National Aeronautics and Space Administration

AMMOS-PDS Pipeline Service (APPS): Easing the Transition to PDS 4

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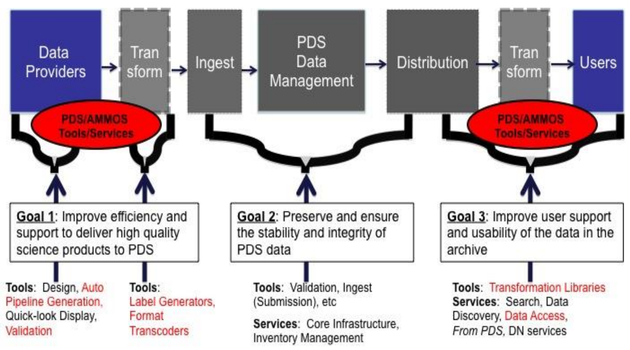
Introduction

The AMMOS-PDS Pipeline Service (APPS) is an end-to-end pipeline for PDS archiving, which streamlines the delivery of science data to the PDS.

- It provides a multi-mission science data (instrument data + metadata/label) transformation service, which connects product generation pipelines and the PDS Archive, while ensuring compliance to the PDS4 standard.
- Its goal is to improve the efficiency (e.g. reduce cost to projects) and reliability of providing mission data to the PDS.
- In addition to delivering data products to the PDS, APPS's Label Design Tool (LDT) enables the easy creation of PDS compliant metadata labels for data products.
- APPS also provides the APPS SIS Hub, which allows users to collaborate on Software Interface Specification documents over the web.

APPS-PDS Conceptual Flow

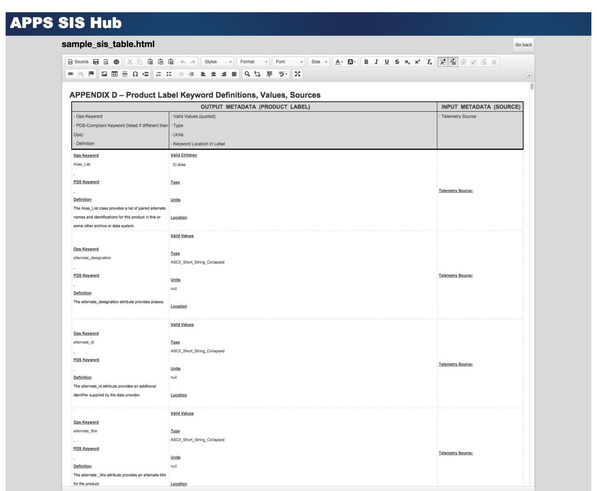


APPS SIS Hub Overview

A software interface specification (SIS) document provides an overview of an instrument and how it interfaces with various software systems. These documents are a collaboration between engineers and can be long and difficult to maintain. APPS's SIS Hub is a tool that allows users to collaborate on SIS documents over the web.

By enabling multiple users to edit a document using an interface similar to Google Docs, collaboration is simpler. Users can take existing documents written in Microsoft Word and import them into the SIS Hub environment. Also, the APPS Label Design Tool can export an appendix of PDS 4 attributes and classes directly to the SIS Hub.

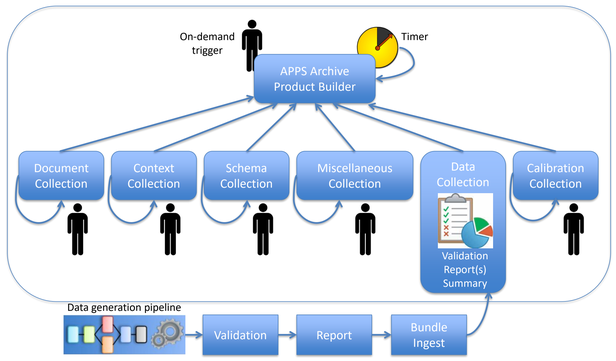
Future features include being able to track changes between users and assign sections of a document for users to fill out. Access controls allow users to determine who can view and edit different documents. Wiki-like tools are also planned which will show how a document has evolved over time. Once a document is ready for delivery it will be possible to export it directly to the PDS.



APPS PDS 4 Bundle Builder Overview

Typically, PDS 4 bundles are generated/built by data providers, and delivered regularly to PDS Discipline Node(s). In turn, the PDS Nodes ingest the bundles, validate them against PDS 4 Standards, and make them available to the public for further research.

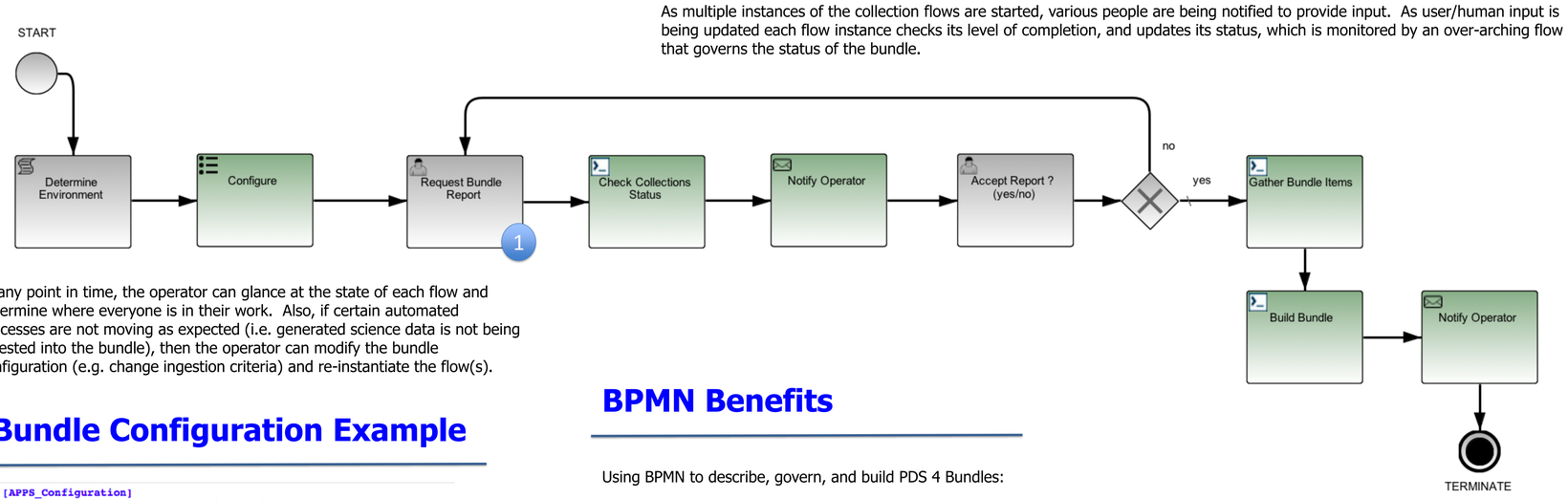
The APPS Bundle Builder provides bundle building capability from a data provider's perspective.



PDS 4 Bundles are composed of multiple Collections: some contain data, and are usually populated automatically (i.e. as data is being generated), and some contain metadata, and other supporting documents, which require a human in the loop to provide some, or all, of their content.

Therefore, the person responsible (the operator) to build and deliver a PDS 4 bundle has to coordinate multiple people along with other automated processes to populate the content of a bundle.

In order to provide a global view of the bundle creation process we used BPMN flows to describe, monitor, and present to the operator the status of each collection within a bundle, along with the overall bundle state.



At any point in time, the operator can glance at the state of each flow and determine where everyone is in their work. Also, if certain automated processes are not moving as expected (i.e. generated science data is not being ingested into the bundle), then the operator can modify the bundle configuration (e.g. change ingestion criteria) and re-instantiate the flow(s).

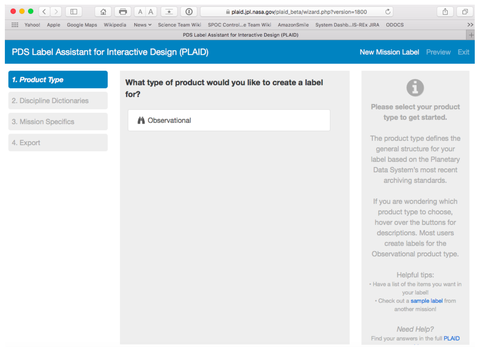
Bundle Configuration Example

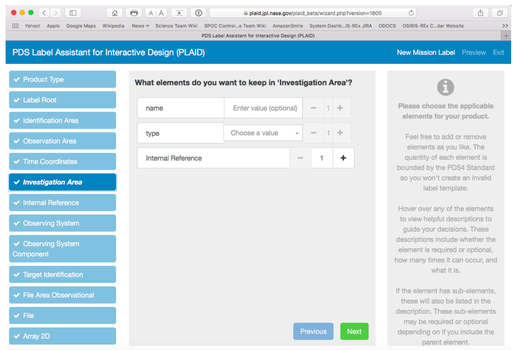
```
[APPS_Configuration]
home_dir                    = /bundle/directory
collection_config_dir       = /collections/configuration/directory
operator_email              = someone@somedomain.com
notify_frequency_days       = 1
bundle_identifier           = some_bundle

[Context_Collection]
type                        = document
notify                      = someone@somedomain.com
label_file                  = label_filename.xml
inventory_table_file        = inventory_table_filename.txt
product_label_file          = product_label_filename.xml
host_product_label_file     = host_product_label_filename.xml
target_product_label_file   = target_product_label_filename.xml
agency_product_label_file   = agency_product_label_filename.xml
facility_product_label_file = facility_product_label_filename.xml
node_product_label_file     = node_product_label_filename.xml

[Data_Collection]
type                        = data
criteria_identifier         = some_keyword
criteria_type               = ISODate
criteria_value              = from_date,to_date
criteria_match              = range
```

APPS - PDS Label Assistant for Interactive Design (PLAID)

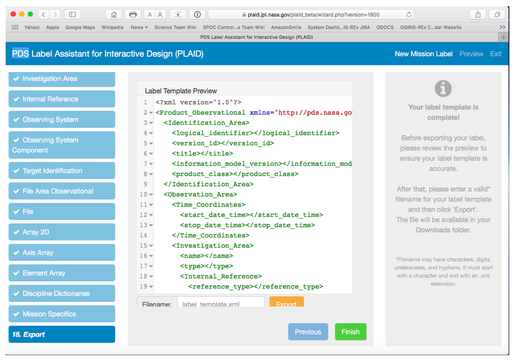




Building PDS 4 compliant metadata labels is difficult for non experts and requires an understanding of the PDS 4 standards, XML, schemas, and schematrons. The APPS PDS Label Assistant for Interactive Design (PLAID) is developed to make creating PDS 4 label templates easier. PLAID provides an intuitive step-by-step web based interface that leads the user through label template development.

PLAID allows users to create and export valid label templates based on rules specified in a PDS schema. The PDS schema version is a selectable option, giving to tool flexibility. Label templates are validated as they are developed, and use a combination of fill-in and dropdown based interfaces to build the labels.

PLAID is being extended to allow users to import PDS 4 label to be used as starting template for new labels. As the number and types of peer reviewed PDS4 labels increases, this functionality will allow new users to rapidly design labels that incorporate best practices of previous missions.



APPS Archive Product Builder BPMN flow

As multiple instances of the collection flows are started, various people are being notified to provide input. As user/human input is being updated each flow instance checks its level of completion, and updates its status, which is monitored by an over-arching flow that governs the status of the bundle.

BPMN Benefits

Using BPMN to describe, govern, and build PDS 4 Bundles:

- Have a graphical representation of the steps involved in generating a bundle.
- Get an overall status of the Bundle completion state at any point in time.
- Provides the ability to model and include "human task" as part of automated processes.
- Offers a Standards-based platform to adapt, and modify, the PDS4 Bundle creation processes for various projects.

References

[1] PDS' New Archive Standards https://pds.jpl.nasa.gov/pds4/about/
[2] APPS is a collaboration between NASA's Advanced Multi-Mission Operations System (AMMOS) and the PDS to provide an archiving pipeline for the missions (i.e. data providers).
[3] Object Management Group (OMG) Business Process Model and Notation (BPMN) http://www.bpmn.org

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