International Planetary Data Alliance

IPDA Archive Data Standards

Requirements Identification Project

Use Cases

DRAFT

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CHANGE LOG

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	2006-12-04	Major rewrite for new project created at 1st IPDA meeting	SH
Updated	2006-12-24	Removed several general use cases.	SH, DC

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1 Introduction

The multi-disciplinary nature of planetary science and the increasing number of national space agencies involved in planetary exploration suggest the need for common data standards to improve access to and exchange of high quality planetary science data products across international boundaries. The purpose of this document is to initiate the development of a set of international science data standards by documenting the possible ways in which users might reference and apply standards to build compliant local archives and share science data within the global planetary science community.

It is accepted that inter-operability between archive repositories is critically dependent on compliance to a common set of archive data standards that includes a data model with a data dictionary of terms, standard data formats, and a model of objects and their relationships.

The use case scenarios captured in this document will be used to derive requirements for the IPDA archive data standards. Requirements derived from these use cases will be documented in the IPDA archive data standards requirements document.

2 Actors

For this document, an actor is a user in the global planetary science community that interacts with the IPDA. In particular these interactions will in some way involve the Archive Data Standards. The following actors are either referenced or implied in the following use cases.

Producer – Producer is the role played by those persons, or client systems, which provide the information to be preserved by a local instance of an IPDA compliant science data archive.

Consumer – Consumer is the role played by those persons, or client systems, that interact with the services of a local instance of an IPDA compliant science data archive to find and acquire science data of interest.

Developer – Developer is the role played by those persons that interact with the IPDA to develop software and systems for an IPDA compliant science data archive.

Manager – Manager is the role played by one who sets overall policy for and is involved in day-to-day operations of a local instance of an IPDA compliant science data archive.

Standards Coordinator – Standards Coordinator is the role played by an IPDA staff member to develop, document, maintain, and distribute the IPDA archive data standards.

3 Definitions

The following terms are used in this document.

1. **Actors** - An actor is a person, organization, or external system that plays a role in one or more interactions with the system.
2. **Archive** – An archive is an organization of people and systems that preserves information and makes it available for a designated community. It typically includes a data repository.
3. **Archive Package** – An archive package is a collection of science data and ancillary data that is being managed and preserved in an archive.
4. **Compatible** – Compatible is a characteristic that suggests the need for mediation or translation for interaction to occur.
5. **Compliant** – Compliant is a characteristic that suggests conformance to a common standard so that no mediation or translation is needed for interaction to occur.
6. **Data Dictionary -** A data dictionary is a set of metadata that contains definitions and representations for data elements.
7. **Data Element** – A data element is an atomic unit of data that has a identifier, a definition, one or more representation terms, optional enumerated values, and list of possible synonyms.
8. **Data Format** – A data format is a particular way to encode information in computer storage. It also represents a classification of data.
9. **Data Model** – A data model is a representation of the entities, properties, and relationships in an area of interest.
10. **Data Product** – A data product is a collection of one or more data files that contains science digital data and information about the data.
11. **Distribution Package** – A distribution package is a collection of data that has been prepared for distribution from an archive.
12. **Knowledge Base** - A knowledge base is a special kind of database for identifying, creating, representing, and distributing knowledge for reuse and learning across an organization.
13. **Repository** – A repository is a central place where data is stored and maintained.
14. **Submission Package** – A submission package is a collection of science data and ancillary data submitted to an archive with the intent that the package will be accepted as placed in the archive as an archive package.
15. **Scenario** - An imagined or projected sequence of events, esp. any of several detailed plans or possibilities.
16. **Use cases** - A use case describes a sequence of actions that provide something of measurable value to an actor.

4 Requirements

Many use cases in this document are derived the following candidate requirements that were extracted from the NASA-PDS/ESA-PSA Planetary Data Interoperability White Paper and the IPDA charter document. Another guiding reference for these use cases is the OAIS Reference Model

1. The IPDA shall provide standards for planetary science archives that will improve the global access to and exchange of high quality planetary science data products across international boundaries.
2. A standard protocol that addresses query, data modeling, and data formatting aspects of the interaction will be adopted.
3. Respond with metadata corresponding to matches (including pointers to the real data).

4. Convert semantically varying "keywords" (that might depend on specific projects) to a set of "standardized" keywords.
5. Maintain commonalities of PSA and PDS data dictionaries
6. Maintain compatibility between the PSA and PDS
7. The overall activity for developing an international standard must evolve over time.

5 Use Cases

The purposes of the following use cases are to help scope and identify the core requirements that the IPDA archive data standards should meet to guide the development and management of a local instance of an IPDA compliant science data archive. Local archive repositories that are compliant to these standards will promote global access to and the exchange of high quality planetary science data across international boundaries.

5.1 Standards Coordinator Manages IPDA Data Archive Standards

Description: IPDA Standards Coordinator manages and makes the IPDA Data Archive Standards available to the IPDA community.

Actors: Standards Coordinator, Providers, Consumers, Managers, Developers

Scenarios:
1. The IPDA Standards Coordinator manages the IPDA Data Archive Standards.
    a. Maintenance of a set of common data elements.
    b. Maintenance of the IPDA data dictionary.
    c. Maintenance of a set of common data formats
    d. Maintenance of a set of descriptive objects and their relationships.
2. The Standards Coordinator makes the IPDA Data Archive Standards accessible to the IPDA community as hardcopy documents, from a website, and from a machine accessible knowledge base.
3. The Standards Coordinator identifies and addresses new requirements for the IPDA Data Archive Standards and makes subsequent changes to the data dictionary, data model, and data formats as necessary.

5.2 Producer Uses the IPDA Archive Data Standards to Create a Data Submission Package

Description: Producer creates a data submission package that is compliant with the IPDA Archive data standards.

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Actors: Producer, Standards Coordinator

Sequence:
1. The Producer requests access to the IPDA archive data standards and processes.
2. The Standards Coordinator makes the IPDA archive data standards and processes available to the Producer.
3. The Producer chooses from a list of IPDA common data formats, the formats most suitable for the data.
4. The Producer, working with the IPDA standards coordinator chooses objects and data elements from a data dictionary for describing the data.
5. The Producer, working with the IPDA standards coordinator designs a science data product template in Object Description Language (ODL).
6. The Producer, using the template produces the science data product.
7. The Producer assembles a data submission package that includes science data products and any ancillary data.
8. The Producer, using IPDA provided validation software, validates that the science data products and data submission package are compliant with IPDA archive data standards.

5.3 Producer/Manager Makes a Local Instance of an IPDA Compliant Archive

Description: Producer creates a new or modifies an existing archive repository to be compliant to IPDA archive data standards.
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Actors: Producer, Manager, Standards Coordinator

Sequence:
1. The Producer/Manager announces the availability of data and the desire to make the data available through the IPDA architecture.
2. The Producer/Manager requests access to the IPDA archive data standards and processes.
3. The Standards Coordinator makes the IPDA archive data standards and processes available to the Producer.
4. The Producer/Manager creates a local instance of an archive repository or modifies an existing archive repository that is compliant with the IPDA data archive standards.
5. The Producer/Manager, using IPDA provided validation software, validates that the science data products resident in the archive are compliant with IPDA archive data standards.
6. The Producer/Manager develops user interfaces that are consistent with IPDA archive data standards.

5.4 Producer Ingests Data into a Local Instance of an IPDA Compliant Archive

Description: Manager of a local instance of an IPDA compliant archive provides services for accepting data from a producer and prepares the data for storage and management within the archive.

Actors: Producer, Manager

Sequence:
1. Producer and Manager agree to ingest data into a local instance of an IPDA compliant archive.
2. Producer forwards data submission package to Manager.
3. Manager performs Quality Assurance check using IPDA validation software to ensure that the submission package is compliant with IPDA Archive Data Standards.
4. Manager accepts or rejects submission package based on validation results.
5. If accepted, manager registers and makes the submitted package and its contents available for distribution.

5.5 Consumer Finds and Retrieves Data from a Local Instance of an IPDA Compliant Archive

Description: Consumer uses services for finding and retrieving data from a local instance of an IPDA compliant archive.

Actors: Consumer, Manager

Scenarios:
1. Local Manager provides user interfaces that are consistent with and use IPDA Archive Data Standards for user guidance.
2. Consumer interacts with user interface to query for and locate science data from across distributed IPDA compliant data archives.
3. Consumer interacts with user interface to retrieve science data and ancillary information from across distributed IPDA compliant data archives.

4. Consumer interacts with user interface to access information such as available data types, query parameters, science data product descriptions, and data dictionary information from across distributed IPDA compliant data archives.

5.6 Developer Uses Archive Data Standards for Software Development

Description: Developer requests IPDA archive data standards for the development of software.

Actors: Developer, Standards Coordinator

Scenarios:
1. The IPDA makes its archive data standards available in a knowledge base for online access by developers and API access by software.
2. A developer designs and develops portable, easy to use validation software for determining whether science data products and submission packages are compliant with IPDA archive data standards.
3. A developer designs and develops user interfaces for a) the identification of the types of data available, b) the parameters available for query constraints, and c) searching, locating and retrieving data from all active IPDA compliant repositories.
4. A developer designs and develops visualization, data process, and data analysis software that are compliant with and use the IPDA Archive Data Standards.
5. A developer references IPDA archive data standards to create a generic protocol with the capability to interoperate between IPDA member repositories.