



AAPS for PDS4 Bundle/Collection Development

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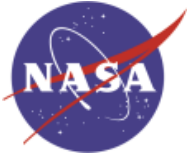
PDS4 Training for Europa Clipper PSG
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APPS Introduction

- **APPS** is the **AMMOS-PDS Pipeline Service**
 - A group of people with a variety of mission and archive backgrounds
 - Mission Development and Operations
 - Instrument Data Processing and Archiving
 - Software Development
 - A collection of PDS and other software products for archive pipeline and label development
 - PDS Label Analysis for Interactive Design (PLAID):
<https://plaid.ipl.nasa.gov/>
 - APPS pipeline (aka archive pipeline) which includes:
 - Transformation (via Apache Velocity templates),
 - Validation (via PDS' Vtool),
 - Reporting (via Apache Couch DB),
 - PDS4 Bundle building (via BPMN process orchestration).
 - Presented at the November 2017 MC F2F Meeting
 - Currently in use by the InSight Mission and planning for Mars 2020
- **APPS** is a service for new archive production and for archive migrations



APPS for new archive production

- Missions (or instrument teams) may not have the dedicated resources to design, develop and implement their archive requirements.
- **APPS** is a service to produce PDS4 compliant archive bundles.
 - Designed to reduce impact on project personnel
 - Leverages core capabilities and services to reduce overall costs
 - Builds upon unique expertise and body of knowledge in the creation and maintenance of PDS labels
- The **APPS** team works with the mission team to:
 - Coordinate with mission operations archive engineers to determine scope of mission archive
 - Assess complexity of the archive effort for cost estimates
 - Plan the archive implementation process
 - **APPS** coordinates between mission and PDS Node
 - **APPS** assists in data set documentation work
 - Implement product generation pipeline
 - Coordinate liens resolutions and update pipeline implementation
 - Produce and deliver archive



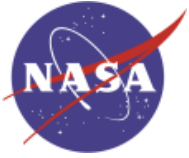
How it works

- MGSS provides an initial consultation to review mission type and complexity
 - This is an initial assessment of product type, complexity, need, etc.
 - Prepare a written ROM estimate based on assessment
 - If acceptable, proceed with the deep-dive assessment
 - Begin label creation/preparation
 - Validate with mission team members and address liens
 - Reprocess products if legacy migration
 - Process and deliver to PDS if new products
 - Provide ongoing support as requested/required
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- APPS is customizable in level of service.
 - APPS can handle all archiving needs or just a sub-set
 - APPS can simply provide tools to your mission if the full service is not needed
 - APPS can be tailored to meet your needed



Why APPS

- PDS4 is more complex than PDS3 and requires a software development background to make efficient use of the XML standard.
- The alternative to APPS is training numerous staff in the PDS4 standard.
 - This is time consuming and costly and may overlap with mission critical activities (i.e. late Phase C/D – early Phase E).
 - APPS staff are PDS4 experts with extensive archive experience. This ensures the maximum scientific return from your archive from the first delivery.
 - APPS reduces mission costs, improves operations efficiency and reduces risk by leveraging the MGSS provided high heritage capability
- Using APPS is an excellent way to meet your NASA HQ and Project mandated data archiving requirements.

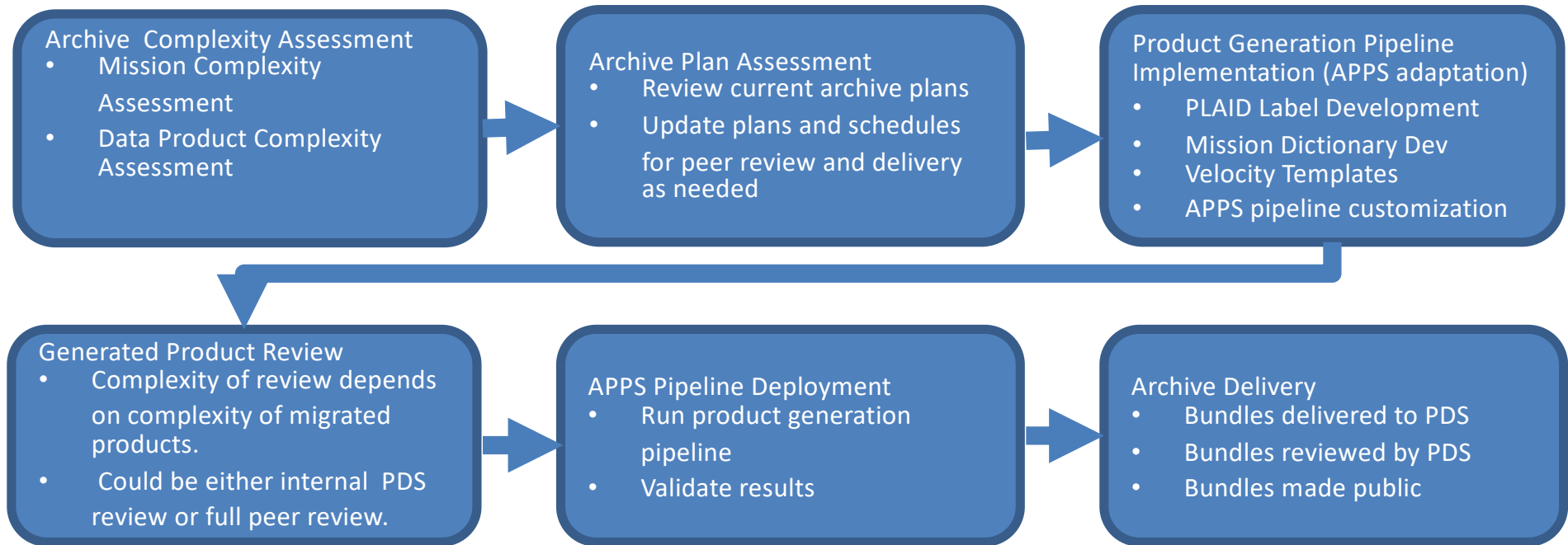


Roles and Responsibilities

- **Mission Operations Archive Engineer (MOAE):** The MOAE verifies and validate the migration plan and the subsequently produced migrated archives. The MOAE works with the Archive Scientist on the correct translation of PDS3 keywords to PDS4 attributes. The MOAE provides any additional mission specific information for archive documentation.
- **APPS Archive Scientist (AS):** The AS manages the migration effort, assists mission team members with the migration complexity assessment, and designs migration labels for data products. The AS works with the PDS Discipline Node to update data dictionaries as necessary for the migration. The AS coordinates with the mission personnel and PDS during the peer review and lien resolution process.
- **APPS Archive Software Developer (ASD):** The ASD will provide all programming support necessary to migrate the archive. This will include automated pipeline development or customization.
- **PDS Discipline Node (DN):** DN personnel assist the MOAE and AS in the development of the Migration Plan. The DN provides PDS4 best practices, reviews prototype products and labels, and updates discipline dictionaries as needed for the migration. The DN schedules and runs the archive peer reviews and provides a lien report to the MOAE and AS. The DN receives the final archive and makes it available to the public.
- **PDS Engineering Node (EN):** The EN supports the DNs and migration efforts by providing updated migration tools including the Generate and Validate tools. EN supports the DNs with formal update and release of discipline dictionaries. EN supports archive peer review efforts and provides registry services for completed archives.



APPS PDS4 Archive Development Process





Notional Timeline of Events

Mission and Data Product Complexity Assessment

Determine complexity of work to be done, data products to convert, and processing required.



JANUARY

PDS4 Label and Product Generation

Generation of PDS4 labels and data products.



JULY

Pipeline Re-Processing

Regeneration of products based on comments from peer review.



DECEMBER

APRIL

OCTOBER

MARCH

Design PDS4 labels, build transformation flow, write programs to reformat data if needed.

Migration Planning and Label Re-design

Peers, science team, and mission review output PDS4 labels and data products and provide feedback.

Peer Review and Lien Resolution

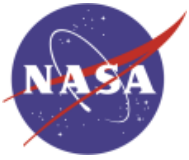
Assembly of final PDS4 bundle and delivery to the PDS.

Bundle Delivery



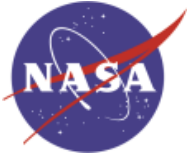
APPS Mission Complexity Assessment

- Roles Involved: **MOAE, AS, DN, EN**
- What does the planned archive look like?
 - Preliminary archive design
 - E.g. 1 bundle per instrument, SPICE bundle, DSN Bundle, derived product bundle
 - Within the bundles, what are the collections?
- Availability and completeness of products/information for mission context and documentation products
- Mission dictionary decisions
 - Single mission dictionary, per instrument dictionary etc.
- Are updates of Discipline Dictionaries needed?



APPS Data Product Complexity Assessment

- Roles Involved: (**MOAE, AS, DN**)
- Within the collections what are the products.
- **APPS** Product Complexity Questionnaire (next slide)
 - This is our quick assessment tool to be used with the missions to gauge the complexity of the development
 - The questionnaire is a check list that can be used to score the general complexity of the migration.
 - 'a' answers = 1, 'b' answers = 2, 'c' answers = 3
 - Add up the total score, higher score = more complex migration
 - Look out for “gotchas”
 - **EXAMPLE:** Binary tables are PDS4 compliant in general, but if the particular products have bit fields, then the product is not compliant.



APPS Product Complexity Questionnaire

1. Are the data products (excluding labels) compliant with PDS4 standards?
 - a. Yes, simple implementation needing only labels
 - b. No, complex implementation needing complete product redesign
2. Does the current mission database contain all or mostly all the appropriate metadata for the PDS4 labels?
 - a. Yes, simple implementation
 - b. No, easily obtained
 - c. No, no difficult to obtain
3. Does the metadata contain information that directly maps to the current specific Discipline Dictionaries or are Discipline Dictionary modifications needed?
 - a. Yes, simple migration
 - b. No, few additions or changes
 - c. No, many additions or changes
4. If products are not PDS4 compliant, is there an available Archive data processing pipeline that could be modified?
 - a. Yes, simpler implementation
 - b. No, but products only require a few changes
 - c. No, products need complicated or new processing
5. Is the currently available Documentation mostly sufficient?
 - a. Yes, SIS update for PDS4 specific changes
 - b. No, SIS update for both PDS4 specific changes and additional content needing Mission Expert Support
6. Are there missing data or missing data sets (i.e. SPICE data, calibration date etc.)?
 - a. No, simple implementation
 - b. Yes, but only a few items
 - c. Yes, many items or new products



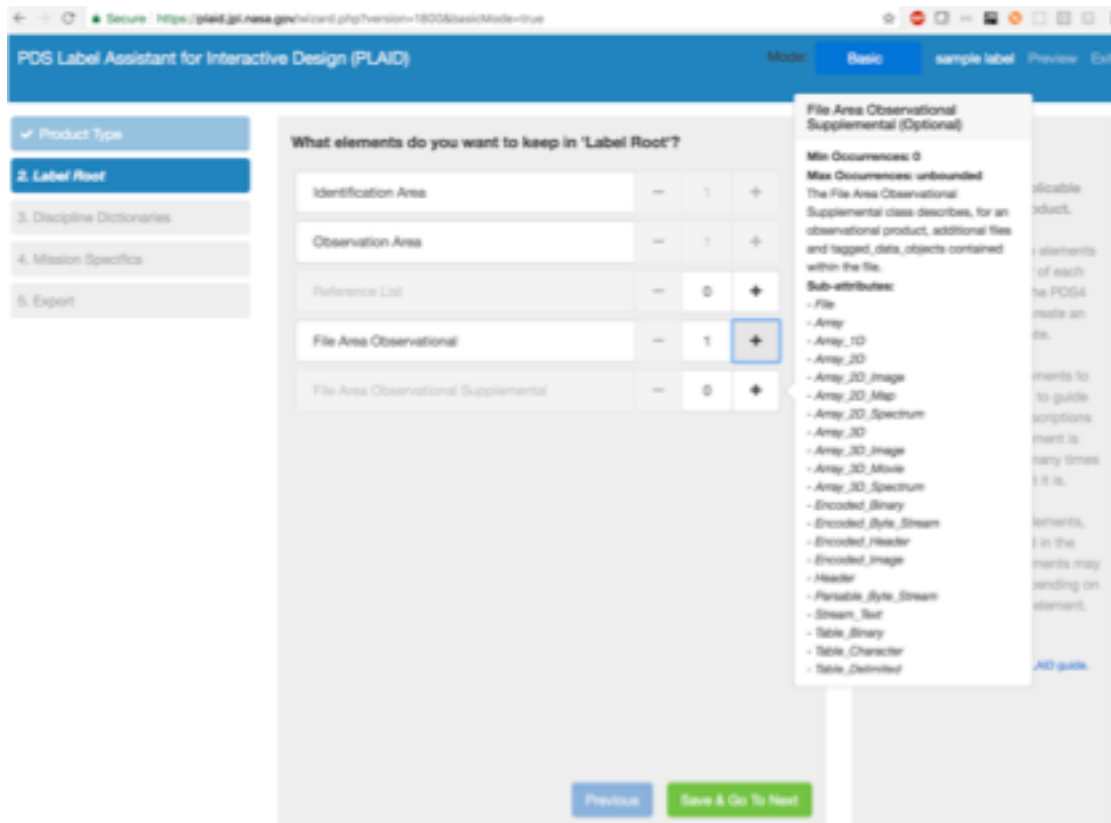
Updated Archive Plan Development

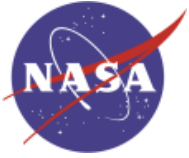
- Roles Involved: **MOAE, AS, ASD, DN**
- Updates to the mission or instrument Data Management and Archive Plan (DMAP) concentrating on:
 - PDS4 Archive Design including bundles, collections and products to be included.
 - Identification of label only development
 - Identification of product + label development
 - Archive generation, validation and transfer
 - Concentrating on automated generation processes and validation.
 - Review Schedule
 - Early data product format review
 - Pipeline Product Peer Review
 - Delivery Schedule
 - Review and confirm proposed delivery schedule



APPS Product Generation Pipeline Implementation

- Roles Involved: **MOAE, AS, ASD**
- Label design using PDS4 tools such as PLAID
- Label implementation in APPS





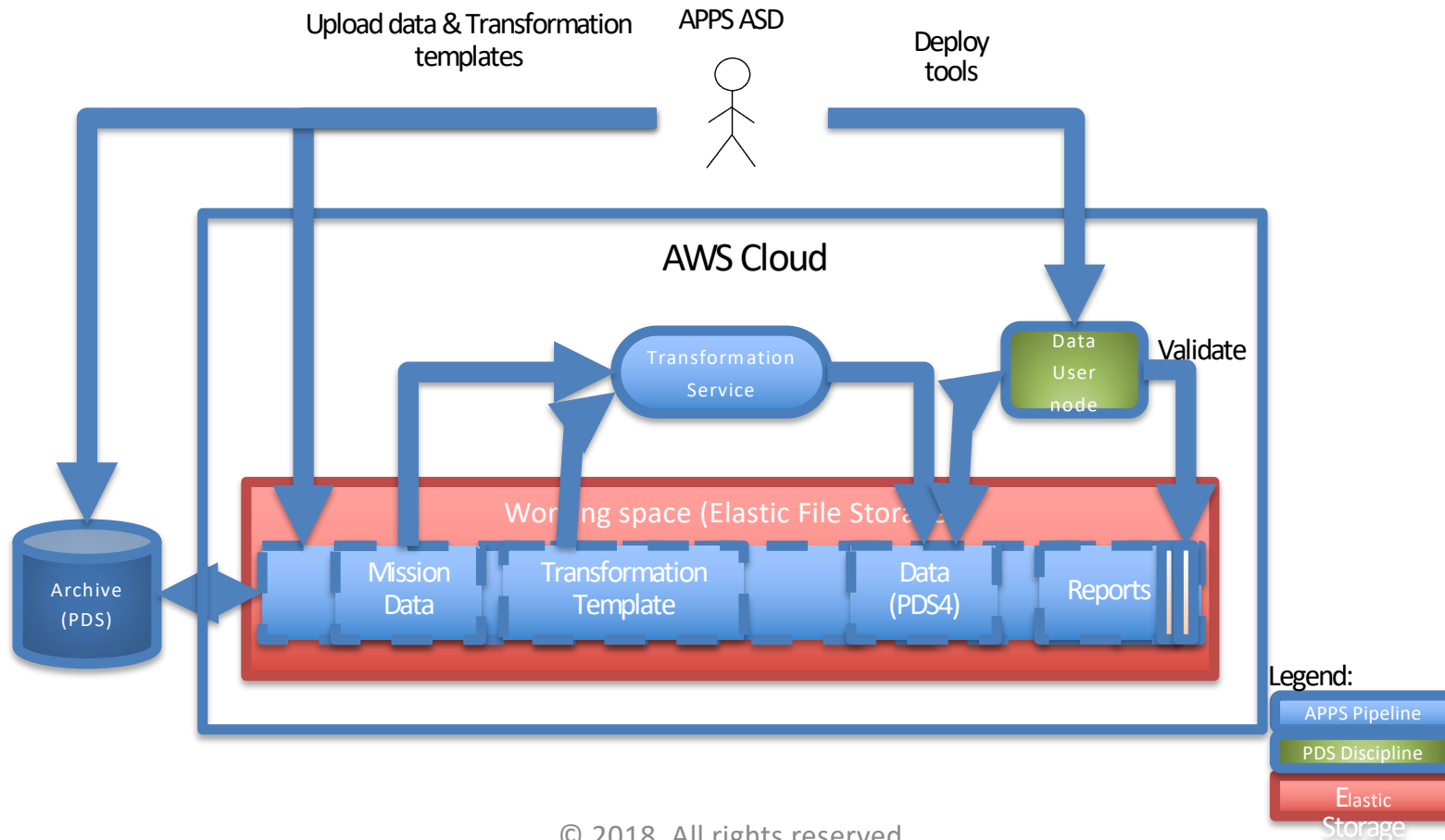
APPS Product Generation Pipeline Review

- Roles Involved: **AS, ASD, DN**
- PDS Node works with the mission to review the new labels and/or data products.
 - Review may be internal to Mission and PDS only.
 - Review may be a full external peer review.
 - Scope and timeframe will be negotiated between mission and PDS Node.
- Review liens are identified and addressed by the mission
 - Final issues are discussed and addressed.
 - Pipeline implementation is updated as needed.
 - Re-review as needed



APPS Product Generation Pipeline Deployment

- Roles Involved: **ASD, AS, MOAE**
- Product Generation and Validation





Archive Delivery

- Roles Involved: **MOAE, AS, DN, EN**
- Product Delivery and Delivery Validation





Conclusions

- **APPS** is a service to produce PDS4 compliant archive bundles.
 - **APPS** provides a complete mission lifecycle archive solution for mission data providers.
 - **APPS** provides a common working environment (a.k.a. a platform) where PDS4 tools and services are available for adaptation on a per- project basis.
 - **APPS** fulfills MGSS's goal of saving missions cost and time by sharing tools and expertise across missions.