann	Felsmann	
LVV-T1436	Gregory Dubois-	Gregory Dubois-	
	Felsmann	Felsmann	
LVV-T1437	Gregory Dubois-	Gregory Dubois-	
	Felsmann	Felsmann	

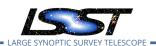


4 Test Campaign Overview

4.1 Summary

Test Plan LV	/V-P48: LDM-503	3-10a: LSP with Authentication and TAP	Completed
Test Cycle LVV-C85: LDM-503-10a: LSP with Authentication and TAP Done			
test case	status	comment	issues
L) // TOO7		Test executed against lsst-lsp-int.	
LVV-T807	Pass	No problems were encountered.	
		Test executed against lsst-lsp-int.	
LVV-T622	Pass w/ Devi-	Minor concerns with the UX for logout operations,	DM-22338
LVV-1022	ation	and with the completeness of the result of logging	DM-22350
	ation	out.	DIVI-22550
		Test executed in full against lsst-lsp-int.	
		As preparation for the execution of LVV-T1436 and	
		LVV-T1437, Steps 6 and 9 were repeated several	
		days later against lsst-lsp-stable in order to refresh	
LVV-T1334	Pass w/ Devi-	the TAP-results URL needed for the subsequent	DM-22350
LVV-11334	ation	tests.	DM-22421
	ation	Minor deviations: certain WISE/NEOWISE single-	DM-22421
		epoch photometry tables, not needed for the test,	DIVI-22422
		were not visible in the TAP service; same concerns	
		with logout behavior as for LVV-T622.	
		Test executed against lsst-lsp-stable.	
LVV-T1436	Pass w/ Devi-	No concerns except the same minor issues with lo-	DM-22350
	ation	gout behavior reported for LVV-T622.	
		Test executed against lsst-lsp-stable.	
		Minor concern: lack of usability of the latest ver-	
LVV-T1437	Pass w/ Devi-	sion of the LSST "convenience API" for TAP service	DM-22538
	ation	access from offsite; fixed by reverting to an earlier	
		version.	
-	· · · · · · · · · · · · · · · · · · ·	Table 2: Task Campasing Commence	

Table 2: Test Campaign Summary



4.2 Overall Assessment

The test successfully demonstrated cross-Aspect single-sign-on and the federated-identity functionality, as well as demonstrating authenticated access to synchronous and asynchronous TAP queries from the Portal Aspect, Notebook Aspect, and from outside the LSST environment acting directly on the API Aspect. The test demonstrated the ability to perform a TAP query in the Portal Aspect and retrieve the results from the Notebook Aspect, or remotely, by means of the query URL obtained from the Portal UI.

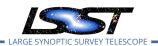
Minor issues were observed in the following areas:

- 1. "Logout" functionality was not particularly user-friendly, and in some cases may not have performed a complete logout
- 2. The CILogon federated-ID-authentication service may in some cases allow a user to determine whether a userid string is valid at NCSA even without a password
- 3. The existing set of tables in Qserv were not organized or described as well in the API Aspect TAP service's TAP_SCHEMA interface, and therefore also not in the Portal Aspect UI however these were corrected immediately following the test under DM-22422
- 4. The WISE (including NEOWISE) single-epoch photometry tables were not visible in the TAP service this has been understood and will be addressed
- 5. The most recent version of the Python "convenience API" for TAP searches in the "jupyter-labutils" package became unusable for external queries because of an issue with token validation. A previous version supported the test successfully, and the path forward for this API will be discussed.

4.3 Recommended Improvements

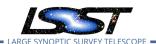
The most salient UX improvement based on this testing would be to change the "logout" functionality in both the Notebook and Portal Aspects to return the user to the LSP landing page, or some other recognizable page, as well as to add to the landing page an indication of whether the user is logged in or not.

Ongoing attention to the quality of the information in TAP_SCHEMA would be highly desirable.



This is more of a science-support issue than a TAP-service-development issue.

Some thought should be given to what support code, examples, and documentation should be provided for external users of the TAP service (and other API Aspect services as they become available).



5 Detailed Test Results

5.1 Test Cycle LVV-C85

Open test cycle LDM-503-10a: LSP with Authentication and TAP in Jira.

LDM-503-10a: LSP with Authentication and TAP

Status: Done

Execute the test cases associated with the DM milestone LDM-503-10a.

5.1.1 Software Version/Baseline

Portal Aspect tests were carried out on suit:1.1.1 and Caltech-IPAC/firefly:release-2019.3.2. The LSST Python environment in the Notebook Aspect was based on weekly 2019_48, including JupyterLab v1.2.3.

LSST JupyterHub version sciplat-hub-with-config:0.16.7 was in operation in the instance under test.

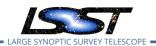
TAP version 1.0.1 was the version under test.

5.1.2 Configuration

LVV-T807, LVV-T637, and LVV-T1334 were carried on out the lsst-lsp-int instance of the LSP because of maintenance issues with the Portal Aspect on lsst-lsp-stable.

Following the return to normal operation of lsst-lsp-stable, part of LVV-T1334 was repeated there, and LVV-T1436 and LVV-T1437 were executed there.

All tests were executed from an OS X 10.11.6 iMac host on the IPAC internal network, with prearranged VPN-free access to the LSP instances at NCSA. Tests requiring a web browser were carried out using Firefox 70.0.1.



5.1.3 Test Cases in LVV-C85 Test Cycle

5.1.3.1 Test Case LVV-T807 - Verify synchronous TAP queries

Open LVV-T807 test case in Jira.

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

Preconditions:

Execution status: Pass

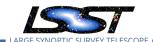
Final comment:

Test executed against lsst-lsp-int.

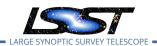
No problems were encountered.

Detailed steps results:

Step	Step Details
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.
	Actual Result
	The general CILogon login screen appeared.
	Status: Pass
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.
	Actual Result



NCSA credentials were used, with a Duo push. Successful; reached "Personal access tokens" screen. Status: Pass 3 Description Request a token for the "read:tap" capability. **Expected Result** A screen confirming the creation of the token. Actual Result "Generate new token" selected. "read:tap" selected. A token oauth2_proxy-a77...6b9b generated, expiring in 24 hours. Status: **Pass** 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 Actual Result** (n/a)Status: **Pass** 5 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 "Isst-Isp-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



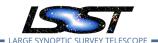
	export ACCESS_TOKEN read -p token -s ACCESS_TOKEN
	curl -w 'HTTP status code: %{http_code}\nContent-Type: %{content_type}\nTotal time: %{time_total}\nBytes received: %{size_download}\nFinal URL: %{url_effective}\n' -L - header "Authorization: Bearer \${ACCESS_TOKEN}" -o tap-tables.xml 'https://lsst-lsp- int.ncsa.illinois.edu/api/tap/sync?LANG=ADQL&REQUEST=doQuery&QUERY=SELECT+*+FROM+TAP_SCHEMA.tables' unset ACCESS_TOKEN
	Expected Result
	Actual Result
	The "curl" command returned HTTP status code 200, in a total time 1.081s, returning 8391 bytes with Content-Type "application/x-votable+xml". The file tap-tables.xml was created and is attached to this execution.
	Status: Pass
6	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
	Actual Result
	The tap-tables.xml file does appear to the eye to be a reasonably conformant VOTable 1.3 file with a TABLEDATA payload.
	Status: Pass

5.1.3.2 Test Case LVV-T622 - Verify LSP only available to authenticated users

Open LVV-T622 test case in Jira.

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

Preconditions:



Execution status: Pass w/ Deviation

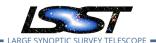
Final comment:

Test executed against lsst-lsp-int.

Minor concerns with the UX for logout operations, and with the completeness of the result of logging out.

Detailed steps results:

Step	Step Details
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.
	Actual Result
	Confirmed; CILogon with an LSST facade was reached. "LSST LSP Integration (Domain Ingress Client) requests access to the following information. If you do not approve this request, do not proceed."
	Status: Pass
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.
	Actual Result
	The message "The username you entered cannot be identified." was displayed in a colored box on the CILogon login screen. This is worth further investigation, to see whether this allows external actors to deduce valid userids.
	Issues found executing this step:
	DM-22338 CILogon can be used to check whether an NCSA username is valid; is this OK?
	Status: Pass
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.) Actual Result The "TAP Searches" screen of the Portal application appeared by default. Status: **Pass** 4 Description Log out from the Portal. **Expected Result** A logout or LSP landing page is displayed. Actual Result A screen with just a "Sign in with OpenID Connect" button (and a footer reading "Secured with OAuth2 Proxy version v3.2.0-151-g151ec7b") appeared. This is not entirely acceptable in the long run. The user should never lose sight of a screen that confirms that they are still in an LSST environment. It is also not clear to what authentication domain one would be signing in, or what screen one would reach if signing in were successful. Issues found executing this step: DM-22350 "Logout" buttons in Portal and Notebook Aspects: non-user-friendly result, and apparently incomplete logout Status: Initial Pass 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. Actual Result

Once at the landing page, clicking on the "Notebook Aspect" link produced a fresh CILogon login screen.

Manual navigation back to the main instance landing page was required. No link to do this was available

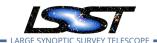
from the screen displayed in Step 4.



Status: **Pass** 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. **Actual Result** After pressing the "Log On" button on the initial CILogon screen, it became clear that I had not in fact been fully logged out. No username/password screen was displayed at all, and I ended up on the "Start My Server" page of JupyterHub, with my userid displayed and a "Logout" button. Clicking that "Logout" button was no more successful at actually logging me out than the Portal equivalent was. Conditional pass because the security vulnerability here only seriously affects shared-browser situations. Status: Pass w/ Deviation 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. **Actual Result** This step also could not be executed, as it proved impossible to get the system into a state in which credentials were requested. Status: Pass w/ Deviation 8 Description Log out of the Notebook Aspect. **Expected Result**



	Actual Result
	This had the same result as in Step 4.
	Status: Initial Pass
)	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
	Actual Result
	(Step 9 appears to have been an incomplete duplicate of Step 10. Skipped.)
	Status: Pass
0	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 "lest less introces illipsis edu" in the "curl" command with the apprentiate root LIPL for the LSP.
	verify using the "curl" command below that an attempt to access the TAP service with invalid credentials is rejected. Replace "Isst-Isp-int.ncsa.illinois.edu" in the "curl" command with the appropriate root URL for 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 "Isst-Isp-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-Isp-
	verify using the "curl" command below that an attempt to access the TAP service with invalid credentials is rejected. Replace "Isst-Isp-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:
	verify using the "curl" command below that an attempt to access the TAP service with invalid credentials is rejected. Replace "Isst-Isp-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-Isp-int.ncsa.illinois.edu/api/tap/sync?LANG=ADQL&REQUEST=doQuery&QUERY=SELECT+*+FROM+TAP_SCHE
	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
	verify using the "curl" command below that an attempt to access the TAP service with invalid credentials is rejected. Replace "Isst-Isp-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://Isst-Isp-int.ncsa.illinois.edu/api/tap/sync?LANG=ADQL&REQUEST=doQuery&QUERY=SELECT+*+FROM+TAP_SCHE Expected Result Actual Result HTTP status code 401 (Authorization Required) was received. The HTML code attached as "tap-
1	verify using the "curl" command below that an attempt to access the TAP service with invalid credentials is rejected. Replace "Isst-Isp-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-Isp-int.ncsa.illinois.edu/api/tap/sync?LANG=ADQL&REQUEST=doQuery&QUERY=SELECT+*+FROM+TAP_SCHE Expected Result Actual Result HTTP status code 401 (Authorization Required) was received. The HTML code attached as "tap-noauth.html" was returned.
1	verify using the "curl" command below that an attempt to access the TAP service with invalid credentials is rejected. Replace "Isst-Isp-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://Isst-Isp-int.ncsa.illinois.edu/api/tap/sync?LANG=ADQL&REQUEST=doQuery&QUERY=SELECT+*+FROM+TAP_SCHE Expected Result Actual Result HTTP status code 401 (Authorization Required) was received. The HTML code attached as "tap-noauth.html" was returned. Status: Pass
1	verify using the "curl" command below that an attempt to access the TAP service with invalid credentials is rejected. Replace "Isst-Isp-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-Isp-int.ncsa.illinois.edu/api/tap/sync?LANG=ADQL&REQUEST=doQuery&QUERY=SELECT+*+FROM+TAP_SCHE Expected Result Actual Result HTTP status code 401 (Authorization Required) was received. The HTML code attached as "tap-noauth.html" was returned. Status: Pass 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



Actual Result

Token ID oauth2_proxy-c077...00f8 was received, with a 24 hour lifetime.

Status: Pass

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?LANG=ADQL&REQUEST=doQuery&QUERY=SELECT+*+FROM+TAP_SCHEMA.tables'

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.

Actual Result

The test was successful.

Status: **Pass**

5.1.3.3 Test Case LVV-T1334 - LDM-503-10a: Portal Aspect tests for LSP with Authentication and TAP milestone

LARGE SYNOPTIC SURVEY TELESCOPE

Open LVV-T1334 test case in Jira.

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.

Preconditions:

Execution status: Pass w/ Deviation

Final comment:

Test executed in full against lsst-lsp-int.

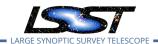
As preparation for the execution of LVV-T1436 and LVV-T1437, Steps 6 and 9 were repeated several days later against lsst-lsp-stable in order to refresh the TAP-results URL needed for the subsequent tests.

Minor deviations: certain WISE/NEOWISE single-epoch photometry tables, not needed for the test, were not visible in the TAP service; same concerns with logout behavior as for LVV-T622.

Detailed steps results:



Step	Step Details
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.
	Actual Result
	Test performed on https://lsst-lsp-int.ncsa.illinois.edu/
	Login screen displayed as expected.
	Status: Pass
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.
	Actual Result
	TAP search screen displayed upon login. Username "Gregory Dubois-Felsmann" displayed.
	Logging out resulted in the "Sign in with OpenID Connect" button being displayed. See DM-22350 for an issue regarding that result.
	Issues found executing this step:
	DM-22350 "Logout" buttons in Portal and Notebook Aspects: non-user-friendly result, and apparently incomplete logout
	Status: Pass
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.

Actual Result

Because of the logout issues in DM-22350, before carrying out this step I cleared my browser history to ensure no carryover of old credentials/tokens/authorization headers.

Logging in with Caltech credentials that had been associated with my NCSA account via identity.lsst.org, I reached the same Portal screen with "Gregory Dubois-Felsmann" displayed.

Status: **Pass**

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.

Actual Result

The lsst-lsp-int.ncsa.illinois.edu/api/tap service was, correctly, selected by default.

Status: Pass

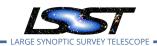
5 Description

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.

Actual Result



The SDSS "RunDeepSource" (deep detection) and "RunDeepForcedSource" (forced photometry) tables are available, under the "sdss_stripe82_01" schema (along with a number of additional tables from the original deployment).

The WISE "allwise_p3as_psd" (deep detection) and "allwise_p3as_mep" (forced photometry) tables are available, under the "wise_00" schema (along with a number of additional tables from the original deployment). The three single-epoch source photometry tables do not seem to be visible.

While this is not formally a deviation from the test plan as written, these tables are all missing explanatory text in the TAP_SCHEMA metadata used by the Portal TAP interface, so there is no user-friendly way to determine the meaning of the tables available to query.

Issues found executing this step:

DM-22421 Investigate why the WISE single-epoch photometry tables are not visible in the lsst-lsp-int TAP service

DM-22422 Provide metadata for the SDSS and WISE schema and table data in TAP SCHEMA

Status: Pass w/ Deviation

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

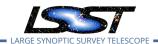
Expected Result

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.

Actual Result

A table of 12,717 rows was retrieved. The data were displayed as a table of 128 100-row pages (that default page size is configurable, and can be changed on the fly by the user). They were also displayed as an overlay on a 2MASS color HiPS image, and as an x-y density plot, with the axes (ra,decl) selected by default, but easily changed in the UI.

The test runner issued the query requesting the following columns (which should have been called out in the test specification): ra, decl, cntr, source_id, coadd_id, w1mpro, w2mpro, w3mpro, w4mpro.



Status: **Pass**

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.

Actual Result

% wc LVV-T1334-output.csv 12718 12718 1567903 LVV-T1334-output.csv

% head -2 LVV-T1334-output.csv

cntr,coadd_id,decl,ra,source_id,w1mpro,w2mpro,w3mpro,w4mpro 15100001351031627,0015p000_ac51,-0.07016340,1.54437160,0015p000_ac51-031627,16.36700000,15.81700000,12.21100000,8.40600000

12,718 rows in the file is the expectation from Step 6: 12,717 plus one header row.

The file was attached to the test execution record in Jira (LVV-E556).

The file was also saved in the lsst-dm/dmtr-161 repository as "executions/LVV-T1334/LVV-T1334-output.csv". Tag "LVV-T1334-e1" was applied.

Status: Pass

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.

Actual Result



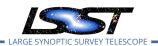
The button is labeled "LSST TAP", not "TAP Searches".

	The ADQL text is: SELECT cntr,coadd_id,decl,ra,source_id,w1mpro,w2mpro,w3mpro,w4mpro FROM wise_00.allwise_p3as_psd WHERE CONTAINS(POINT('ICRS', ra, decl),CIRCLE('ICRS', 2, 0, 0.5))=1			
	Status: Pass			
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			
	Actual Result			
	https://lsst-lsp-int.ncsa.illinois.edu/api/tap/async/eatzseuepds92ous			
	Status: Pass			
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.</uws:parameter>			
	Expected Result			
	The ADQL code matches that from Step 8.			
	Actual Result			
	Pass: <uws:parameter id="QUERY"> SELECT cntr,coadd_id,decl,ra,source_id,w1mpro,w2mpro,w3mpro,w4mpro FROM wise_00.allwise_p3as_psd WHERE CONTAINS(POINT('ICRS', ra, decl),CIRCLE('ICRS', 2, 0, 0.5))=1 </uws:parameter>			
	Status: Pass			

5.1.3.4 Test Case LVV-T1436 - LDM-503-10a: Notebook Aspect tests for LSP with Authentication and TAP milestone

Open LVV-T1436 test case in Jira.

This test case verifies that the Notebook Aspect of the Science Platform is accessible to au-



thorized 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.

Preconditions:

Test case LVV-T1334 must have already been executed and the prescribed outputs saved, notably including the "LVV-T1334-output.csv" file.

Execution status: Pass w/ Deviation

Final comment:

Test executed against lsst-lsp-stable.

No concerns except the same minor issues with logout behavior reported for LVV-T622.

Detailed steps results:

Step	Step Details
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.
	Actual Result
	Carried out on {{lsst-lsp-stable}}.
	Caltech credentials used; "Gregory Dubois-Felsmann" displayed.
	NB: to enable further testing, the UI-driven Portal TAP search from LVV-T1334 Step 6 was repeated in this session in order to refresh the TAP results URL needed below. It is now https://lsst-lsp-stable.ncsa.illinois.edu/api/tap/async/gbupxri6cznn4jt7 - replacing the one recorded in LVV-T1334's execution.
	Status: Pass
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.
	Actual Result
	No credentials were requested. "gpdf" was displayed as the user ID in the upper right.
	Status: Pass
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.
	Actual Result
	The Weekly 2019_48 release was used. Successful session startup.
	Status: Pass
4	Description
	Close any Portal Aspect window/tab(s) that are open.
	Expected Result
	Actual Result



Status: Pass			
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.: touch ~/test-20190915.txt (Use the current date.)		
	Expected Result		
	The test file should be visible in the JupyterLab file browser.		
	Actual Result		
	touch ~/20191209.txt was created.		
	Status: Pass		
6	Description		
	Log out of the Notebook Aspect.		
	Expected Result		
	Actual Result		
	The "Sign in with OpenID Connect" screen was displayed. (As noted elsewhere this is not ultimately a user-friendly place for a logout to end up.)		
	Status: Pass		
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 <i>logout</i> is cross-Aspect.)		
	Actual Result		
	The browser displayed a version of the Portal Aspect screen at first, with its Firefly components greyed out. It required an explicit refresh before the CILogon screen was displayed. Most likely some improvement to cache invalidation will be needed.		
	Issues found executing this step:		
	DM-22350 "Logout" buttons in Portal and Notebook Aspects: non-user-friendly result, and apparently incomplete logout		
	Status: Pass w/ Deviation		
8	Description		



	Close the login window and quit the web browser in use.			
	Expected Result			
	Actual Result			
	Status: Pass			
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.			
	Actual Result			
	Upon logging in the previous JupyterLab server session was available. It was not necessary to create a new one. (I.e., simply logging out, as instructed above, evidently does not stop the actual JL server process.)			
	Status: Pass			
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.)			
	Actual Result			
	The ~/20191209.txt file was visible as expected, and other aspects of the session clearly showed that it was the same as the one reached via Caltech credentials.			
	Status: Pass			
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			



Actual Result

The details of this bookkeeping were worked out after the substance of the test case and test plan were approved.

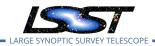
The appropriate instructions would have been:

- 1. Clone the "LVV-C85-unexecuted" tag of the lsst-dm/dmtr-161 repository into the Notebook Aspect user environment.
- 2. Copy the "notebooks/LDM-503-10a-test.ipynb" notebook to a new subdirectory of the repository clone. "executions/LVV-T1436".

	3. Record the SHA-1 corresponding to the above tag.			
	The SHA-1 for"LVV-C85-unexecuted" is 6b560e5.			
	Status: Pass			
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			
	Actual Result			
	Status: Pass			
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			
	Actual Result			
	The URL from Step 1 above was used instead: https://lsst-lsp-stable.ncsa.illinois.edu/api/tap/async/gbupxri6cznn4jt7 , as the one from LVV-T1334 had expired due to the length of time elapsed since that test was performed.			
	Note that the copy of the test notebook in the"executions/LVV-T1436" directory was used for the test.			
	Status: Pass			
14	Description			
	Execute the entire notebook.			
	Expected Result			



	Actual Result
	Status: Pass
15	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
	Actual Result
	The final output of the notebook was:
	Successfully completed query from notebook: True Successful comparison to Portal query output: True Successful comparison to TAP job from Portal query: True
	Status: Pass
16	Description
	Save and close the test notebook. Save the fully-executed notebook in TBD location as a record of the test.
	Expected Result
	Actual Result
	The fully executed notebook was saved in the lsst-dm/dmtr-161 repository as "executions/LVV-T1436/LDM-503-10a-test.ipynb". Tag "LVV-T1436-e1" was applied.
	Status: Pass
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
	Actual Result
	The Portal Aspect TAP search screen opened immediately from the link from the lsst-lsp-stable landing page. User "Gregory Dubois-Felsmann" was displayed as expected.
	Status: Pass
18	Description



Log out of the Notebook Aspect, close the Portal Aspect windows, and quit the Web br		
	Expected Result	
	Actual Result	
	Status: Pass	

5.1.3.5 Test Case LVV-T1437 - LDM-503-10a: API Aspect tests for LSP with Authentication and TAP milestone

Open LVV-T1437 test case in Jira.

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.

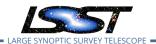
In so doing and in conjunction with the other LDM-503-10a test cases collected under LVV-P48, it addresses all or part of the following requirements:

- 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.

Preconditions:

Test case LVV-T1334 must have already been executed and the prescribed outputs saved, notably including the "LVV-T1334-output.csv" file.



Execution status: Pass w/ Deviation

Final comment:

Test executed against lsst-lsp-stable.

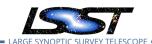
Minor concern: lack of usability of the latest version of the LSST "convenience API" for TAP service access from offsite; fixed by reverting to an earlier version.

Detailed steps results:

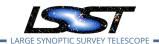
Step	Step Details		
1	Description		
	On the local computer, clone the test notebook for LDM-503-10a, "LDM-503-10a-test.ipynb", into the user environment from the TBD tag of the TBD Github repository. Note the SHA that applies to the version of the test notebook that has been cloned.		
	Expected Result		
	Actual Result		
	The details of this bookkeeping were worked out after the substance of the test case and test plan were approved.		
	The appropriate instructions would have been:		
	1. Clone the "LVV-C85-unexecuted" tag of the lsst-dm/dmtr-161 repository into the Notebook Aspect user environment. 2. Country "A PAN 500 40 and the last different behavior of the last		
	 Copy the "notebooks/LDM-503-10a-test.ipynb" notebook to a new subdirectory of the repository clone, "executions/LVV-T1437". 		
	3. Record the SHA-1 corresponding to the above tag.		
	The SHA-1 for "LVV-C85-unexecuted" is 6b560e5.		
	Status: Pass		
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		
	Actual Result		
	It proved necessary to back up to jupyterlabutils 0.5.0 (the current version being 0.5.3) in order to avoic a token-validation failure below in Step 8. Note that the requirement for the offsite usability of the TAP-query-access convenience functions in this package has not been formally established.		



	Issues found executing this step:				
	DM-22538 jupyterlabutils 0.5.3 (current) does not work with the short tokens from the LSP get-token service				
	Status: Pass w/ Deviation				
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				
	Actual Result				
	Status: Pass				
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. Copy the access token to the clipboard.				
	Expected Result				
	Actual Result				
	The token oauth2_proxy-3ce5a7 was generated.				
	Status: Pass				
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 noecho prompt this command produces.				
	Example Code				
	export ACCESS_TOKEN read -s ACCESS_TOKEN				
	Expected Result				
	Actual Result				
	Status: Pass				
6	Description				

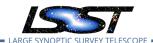


	taunch a LOCAL instance of JupyterLab (i.e., by running "jupyter lab") on the computer to be used for testing. Ensure that the test notebook is visible from within JupyterLab. NB: as a reminder, this test case must NOT be run in the Notebook Aspect.
	Expected Result
	Actual Result
	Status: Pass
7	Description
	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
	Actual Result
	https://lsst-lsp-stable.ncsa.illinois.edu/api/tap/async/gbupxri6cznn4jt7 was inserted. (This was the URL generated at the start of LVV-T1436 to replace the one from LVV-T1334 which had expired.)
	Status: Pass
8	Description
	Execute the entire notebook.
	Expected Result
	Actual Result
	The notebook runs to completion successfully.
	(Note: It is at this stage that the "token-validation failure" mentioned in Step 2 above appears if a too-recent version of the "jupyterlabutils" package is installed.)
	Status: Pass
9	Status: Pass Description
9	
9	Description Record the success and/or failure indications that appear in the final output cell of the notebook.



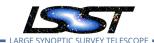
The final output of the notebook was:

	Successfully completed query from notebook: True Successful comparison to Portal query output: True Successful comparison to TAP job from Portal query: True	
	Status: Pass	
10	Description	
	Save and close the test notebook. Save the fully-executed notebook in TBD location as a record of the test.	
	Expected Result	
	Actual Result	
	The fully executed notebook was saved in the lsst-dm/dmtr-161 repository as "executions/LVV-T1437/LDM-503-10a-test.ipynb". Tag "LVV-T1437-e1" was applied.	
	Status: Pass	

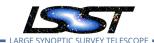


A Traceability

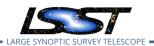
Test Case	VE Key	VE Summary
LVV-T622	LVV-9830	DMS-LSP-REQ-0020-V-01: Authenticated User Ac-
		cess_1
LVV-T807	LVV-10014	DMS-API-REQ-0007-V-01: Synchronous TAP Sup-
		port_1
LVV-T1334	LVV-9811	DMS-LSP-REQ-0002-V-01: Portal Aspect_1
	LVV-9809	DMS-LSP-REQ-0005-V-01: Linkage of Aspects_1
	LVV-9812	DMS-LSP-REQ-0006-V-01: Use of VO Standards_1
	LVV-9830	DMS-LSP-REQ-0020-V-01: Authenticated User Ac-
		cess_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 Applica-
		tion_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: Posi-
		tion on the Sky_1
	LVV-9869	DMS-PRTL-REQ-0026-V-01: Positional Query by Re-
		gion: 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 Tabu-
		lar Data_1
LVV-T1436	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 Envi- ronment_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
LVV-T1437	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 Sup-
	port_1
LVV-10013	DMS-API-REQ-0008-V-01: Asynchronous TAP Sup-
	port_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 Re-
	trieval_1
LVV-10037	DMS-API-REQ-0001-V-01: Secure Protocols_1



B Acronyms used in this document

Acronym	Description
2D	Two-dimensional
2MASS	Two-Micron All Sky Survey
ADQL	Astronomical Data Query Language
API	Application Programming Interface
CSV	Comma Separated Values
DM	Data Management
DMS	Data Management Subsystem
DMTR	DM Test Report
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
IPAC	No longer an acronym; science and data center at Caltech
IVOA	International Virtual-Observatory Alliance
LDF	LSST Data Facility
LDM	LSST Data Management (Document Handle)
LSE	LSST Systems Engineering (Document Handle)
LSP	LSST Science Platform
LSST	Large Synoptic Survey Telescope
NCSA	National Center for Supercomputing Applications
OS	Operating System
PDAC	Prototype Data Access Center
SDSS	Sloan Digital Sky Survey
SHA-1	Secure Hash Algorithm 1
TAP	Table Access Protocol
TBD	To Be Defined (Determined)
UI	User Interface
UX	User Experience
VO	Virtual Observatory
WISE	Wide-field Survey Explorer
XML	eXtensible Markup Language