JPL Multimission Instrument Processing Laboratory (MIPL)

Towards PDS 4 - AMMOS-PDS Pipeline Service (APPS)

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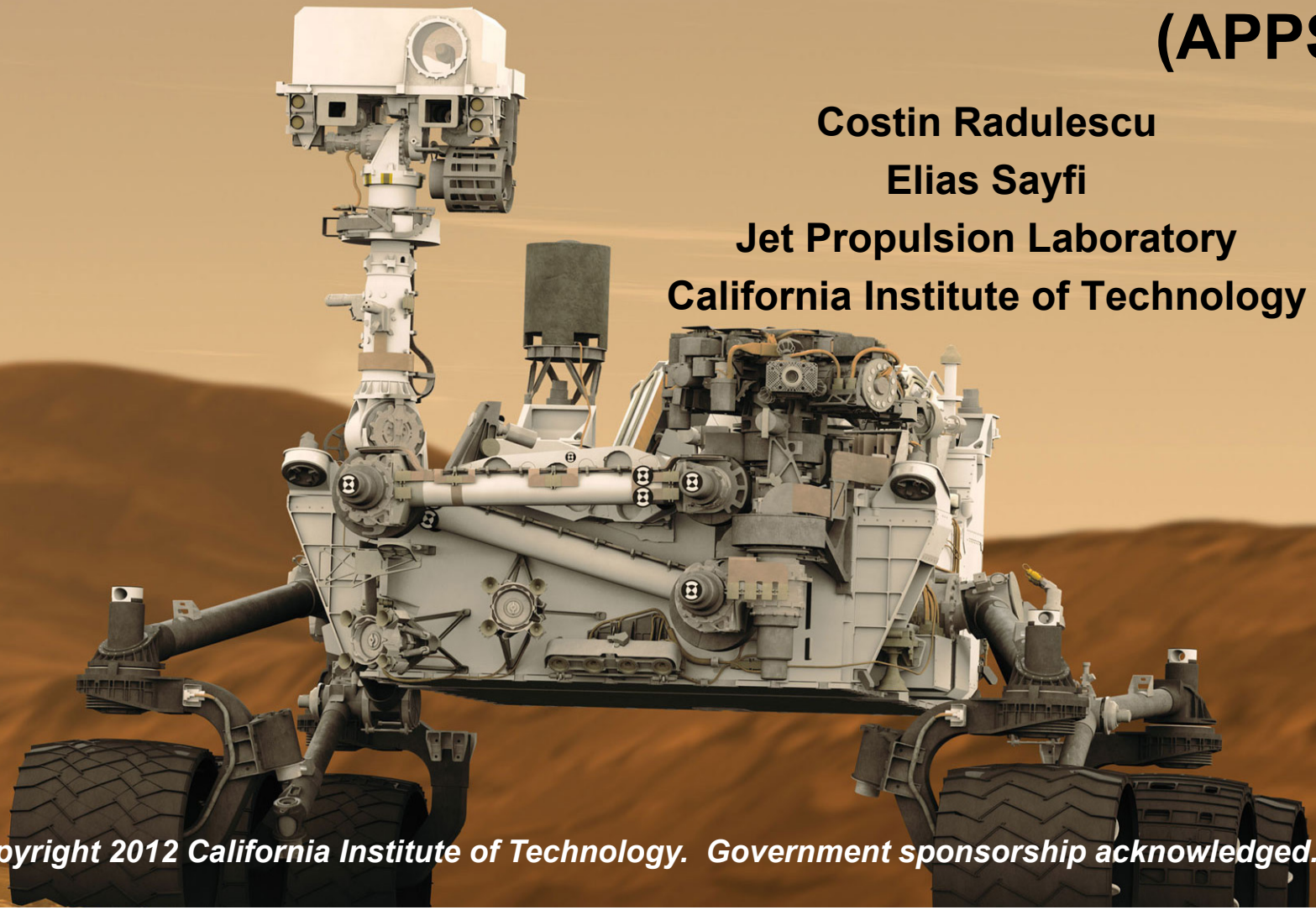


Background

Multi-mission Instrument Processing Laboratory at the Jet Propulsion Laboratory (JPL)

- Multi-project facility responsible for the ground-based science instrument data processing and distribution for NASA's family of planetary missions.

- Co-funded and managed by the Interplanetary Network Directorate (IND) Advanced Multi-Mission Operations System (AMMOS) Program Office's Instrument Operations Subsystem (IOS) element, and the mission-specific projects associated with JPL and NASA. (MIPL was know for many years as the Multi-Mission Image Processing Lab.)

MIPL Overview

MIPL is comprised of three major components:

1. Core multi-mission science processing and data management (VICAR).
   - Support automated pipeline generation and distribution of instrument science data products.
2. Project-specific adaptations.
   - Core software is adapted to meet specific mission requirements and integrate with project-specific tools.
3. System infrastructure to create and support development, test, and operations environments to meet mission needs.

- **All science data produced by MIPL are created in formats specified by NASA's Planetary Data System (PDS), and it is archived per project specifications.**

- **MIPL currently produces thousands of PDS-compliant science products daily.**

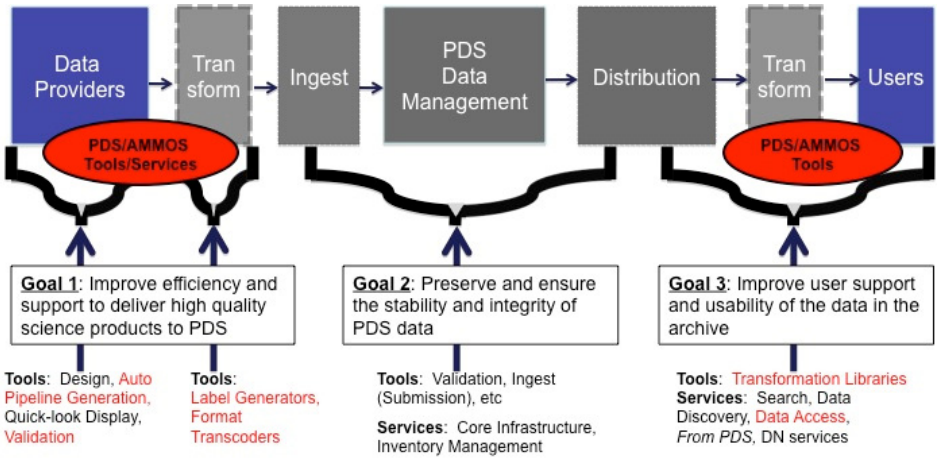
Product Categories

- **MIPL is in the critical path for operations.**
- **Tactical Products**
  - Used for daily operations
  - Optical navigation (Orbiters)
  - Critical path for rover operations
    - Rover Planners (drivers)
    - Science Planners (defining targets and goals)
  - Tight timing requirements
    - 1-30 minutes, depending on product
- **Strategic Products**
  - Long-term rover operational planning (days to weeks)
  - Science users
  - Public release
- **Special products for operations, science, and public outreach**

AMMOS-PDS Pipeline Service (APPS)

APPS is a MIPL/IOS/PDS service:

- Provides a multi-mission instrument data and metadata transformation service which interfaces local or remote Mission Data-Producer's data processing pipeline and the PDS data archive.
- Joint effort between AMMOS and PDS Engineering Node.
- 3-Year effort (currently in the 1st year)



Conceptual flow

APPS Objectives

- **Improve the efficiency and reliability of providing mission science data products to the PDS.**
  - Build on the PDS 4 model driven architecture.
  - MIPL/PDS tools and processes have been used successfully by a wide variety of missions.
  - Well suited to run within an automated pipeline environment.
  - Delivered and operated anywhere.

- **Contribute to the usability of PDS data**
  - MIPL/PDS suite of tools can interface with the PDS and improve usability of data:
    - Transformation Libraries
    - Data Delivery/Packaging
    - Shared Services (Science data search and discovery)

APPS Components

- **APPS provides all the tools and processes to assist a mission (e.g. PI) to go from raw data to creating a PDS (4) compliant product ready for archiving.**
  - Processes to interact and exchange information with PDS Node(s) to ensure proper science data description:
    - Design product label (metadata)
      - PDS keywords usage/selection.
      - Label formulation.
      - Science data format description.
    - Create Software Interface Specification (SIS) documents for the science products.
  - Software tools:
    - Label generation, validation, transformation
  - Web-services:
    - Uniform data processing (data format independence)
    - Data access

Design Product Labels

- **Instrumental tool used by system engineers to create SISs.**
- **PDS 4 model provides a common ontology used to derive PDS 4 compliant labels.**
- **APPS provides:**
  - Processes and tools to define and produce PDS4 compliant labels,
    - include mission specific keywords.
  - Help describe data format.
    - Work with the PDS Node to present and describe the science data.

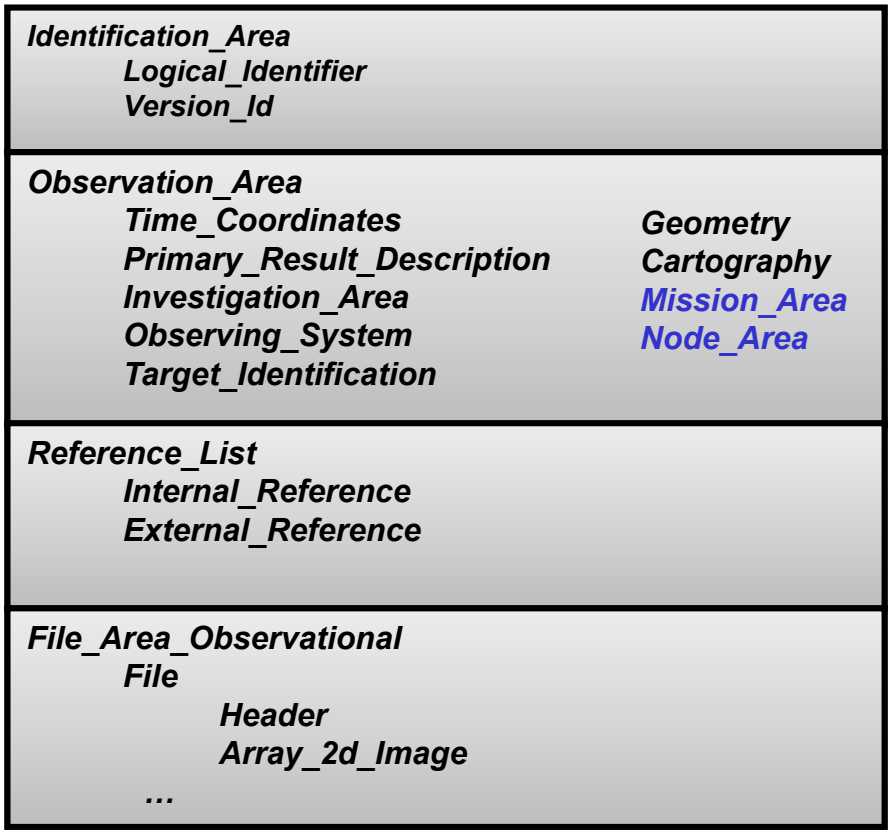
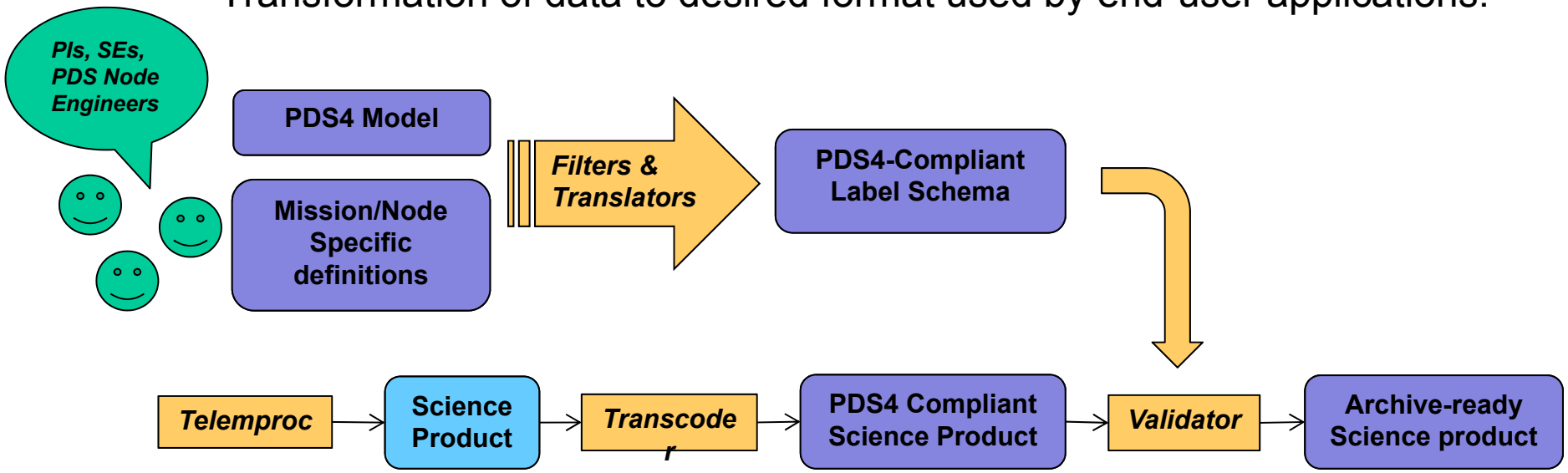


Image: Courtesy of Steve Hughes, JPL, PDS Engineering Node

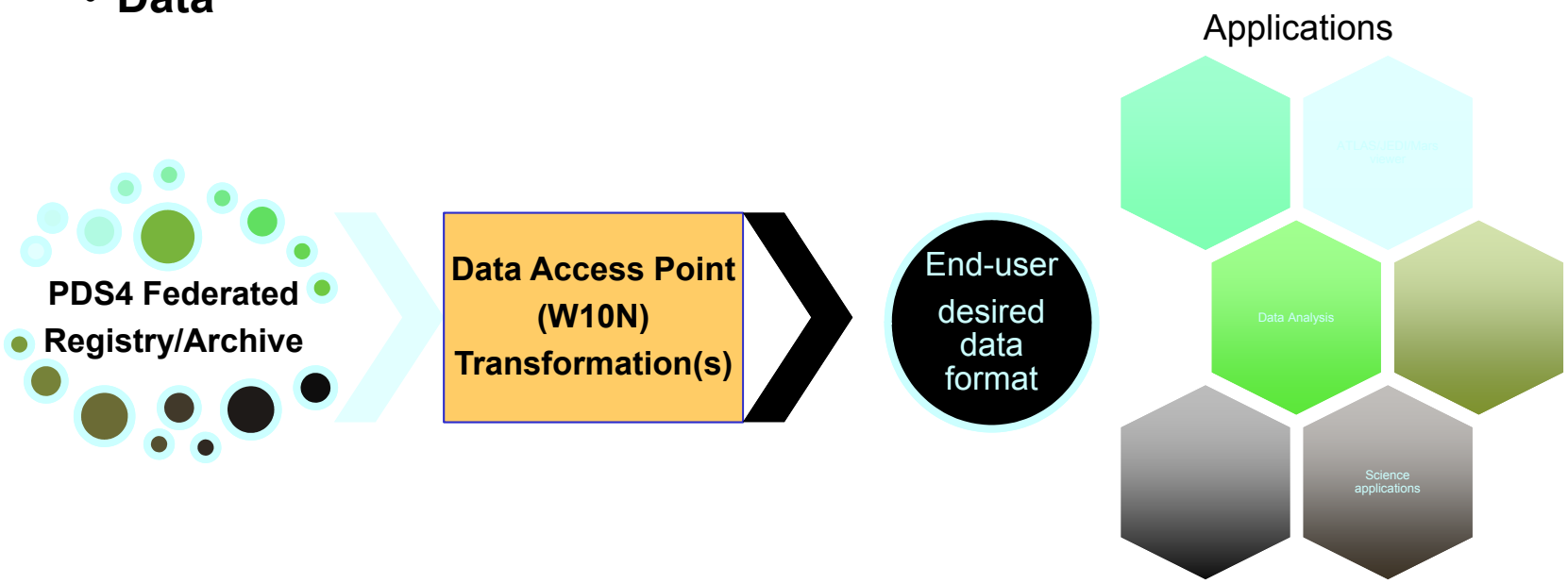
Software Tools

- **XML schema editor to produce mission specific PDS 4 model extensions.**
- **Software that generates the label and validates it against XML schema as part of automated pipeline generation system.**
- **Product format transformation software (Transcoder)**
  - Convert specific science data formats into an archive ready PDS4 compliant product.
  - Transformation of data to desired format used by end-user applications.



Web-Services

- Provide a generic (uniform) data access point to deliver PDS archived data
- Provides search at different levels:
  - Label
  - Metadata
  - Data



Conclusions

- **The PDS 4 architecture has implications and benefits to instrument science data processing capabilities**
- **Improves the efficiency of the end-to-end process**
  - Raw data to PDS 4 compliant product
  - Ontology (model) to label
- **Provides system wide visibility**

Questions and Answers

- **Thank you.**

Backup material

Design Product Labels

- **Instrumental tool used by system engineers to create SISs.**
- **PDS 4 model provides a common ontology used to derive PDS 4 compliant labels.**
- **Standard based:**
  - Uses ISO11179 metadata standard to define attributes
- **Label has specific places for mission and PDS node specific keyword(s), respectively.**
- **Filters and translators are used to generate schema (XML) used for validation.**