GLOSSARY OF PDS4 TERMS
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PDS4 Document Editorial Board
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Contents

This document defines terms used across the Planetary Data System in its version 4 (PDS4). Definitions can be found where words are highlighted in **bold** font. The definitions are given in a 'functional' order — the order in which they might be needed to understand PDS4 from the ground up — rather than alphabetically. Where there is a divergence between PDS4 definitions and those used in the Open Archival Information System Reference Model (OAIS RM, the basis for the PDS4 Information Model, PDS4 IM), there is a note. A few words have different meanings depending on the communities in which they are used; we have adopted modifiers if one use is clearly secondary in the PDS context. For example, 'attribute' is widely used in PDS, while 'XML attribute' has a different meaning, appropriate to an XML context.

Introduction:

Our environment is filled with 'objects'; some are tangible (like rocks and water), others are intangible (like sounds and ideas). We call these 'physical objects' and 'conceptual objects', respectively. Since this is a glossary for the Planetary Data System, we also identify 'digital objects', which are the bits in a computer or storage device that can be interpreted and used — for example, as an image or a table of numbers. Whether 'bits' are physical or conceptual (or a little of each) doesn't really matter; we are putting digital objects into this third category.

For purposes of the PDS4 Information Model, we call all three types of object (physical, conceptual, and digital) '**data objects'** — even though we have to stretch a little to think of physical and conceptual objects as 'data'. Viewed from the perspective of the PDS4 IM, we can imagine physical and conceptual objects to be data objects with no bits — which is perfectly OK so far as the model is concerned.

In order to use an object, we need information on both its structure and its meaning — in the case of digital objects, this is easy: how are the bits organized into rows and columns (for example) and what do they represent? We can fit both the object *and* its description into the archive.

We can't fit rocks, water, sounds, or ideas into PDS4; but we can fit their descriptions. We can pair each description of a physical or conceptual object with its (imaginary) data object; then we can operate on these 'pairs' in exactly the same way we operate on the digital objects and their descriptions. Nothing happens when we ask PDS4 to display the real rock, water, sound, or idea on a computer screen; but the model is happy.

A data object paired with its description is called an '**information object'** in the OAIS RM and in the PDS4 IM (Figure 1). PDS4 is based entirely on 'information objects'; in the XML implementation of PDS4, there is a little added XML window dressing (overhead), but the PDS4 information objects overwhelmingly dominate.

In the next section we start creating PDS4 from the ground up, constructing basic building blocks and defining terms.

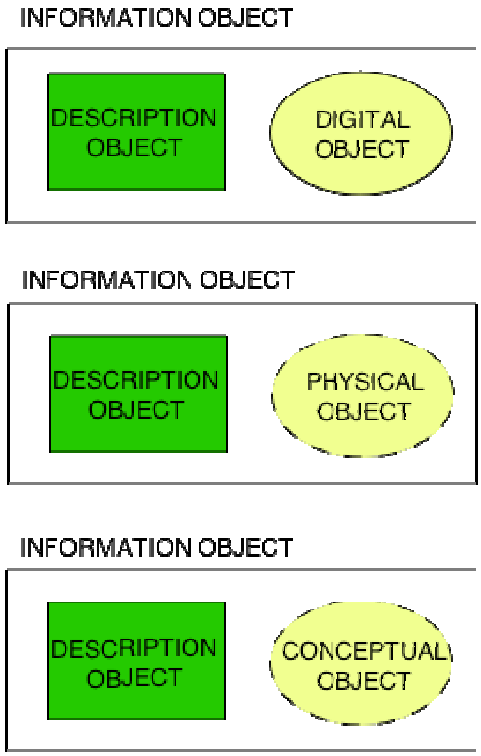

Figure 1. The 'information object' is the basic building block of PDS4. It is the pairing of a description with a digital, physical, or conceptual 'data object'. The fact that physical and conceptual data objects do not actually exist in the archive (dashed outlines) is not important so far as the PDS4 Information Model is concerned.

Building Blocks:

To build a functional data system, we require that every component be modeled — given a formal structure that explains content and constrains the operations that can be performed on it (and which it can perform). For PDS4 modeling an object oriented approach and vocabulary has been adopted. We start by defining 'attribute' and 'class'.

attribute: A property or characteristic that provides a unit of information. For example, 'color' and 'length' are possible attributes.

class: The set of attributes (including a name) which defines a family. A class is generic — a template from which individual members of the family may be constructed. If the class 'rope' (its name) is defined by attributes 'color' and 'length', we can construct a family of ropes — *e.g.*, red and 3 m long, red and 4 m long, blue and 2 m long, ...

Related definitions include:

association: An attribute that establishes a unidirectional relationship between two classes. For example, a table has records; 'has record' is the relationship between one entity (Table_Base, the simplest table in PDS4 nomenclature) and another (Table_Record).

meta-attribute: An attribute of an attribute — that is, a 'dictionary' attribute, which is used to define one or more attributes in the PDS4 Information Model. For example, 'conceptual_domain' and 'maximum_value' are used in defining some attributes.

object: The realization of a single member of a family defined by a class. If the class 'rope' has attributes 'color' and 'length', we can construct a 'rope' family with three members — red and 3 m long, red and 4 m long, and blue and 2 m long. Each member is an object.

In PDS4 there are three subclasses of object: digital object, physical object, and conceptual object but only digital objects will be found in the digital archive. [Note: the OAIS RM calls these 'data objects']. We can now define the three subclasses:

digital object: An object which is real data — for example, a binary image of a redwood tree or an ASCII table of atmospheric composition versus altitude.

physical object: An object which is physical or tangible (and, therefore, does not itself fit into a digital archive). Examples of 'physical objects' include the planet Saturn and the Venus Express magnetometer. Note that an ASCII file describing Saturn is a *digital* object, not a physical object (nor a component of a physical object).

conceptual object: An object which is intangible (and, because it is intangible, does not fit into a digital archive). Examples of 'conceptual objects' include the Cassini mission and NASA's strategic plan for solar system exploration. Note that a PDF describing the

Cassini mission is a *digital* object, not a conceptual object (nor a component of a conceptual object).

As noted above, objects, by themselves, are not very useful. We know nothing about their structures and have no clues as to how their contents should be retrieved and interpreted.

description object: Something that describes an object. As appropriate, it will have structural and descriptive components. Technically speaking, a 'description object' in PDS4 is a 'digital object' — a string of bits; but we assume that we can read it and, on that basis, give it a special name.

tagged digital object: A digital object paired with its companion description object (Figure 2). [Note: In the OAIS RM this is known as an 'information object']

tagged non-digital object: A physical object or a conceptual object paired with its companion description object (Figure 2). [Note: In the OAIS RM this is known as an 'information object']

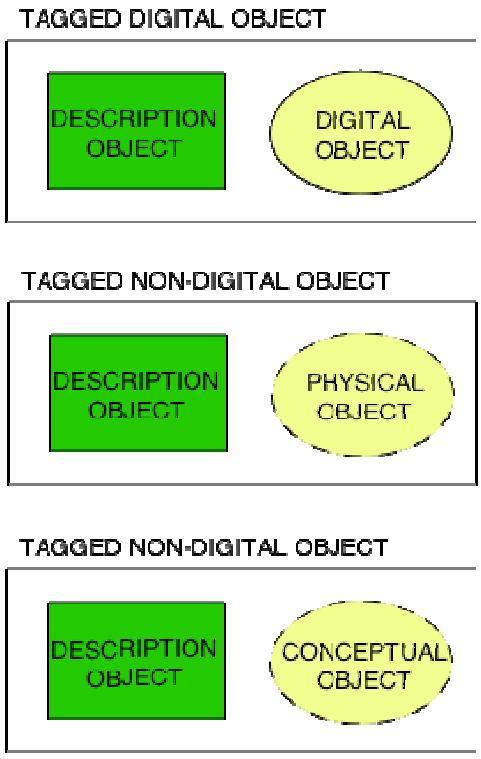

Figure 2. 'Tagged digital objects' and 'tagged non-digital objects' are the fundamental components of PDS4 'products'. Dashed lines denote objects that are not actually in the archive. [Note: Tagged objects are 'information objects' in OAIS RM, per Figure 1.]

Product-related definitions:

label: The aggregation of one or more description objects such that the aggregation describes a single PDS product. In the PDS4 implementation, labels are constructed using XML, which imposes a small amount of overhead.

identifier: A unique character string by which a product, object, or other entity may be identified and located. Identifiers can be global, in which case they are unique across all of PDS (and its federation partners). A local identifier must be unique within a label.

product: One or more tagged objects (digital, non-digital, or both) grouped together and having a single PDS-unique identifier. In the PDS4 implementation, the descriptions are combined into a single XML label. Although it may be possible to locate individual objects within PDS (and to find specific bit strings within digital objects), PDS4 defines 'products' to be the smallest granular unit of addressable data within its complete holdings.

basic product: The simplest product in PDS4; one or more data objects (and their description objects), which constitute (typically) a single observation, document, etc. The only PDS4 products that are *not* basic products are Product_Collection and Product_Bundle. Every basic product must be a primary member of one (and only one) collection. Basic products may be secondary members of any number of collections.

Collection- and bundle-related definitions:

collection: A list of basic products, all of which are closely related in some way. A collection is itself a product (because it is simply a list, with its label); but it is not a *basic* product.

primary member: A *basic product* is a primary member of the collection within which it first entered into PDS4. Every basic product must be a primary member of one (and only one) collection.

secondary member: A *basic product* may be a secondary member of any number of collections. A collection which lists references to basic products already registered in PDS would identify those products as secondary members of the collection. For example, a collection of all Voyager images which had Saturn's rings within the field of view would identify each of those image products as secondary members of this new collection.

bundle: A list of collections. For example, a bundle could list a collection of raw data obtained by one instrument during a mission lifetime, a collection of the calibration products associated with the instrument, and a collection of all documentation relevant to those collections.

Delivery-related definitions:

container: The physical equivalent of a package; the product manifest and all related files wrapped together for transfer — for example, in a ZIP, GZIP, or TAR file.

package: A product manifest and all related files *logically* grouped together for transfer.

XML-related definitions:

tag: Fundamental syntax in XML; a tag is a character string delimited by "<" and ">". For example "<date>" is a tag.

XML element: An XML structure that begins with <tag>, contains 'content', and ends with </tag>. For example, "<date>2009</date>" is an XML element that establishes the date as 2009.

XML attribute: An attribute-value pair that is inserted into an XML element to provide additional information, such as units; the value is always quoted. For example

<date unit='year'>2009</date>

XML schema: The definition of an XML document, specifying required and optional XML elements, their order, and parent-child relationships.

Management-related definitions:

registry: A data base that provides services for sharing content and metadata.

registration authority: An organization responsible for maintaining a registry — in this case, the PDS4 Information Model and its components. The registration authority for the Planetary Data System is 'PDS'.

steward: A person or organization that manages a set of registered attributes and classes, typically as an agent for another or others. A registration authority must have at least one steward; it may have many. Stewards for PDS4 include PDS, the discipline nodes, and any mission wishing to conform to the PDS4 Information Model.

namespace: A context for defining classes and attributes. Two items with the same name but from different namespaces generally have different definitions. For example, "title" has a very different meaning in a *movie* namespace compared with its meaning in an *automobile* namespace.

Other definitions:

cardinality: The number of values allowed to an attribute or association in a single class. Cardinality in general is stated as a range with a minimum and maximum. For example, an *optional* attribute that may be multi-valued will have a cardinality of "0..*". A cardinality where the minimum and maximum are the same is often shown as the single value; for example, an attribute required to have exactly one value will have a cardinality of "1". When a value is required, the minimum cardinality is at least 1. At least one value is always required in PDS4.

class hierarchy: An ordering of classes which shows parent-child relationships.

entity: Something that has a distinct, separate existence.

local: In a label

metadata: Data about data — for example, a 'description object' contains information (metadata) about an 'object.'

model: A representation or description designed to show an entity and its composition.

resource: The target (referent) of any Uniform Resource Identifier; the thing to which a URI points.

extension: In PDS4 a class extension is a subclass. Subclasses are more specialized versions of a class. They inherit attributes and behaviors from their parent classes, and they can have attributes of their own. For example, Array_2D is a PDS4 subclass of Array_Base.

formal: TBW

logical: TBW

subclass: See extension.

PDS4 Acronyms

ASCII	American Standard Code for Information Interchange
CCSDS	Consultative Committee for Space Data Systems
COSPAR	Committee on Space Research
DPH	Data Provider's Handbook
ebXML	electronic business eXtensible Markup Language
ESA	European Space Agency
HTML	Hypertext Markup Language
IAG	International Association of Geodesy
IAU	International Astronomical Union
IEEE	Institute of Electrical and Electronics Engineers
IM	Information Model
ISO	International Standards Organization
ISO/IEC	International Standards Organization / International Electrotechnical Commission
ISO/TS	International Standards Organization / Technical Standard
JPL	Jet Propulsion Laboratory
LSB	Least Significant Bit
MD5	Message-Digest algorithm 5
MSB	Most Significant Bit
NAIF	Navigation and Ancillary Information Facility
NASA	National Aeronautics and Space Administration
NBS	National Bureau of Standards
OAIS	Open Archival Information System
PDF	Portable Document Format
PDS	Planetary Data System
PDS4	Planetary Data System, version 4
PSA	(ESA) Planetary Science Archive
PSDD	Planetary Science Data Dictionary
RM	Reference Model
SPICE	Spacecraft, Planet, Instrument, C-matrix (pointing), and Events kernels
SR	(PDS) Standards Reference
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URN	Uniform Resource Name
UTF	Unicode Transformation Format
W3C	World Wide Web Consortium
XML	eXtensible Markup Language