LearnSphere Workflow Public API

A way to programmatically get workflow data and implement workflow functions in LearnSphere

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Contents

1   API

This API is a list of methods for programmatically getting LearnSphere workflow data and implementing workflow functions.

As of LearnSphere version 3.1 (March 2019), we've implemented:

- Get Workflow Metadata
- Get workflow files
- Delete a Workflow
- Run a Workflow
- Save as a New Workflow
- Modify a Workflow

2   Note on format

https://url/[?optional_section]
URL to perform the action.

3   Representational state transfer (REST)

The LearnSphere Workflow API design generally follows a "REST" approach to web services. In doing so, we've modeled a workflow as a collection of resources which can be retrieved using HTTP.

3.1   HTTP Response Status Codes

LearnSphere Web Services will, in many cases, return an HTTP status code that you can use to determine how to analyze the body of the HTTP message. For example, if you know the HTTP response code was an error such as "401 Unauthorized", then you know that the content of the body of the message will be XML describing the error.

For a list of web services result codes and the HTTP status codes that appear with them, see Appendix A.

4   Authentication

Authentication is a process for identifying and verifying who is sending a request. To use LearnSphere web services, you need to identify yourself as the sender of each request. This is accomplished by sending a digital signature that is derived from a pair of public/private access keys.

Note: LearnSphere web services use Datashop web services authentication mechanism to verify the user. To use LearnSphere web services, you must first request access. Visit http://pslcdatashop.web.cmu.edu/WebServicesCredentials to read the User Agreement and request access. You will need to first register with DataShop if you haven't already.

Note: In addition to this documentation, consult the Java source of the sample DataShop web services client for code examples. See methods *signedRequest*, *encrypt*, and *httpTimestamp* in particular. Contact DataShop for LearnSphere Workflow specific web services client code examples.

## 4.1	Access Credentials

Access credentials refers to your two access keys. You can retrieve or reset your access keys from DataShop's [Web Services Credentials](#) page.

Access Key ID

Your Access Key ID identifies you as the party responsible for service requests. Include it with each request you send to us.

Secret Access Key

Your Access Key ID has a Secret Access Key associated with it. Use your Secret Access Key to calculate a signature to include in requests to DataShop web services. Your Secret Access Key is a secret, and should be known only by you and DataShop. You should never include your Secret Access Key in your requests to DataShop web services. You should never email your Secret Access Key to anyone. It is important to keep your Secret Access Key confidential to protect your account.

## 4.2	Using your Access Credentials to Sign a Request

Consult "Datashop Public API.docx" for detailed information for this section.

# 5	Getting Data

## 5.1	Get Workflow Metadata

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/[?id]
Get list of workflows matching the parameters, or information about a single workflow (if an id is specified).

### 5.1.1	Workflow ID

The LearnSphere Workflow API expects you to reference workflows by "ID", a unique identifier for each workflow in the repository. The ID of any of workflow can be determined by performing a request to list the workflows, which lists the IDs in the response. The ID of each workflow is shown as the "id" attribute of each workflow element

### 5.1.2	Request Parameters
global

true or false. When true, web service returns only workflows that are public. When false, web service returns only workflows that are not public. When undefined, web service doesn't filter out workflows by global flag.

> **Note:** If you request a single dataset, global is not a valid parameter

mine

true or false. When true, web service returns only workflows that are owned by the authenticated user . When false, web service returns workflows that are not owned by the authenticated user. When undefined, web service doesn't filter out workflows by workflow owner.

Note: If you request a single dataset, mine is not a valid parameter

verbose

true or false. Default is **false**. False returns the simpler, less verbose description for each workflow (see directly below) while true returns the more verbose description for each workflow (see further below).

5.1.3   Response Fields

Default

name: workflow name

owner: creator of the workflow

global: true for public or false for private

data_access: access status of workflow data; possible values are: public, private, locked, locked*, request, request*

last_updated: date of last change

state: status of workflow; possible values are: new, running, error, success, paused

Additional fields of default for verbose

description: description of workflow

components: parent node for component

    component: starting of a component

        id_human: component name readable to human

        name: component name from UI

        type: component type

        connections: parent node for connections

            connection: starting of a connection of a component

                to: the end point of a connection

                from: the begining point of a connection

                index: index of the connections

                frindex: index of all from connections

                tindex: index of all to connections

        import_file: import file of an import component

            name: name of the import file

            type: type of the import file

            file_selection_type: selection type of the import file

            dataset_link: dataset id to which the import file is linked

            dataset_name: dataset name to which the import file is linked

        options: parent node for options

            option: starting of a option of a component

                name: name of an option

                value: value of an option

        annotations: parent node for annotations

annotation: starting of an annotation

> **annotation_text**: content of an annotation

Additional fields of verbose for a single workflow

> **attached_datasets**: parent node for datasets that workflow is attached to
>
> > **dataset**: starting of a dataset of attached datasets
> >
> > > **name**: name of dataset
> > >
> > > **project**: project of dataset, a node in dataset tag, only in verbose version of single workflow
> >
> > **result**: starting node of a result
> >
> > > **elapsed_second**: running time of a workflow
> > >
> > > **output_file:** starting node of a output file
> > >
> > > > **type:** type of output file
> > > >
> > > > **path:** path/id of output file
> > > >
> > > > **name:** name of output file
> > > >
> > > > **index:** index of all output files
> > > >
> > > > **label:** label of output file
> >
> > **errors**: parent node for errors
> >
> > > **error**: component error of a component

Note: The order of datasets in the response XML is indeterminate.

5.1.4   Example request:

GET **https:// pslcdatashop.web.cmu.edu/learnsphere/services/workflows?mine=true&global=false**

5.1.5   Example response on success:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<learnsphere_message result_code="0" result_message="Success. 3 workflows found.">
<workflow id="6">
        <name>test_multi</name>
        <owner>hcheng</owner>
        <global>false</global>
        <data_access>private</data_access>
        <last_updated>2018-08-20</last_updated>
        <state>success</state>
 </workflow>
 <workflow id="8">
        <name>test</name>
        <owner>hcheng</owner>
        <global>false</global>
        <data_access>private</data_access>
        <last_updated>2018-09-17</last_updated>
        <state>success</state>
</workflow>
<workflow id="11">
        <name>test errors in workflow level</name>
```

```xml
        <owner>hcheng</owner>
        <global>false</global>
        <data_access>private</data_access>
        <last_updated>2018-09-24</last_updated>
        <state>error</state>
</workflow>
</learnsphere_message>
```

5.1.6   Example response on error:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<pslc_datashop_message result_code="-34" result_message="Error. Workflow 1 is not valid."/>
```

5.1.7   Example request (verbose)

GET **https:// pslcdatashop.web.cmu.edu/learnsphere/services/workflows/10?verbose=true**

```xml
<?xml version="1.0" encoding="UTF-8"?>
<learnsphere_message result_code="0" result_message="Success. 1 workflows found.">
  <workflow id="8">
        <name>test</name>
        <owner>hcheng</owner>
        <global>no</global>
        <data_access>private</data_access>
        <description/>
        <last_updated>2018-09-17</last_updated>
        <state>success</state>
        <attached_datasets>
                <dataset id="1">
                <name>Sample Module to test SWFs - Take 2</name>
                <project>Default</project>
                </dataset>
        </attached_datasets>
        <annotations>
                <annotation id="1">
                <annotation_text>test</annotation_text>
                </annotation>
        </annotations>
        <components>
                <component id="Data-1-x076886">
                <id_human>Data #1</id_human>
                <name>Import</name>
                <type>data</type>
                <connections>
                        <connection>
                        <to>Anaysis-1-x186672</to>
                        <index>0</index>
                        <frindex>0</frindex>
                        </connection>
```

```xml
                    </connections>
                    <import_file id="170">
                            <name>ds96_student_step_export.txt</name>
                            <type>student-step</type>
                            <file_selection_type>student-step</file_selection_type>
                            <dataset_link>1</dataset_link>
                            <dataset_name>Sample Module to test SWFs - Take 2</dataset_name>
                    </import_file>
                    <result>
                            <elapsed_seconds>0</elapsed_seconds>
                    </result>
                    </component>
                    <component id="Analysis-1-x186672">
                    <id_human>Analysis #1</id_human>
                    <name>AFM</name>
                    <type>analysis</type>
                    <connections>
                            <connection>
                                    <from>Data-1-x076886</from>
                                    <index>0</index>
                                    <tindex>0</tindex>
                            </connection>
                    </connections>
                    <options>
                            <option>
                                    <name>model</name>
                                    <value>\s*KC\s*\((.*)\)\s*</value>
                            </option>
                    </options>
                    <result>
                            <elapsed_seconds>2</elapsed_seconds>
                            <output_files>
                                    <output_file>
                                            <type>student-step</type>
                                            <path>171</path>
                                            <name>Step-values-with-predictions.txt</name>
                                            <index>0</index>
                                            <label>student-step</label>
                                    </output_file>
                            </output_files>
                    </result>
                    </component>
            </components>
      </workflow>
  </learnsphere_message>
```

5.2 Get workflow files

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflow_files/id/
Get all accessible files for a workflow.

5.2.1 Request Parameters
File_type

input or output. When input, web service returns this workflow's import files accessible for the authenticated user. When output, web service returns this workflow's output files accessible for the authenticated user. When undefined, web service returns this workflow's input and output files accessible for the authenticated user.

5.2.2 Example request:

GET
https://pslcdatashop.web.cmu.edu/learnsphere/services/workflow_files/8?file_type=output

5.2.3   All result files are archived into a zip file. To see examples of implementation of accessing the zip file, reference to LearnSphereWebServicesClient.java which can be downloaded from http://pslcdatashop.org/about/webservices.html. The key statement to access this web service is:

yourClient.getFileService(URLServicePath, "application/zip", final_zip_file_path);

where URLServicePath is "/workflow_files/id" and final_zip_file_path is the location where you want to put the output zip file.

6 Deleting Workflow

6.1 Delete a Workflow

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/id/delete
Delete the workflow of the specified id

6.1.1 Example request:

Delete the workflow that has id equal to 8

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/8/delete

6.1.2 Example response on success:
```
<?xml version="1.0" encoding="UTF-8"?>
<learnsphere_message result_code="0" result_message="Success. Workflow 8 is successfully deleted."/>
```

6.1.3   Example response on error:

```
<?xml version="1.0" encoding="UTF-8"?>
<pslc_datashop_message result_code="-34" result_message="Error. Workflow 1 is not valid."/>
```

7   Running Workflow

7.1   Run a Workflow

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/id/run
Run workflow of the specified id. Only the workflow's owner can call this web service. Calling of this function will fail if the workflow is in the middle of running started by another process. After server receives the running request, server starts a new thread to run the workflow. This is to avoid hanging of the calling process in case of long-running workflow. For long running workflow, user should receive a notification email after the new thread finishes running.

To check the running result status of the workflow, use "get" workflow web service. Here is an example of "get" workflow service call: https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/8 . The "state" element of the returned XML depicts the state of the workflow specified. The possible values include: new, running, error, success, paused

7.1.1   Example request:

Run the workflow that has id equal to 8

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/8/run

7.1.2   Example response on success:

```
<?xml version="1.0" encoding="UTF-8"?>
<learnsphere_message result_code="0" result_message="Success. Workflow 8 is started to run. Check back for running status."/>
```

7.1.3   Example response on error:

```
<?xml version="1.0" encoding="UTF-8"?>
<pslc_datashop_message result_code="-36" result_message="Error. Workflow 8 is already running. Please wait for the process to complete."/>
```

8   Saving as a New Workflow

8.1   Save as a New Workflow

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/id/save_as_new?new_workflow_name=myNewWorkflow

Use an existing workflow as template to create a new workflow. For owner of the template workflow or admin of LearnSphere, the import files of the template workflow are also saved with the new workflow. For other user, files of the template workflow are stripped unless the user has access right to these files. The output contains the verbose metadata of the newly created workflow. Check section 5.1.7 for details.

8.1.1   Request Parameters
new_workflow_name

   The new workflow name. Required.

8.1.2   Example request:

Create a new workflow using workflow of id 8 as template

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/8/save_as_new?new_workflow_name= my+new+workflow

8.1.3   Example response on success:
```xml
<?xml version="1.0" encoding="UTF-8"?>
<learnsphere_message result_code="0" result_message=" Success. New workflow is created. The new workflow ID is 18."/>
<workflow id="18">
        <name>test</name>
        <owner>hcheng</owner>
        <global>no</global>
        <data_access>private</data_access>
        <description/>
        <last_updated>2018-09-17</last_updated>
        <state>success</state>
        <components>
                <component id="Data-1-x076886">
                <id_human>Data #1</id_human>
                <name>Import</name>
                <type>data</type>
        ……..
        ……..
</workflow>
</learnsphere_message>
```

8.1.4   Example response on error:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<pslc_datashop_message result_code="-34" result_message="Error. Workflow 1 is not valid."/>
```

9   Modifying a Workflow

9.1   Modify a Workflow

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/id/modify file_path_and_name.zip

Modify a workflow. The workflow definition XML file and all workflow import files should be compacted into one zip file and passed as the only argument to the modify web service call.

Workflow definition XML file is the same as the verbose output of workflow metadata "Get" web service. Please refer to Section 5.7.1 for detailed description of this file. When generating a new workflow XML definition file for the modified workflow, please pay attention to the following requirements:

a. Workflow id defined in XML should be the same as the id defined in the web service URL.
b. Only workflow owner and system admin can modify the workflow
c. The "owner" element defined in XML should be the same as the user who requests this web service.
d. The "id" attribute of the "component" element is required. When adding a new component to the workflow, make up a unique component id that has not been used by any component of this workflow. The component id should be in this format: [component type]-[single digit number]-x[six digit number], i.e., Data-1-x830891.
e. Component "name" and "type" elements are required.
f. The "name" element within the "import-file" element is required. The value of the "name" element should match with one of the files of the input zip file.
g. The "from" and "to" elements within the "connection" element should be defined by the component id within this XML definition file.

The output contains the verbose metadata of the modified workflow. Check section 5.1.7 for details.

9.1.1   Example request:

https://pslcdatashop.web.cmu.edu/learnsphere/services/workflows/4/modify wf_definition_and_import_files.zip

9.1.2   Example response on success:

```
<?xml version="1.0" encoding="UTF-8"?>
<learnsphere_message result_code="0" result_message="Workflow 4 is modified successfully."/>
<workflow id="4">
        <name>test</name>
        <owner>hcheng</owner>
        <global>no</global>
        <data_access>private</data_access>
        <description/>
        <last_updated>2018-09-17</last_updated>
```

```
        <state>success</state>
        <components>
                <component id="Data-1-x076886">
                <id_human>Data #1</id_human>
                <name>Import</name>
                <type>data</type>
        ……..
        ……..
</workflow>
</learnsphere_message>
```

9.1.3   Example response on error:

```
<?xml version="1.0" encoding="UTF-8"?>
<pslc_datashop_message result_code="-34" result_message="Error. Workflow 4 is not valid."/>
```

Appendix A

All Possible Result Codes

Result Code	HTTP Status Code	Description	Services that could return this result code
0	200 OK	Success. [Optional message]	All
-5	400 Bad Request	Error. Invalid request parameter: [parameter].	All
-6	400 Bad Request	Error. Invalid value for parameter [param]: [value].	All
-6	400 Bad Request	Number format error for workflow [workflowID]	All
-17	400 Bad Request	XML parsing error for workflow [workflowID]	All
-32	400 Bad Request	Invalid request ([action]) for user '[name]' on project '[name]'.	Authorization
-33	401 Unauthorized	Workflow [workflowID] is not accessible	All
-34	404 Not Found	Workflow [workflowID] is not valid	All
-35	500 Internal server error	Workflow initialization error	Run workflow
-36	500 Internal server error	Workflow already run error	Run and modify workflow
-37	400 Bad Request	Workflow definition error	Modify workflow
-38	400 Bad Request	Workflow upload file oversize error	Modify workflow
-39	500 Internal server error	Workflow internal file error	Modify workflow
-99	404 Not Found	Error. No web service found matching the URL. For a list of valid URLs, see http://pslcdatashop.org/api/	All

-100	500 Internal Server Error	Unknown error.	All
-100	500 Internal Server Error	JSONException for workflow [workflowID]	All
-101	401 Unauthorized	Authorization failed. Check your credentials.	All
-101	401 Unauthorized	Authorization failed. Check your credentials.	All
-102	406 Not Acceptable	This content is available only as [content type].	All
-103	405 Method Not Allowed	Operation not supported. (Note to reader: this is for unsupported PUT/POST/DELETE methods.)	All

Appendix B

Revision History