PDS4 Essential Core for theVersion 1.0 Public Release
February 8, 2013

I. Purpose

The purpose of this document is to serve as an internal memo for thePDS Management Council in order to agree on the minimal set of capabilities required to release version 1.0 publicly to the PDS data providers.

II. Introduction and Scope

Version 1.0 of PDS4 is the first public release. The scope of the release is to *supportdata providers and Discipline Nodes in developing PDS4 data products both for new missions and data migration*. Previous releases of PDS4 have been scoped to support the LADEE and MAVEN missions as early adopters as well as internal testing by PDS and the IPDA. Future, incremental releases will target data users as PDS4 data are available within the PDS. The minimum PDS4 capabilities that are essential for the MC to authorize the first incremental "public" release, V1.0, of PDS4 includes:

- A stable subset of product classes for data provider use[1].
- Tools and services sufficient to meet the needs of data providers, focused on the needs of LADEE & MAVEN[2].
- Sufficient documentation to support the above[3].

Regarding the contents of the Information Model, the expectation is that all classes identified as part of the essential "core"will be sufficiently stable and backwards compatible with future iterations of the Information Model (IM).

Regarding the system portion of the essential "core", the expectation is that the essential services and tools will be functional, wherefuture iterations will produce improvements in ease of use, scope, and efficiency. We are looking for good enough, not perfect.

While at this stage we are identifying the minimum essential elements, the internal review may identify addition elements to be identified as essential in version 1.0 if they meet the expectations above. (This allows us to identify as reasonably stable additional classes beyond the minimum if they mature sufficiently rapidly).

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[1]*The primary driver in determining which classes need to be sufficiently mature to afford long-term stability is based on the needs of LADEE & MAVEN.*

[2]*Tools and services designed for end user support are specifically not included in the initial public release.*

[3]*A compilation of policies, rules, and other PDS4 constraints that are both given explicitly in the Information Model and Data Dictionary and can be derived from the Information Model.*

III. Timeline

The 3b build that is planned for March 2013 will include the full information model, schema, documentation and available PDS4 systems tools and services.Following the build will be an *Acceptance Test* process and review. Should it be accepted for release, a subset will be identified as "essential" for Version 1.0and posted on the PDS4 page [1] of the main PDS web site.

The following identifies the timeline:

- End of March: release 3b. Includes the full information model, schema, documentation, and available PDS4 system tools and services. A subset of release 3b will be identified as "essential" for the Version 1.0 "public" release.

- April – June: Acceptance testing and review by the PDS.

- July: Assuming a favorable review and successful lien resolution, release Version 1.0 of PDS4. It will include the full information model, schema, documentation, and available PDS4 system tools and services. A subset of Version 1.0 will be identified as "essential".

IV. Core Information Model

The classes from the PDS4 Information Model being proposed for the Version 1.0 candidate release are summarized in the following table. A complete detailed breakout can be found in Appendix A. The Data Design Working Group (DDWG) made the initial determination based on those classes needed to support the LADEE and MAVEN missions, primarily the 2D image, the table classes, and the Product Observational component classes.

The concept of backwards compatibility has been taken into consideration for the determination of what classes are to be included in the initial release and those that can be delayed. For example, the Array_3D classes are subclasses of the Array class but if necessary can be delayed to V1.1 since they are backwards compatible by definition. In other words, if the Array class is accepted for Version 1.0, then only the additional features provided by the Array_3D subclasses need to be reviewed since their core components were previously accepted.

Data Structures

The four fundamental data structure classes define the structures of all PDS4 digital objects.

Class	Subclasses	Description
Array	Array_2D, Array_2D_Image	The Array class defines a homogeneous N-dimensional array of scalars.

	Array_2D_Spectrum[1] Array_2D_Map[1] Array_3D[1] Array_3D_Spectrum[1]	
Table (Base)	Fixed-width Character Table, Fixed-width Binary Table	The Table class defines a set of repeating records, each with aheterogeneous set of fields.
Parsable Byte Stream	Delimited Table, Header, SPICE Kernel, Stream Text	The Parsable Byte Stream class defines byte streams that have standard parsing rules.
Encoded Byte Stream	Encoded_Image, PDF/A	The Encoded Byte Stream class defines byte streams that must be decoded by software before use. These byte streams must only use standard encodings.

[1]Thesedata structures require active node advocacy to be included in V1.0, otherwise they will slip to V1.1.

Product
A Product is a uniquely identified information object that is managed by the registry. An example of an information object is a digital image and a label that describes the image.

Class	Subclasses	Description
Product Observational	N/A	A Product_Observational is a set of one or more information objects produced by an observing system.
Product Document	N/A	The Product Document class describes a document.
Product XML_Schema	N/A	The Product_XML_Schema is used to describe XML schemas.

Aggregates
The aggregate products are used to group a set of data or observational products.

Class	Subclasses	Description
Product Collection	N/A	A Product_Collection has a table of references to one or more data products.
Product Bundle	N/A	A Product_Bundlehas a table of references to one or more collections.

V. Essential Core Software

The core software for the Version 1.0 candidate release consists of tools and services to support PDS4 data validation, registration, and search. The software includes the following:

Local Data Dictionary Generation
Software for generating a Local Data Dictionary (LDD) that can be referenced by product labels. Satisfied by the following component:

Component	Capabilities
LDDTool	• Supports generating Local Data Dictionary XML Schema and Schematron files from a populated template. • Supports generating additional files for merging the LDD into the Information Model.

Label and Data Validation
Software for validating PDS4 product labels and product data. The associated specific schema for the product label specifies syntactic and semantic constraints. The product label itself specifies the constraints for the data. Satisfied by the following component:

Component	Capabilities
Validate Tool	• Supports validation of PDS4 product labels against the associated XML Schema and Schematron files. See the Preparation Tools SRD/SDD [2] for more details.

Data Registration
Software for capturing metadata describing data products registered in the PDS data system. Satisfied by the following components:

Component	Capabilities
Registry Service	• Supports registration of PDS products as defined in the PDS Information Model. • Supports managing registered products including updating, versioning and deleting. • Supports querying for registered products. See the Registry Service SRD/SDD [3] for more details.
Harvest Tool	• Supports retrieval of metadata from PDS products and registration of that metadata with the Registry Service. See the Harvest Tool SRD/SDD [4] for more details.

Data Search
Software for finding data products registered in the PDS data system. Satisfied by the following components:

Component	Capabilities
Search Service	• Supports indexing of metadata for registered catalog-level* PDS products from the Registry Service. • Supports query requests for registered PDS3/PDS4 catalog-level* PDS products and retrieval of query results. • Supports the PDS and PDAP search protocols for specifying query criteria. *Catalog-level products include Mission/Investigation, Instrument Host, Instrument, Target, Data Set and Bundle/Collection products. It does not include Observational products. See the Search Service SRD/SDD [5] for more details.
Search User Interface	• Provides a graphical user interface integrated with the PDS web site (http://pds.nasa.gov/) for submitting query requests and retrieving query results to/from the Search Service. • Supports query requests for and display of returned query results for PDS3/PDS4 catalog-level PDS products. See the Search Service SRD/SDD [5] for more details.

VI. Non-EssentialSoftware

In addition to the core software described above, the following functions provide additional support for preparing PDS4 data beyond the essential core software. These will be included as part of build 3b, but are considered not critical to supporting the primary scope of the public release.

Label Generation
Software for generating PDS4 labels from existing PDS3 labels in bulk. Although initially intended for migration, it should be adaptable to generating labels for new PDS4 data products. Satisfied by the following component:

Component	Capabilities
Generate Tool	• Supports generation of PDS4 product label from PDS3 product label or other metadata source.

Label and Data Transformation
Software for reading and writing PDS4 data products that also includes transforming data and label files into various formats. Satisfied by the following components:

Component	Capabilities
PDS4 Tools	• Supports reading and writing PDS4 data, withsupport for Array 2D Image, Binary Table, Character Table and Delimited Table.

Component	Capabilities
Transform Tool	• Supports transforming PDS3 and PDS4 product labels and data into common formats, including: o PDS4 product label to Parameter Value Language (PVL) o PDS4 Array 2D Image to BMP, GIF, JPEG, JPEG2000, PNG, PNM, RAW, TIFF and WBMP o PDS3 Image to BMP, GIF, JPEG, JPEG2000, PNG, PNM, RAW, TIFF and WBMP As of the writing of this document, additional transformations listed in the Format Transformations [6] spreadsheet have yet to be prioritized by Node staff. This prioritization will help identify candidate transformation support for the Build 3b release and beyond.

VI. Core Documentation

The documentation being proposed for the Version 1.0 candidate release consists of the Information Model Specification, Data Dictionary, Concepts Document, Glossary, Standards Reference, and Data Providers Handbook.

Appendix A – Core Classes

The following table includes the classes for candidate release V1.0 and the future releases. The legend provides a brief description of each of the color codes.

Context classes such as instrument and investigation are included in the Version 1.0 candidate release since they are being used for the LADEE and MAVEN missions. However the DDWG did not believe that a formal review was required since they are managed internally to the PDS and are already being used. Any change to a context class will have minimal impact on an associated data product because data products reference context products using unique identifiers.

Most of the remaining classes are held for candidate release V1.1. These classes are currently under development and many are mature, however further testing is desired.

	Release	**Available For Testing**	**Projected Release**
Legend	V1.0 - for public use	Build 3b - 4/1/2013	7/15/2013
	V1.1- for public use, follow-on release	Build 3b - 4/1/2013	Build 4a
	Internal - for internal use	Build 3b - 4/1/2013	7/15/2013
	V0.3b - in development	Build 3b - 4/1/2013	7/15/2013

	PDS4 Classes and Candidate Releases			
	Name	**Version**	**Steward**	**Description**
1	Array	V1.0	pds	The Array class defines a homogeneous N-dimensional array of scalars. The Array class is the parent class for all n-dimensional arrays of scalars.
2	Array_2D	V1.0	pds	The Array 2D class is the parent class for all two dimensional array based classes.
3	Array_2D_Image	V1.0	pds	The Array 2D Image class is an extension of the Array 2D class and defines a two dimensional image.
4	Array_2D_Map	V1.0	pds	The Array 2D Map class is an extension of the Array 2D class and defines a two dimensional map.
5	Array_2D_Spectrum	V1.0	pds	The Array 2D Spectrum class is an extension of the Array 2D class and defines a two dimensional spectrum.
6	Array_3D	V1.0	pds	The Array 3D class is the parent class for all three dimensional array based classes.
7	Array_3D_Spectrum	V1.0	pds	The Array 3D Spectrum class is an extension of the Array 3D class and defines a three dimensional spectrum.
8	Axis_Array	V1.0	pds	The Axis Array class is used as a component of the array class and defines an axis of the array.
9	Band_Bin	V1.0	img	The Band_Bin class specifies the characteristics of an individual spectral band in a spectral qube.
10	Band_Bin_Set	V1.0	img	The Band_Bin_Set class contains the spectral characteristics for all the spectral bands in a qube.
11	Bundle	V1.0	pds	The Bundle class describes a collection of collections.
12	Bundle_Member_Entry	V1.0	pds	The Bundle Member Entry class provides a member reference to a collection.
13	Byte_Stream	V1.0	pds	The Byte Stream class defines a stream of bytes.
14	Citation_Information	V1.0	pds	The Citation_Information class provides specific fields often used in citing the product in journal articles, abstract services, and other reference contexts.
15	Collection	V1.0	pds	The Collection class provides a description of a set of products.
16	Context_Area	V1.0	pds	The Context Area provides context information for a product.
17	Discipline_Area	V1.0	pds	The Discipline area allows the insertion of discipline specific metadata.
18	Display_2D_Image	V1.0	pds	The Display_2D_Image class provides attributes to enable the display of a 2 dimensional image.
19	Document	V1.0	pds	The Document class describes a document.
20	Document_File	V1.0	pds	The Document File class describes a file which is a part of a document.

21	Document_Format	V1.0	pds	The Document Format provides a description of a variant of a logical document that is stored in a specific format. For example the PDS Standards Reference has HTML and PDF formatted versions.
22	Document_Format_Set	V1.0	pds	The Document Format Set class is a set consisting of a document format and associated files.
23	Element_Array	V1.0	pds	The Element Array class is used as a component of the array class and defines an element of the array.
24	Encoded_Byte_Stream	V1.0	pds	The Encoded Byte Stream class defines byte streams that must be decoded by sofware before use. These byte streams must only use standard encodings. The Encoded Byte Stream class is the parent class for all encoded byte streams.
25	Encoded_Image	V1.0	pds	The Encoded Image class is used for ancillary images in standard formats, such as JPEG.
26	External_Reference	V1.0	pds	The External_Reference class is used to reference a source outside the PDS registry system.
27	Field	V1.0	pds	The Field class defines a field of a record and is the parent class of all specific field classes.
28	Field_Binary	V1.0	pds	The Field_Binary class defines a field of the record.
29	Field_Bit	V1.0	pds	The Field_Bit class provides parameters for extracting one field out of a string of bytes which contains packed data (that is, data values either smaller than a single byte, or crossing byte boundaries, or both.
30	Field_Character	V1.0	pds	The Field_Character class defines a field of the record.
31	Field_Delimited	V1.0	pds	The Field_Delimited class defines a field of the record.
32	Field_Statistics	V1.0	pds	The Field Statistics class provides a set of metrics for a column formed by a field in a repeating record.
33	File	V1.0	pds	The File class consists of attributes that describe a file in a data store.
34	File_Area	V1.0	pds	The File_Area class defines a File and its component data objects.
35	File_Area_Binary	V1.0	ops	The File Area Binary class describes a file that contains an encoded byte stream.
36	File_Area_Checksum_Manifest	V1.0	ops	The File Area Checksum Manifest class describes a file that contains a two column table for file references and checksums.
37	File_Area_Encoded_Image	V1.0	pds	The File Area Encoded Image class describes a file that contains an Encoded Image object.
38	File_Area_Inventory	V1.0	pds	The File Area Inventory class describes a file and an inventory consisting of references to members.
39	File_Area_Observational	V1.0	pds	The File Area Observational class describes, for an observational product, a file and one or more tagged_data_objects contained within the file.
40	File_Area_Observational_Supplemental	V1.0	pds	The File Area Observational Supplemental class describes, for an observational product, additional files and one or more tagged_data_objects contained within the file.

41	File_Area_SPICE_Kernel	V1.0	pds	The File Area SPICE Kernel class describes a file that contains a SPICE Kernel object.
42	File_Area_Text	V1.0	pds	The File Area Text class describes a file that contains a text stream object.
43	File_Area_Transfer_Manifest	V1.0	ops	The File Area Transfer Manifest class describes a file that contains a two column table that maps the logical identifers and version ids of products to their file specification names.
44	File_Area_XML_Schema	V1.0	pds	The File Area XML Schema class describes a file that contains a resource used for the PDS4 implementation into XML.
45	Header	V1.0	pds	The Header class describes a data object header.
46	Identification_Area	V1.0	pds	The identification area consists of attributes that identify and name an object.
47	Internal_Reference	V1.0	pds	The Internal_Reference class is used to cross-reference other products in the PDS registry system.
48	Inventory	V1.0	pds	The Inventory class defines the inventory for members of a collection.
49	Investigation_Area	V1.0	pds	The Investigation_Area class provides information about an investigation (mission, observing campaign or other coordinated, large-scale data collection effort).
50	Mission_Area	V1.0	pds	The mission area allows the insertion of mission specific metadata.
51	Modification_Detail	V1.0	pds	The Modification_Detail class provides the details of one round of modification for the product. The first, required, instance of this class documents the date the product was first registered.
52	Modification_History	V1.0	pds	The Modification_History class tracks the history of changes made to the product once it enters the registry system.
53	Object_Statistics	V1.0	pds	The Object Statistics class provides a set of values that provide metrics about the object.
54	Observation_Area	V1.0	pds	The observation area consists of attributes that provide information about the circumstances under which the data were collected.
55	Observing_System	V1.0	pds	The Observing System class describes the entire suite used to collect the data.
56	Observing_System_Component	V1.0	pds	The Observing System Component class references one or more subsystems used to collect data. A subsystem can be an instrument_host, instrument, or any other similar product. Each subsystem is categorized as either a sensor or a source. If the observing system includes both a sensor and a source, Observing System Component occurs twice (once for each type) otherwise it only occurs once.
57	Packed_Data_Fields	V1.0	pds	The Packed_Data_Fields class contains field definitions for extracting packed data from the associated byte string field.
58	Parsable_Byte_Stream	V1.0	pds	The Parsable Byte Stream class defines byte streams that have standard parsing rules. The Parsable Byte Stream class is the parent class for all parsable byte streams.
59	Primary_Result_Summary	V1.0	pds	The Primary_Result_Summary class provides a high-level description of the types of products included in the collection or bundle
60	Product	V1.0	pds	A Product is a uniquely identified object that is managed by a registry/repository. It consists of one or more tagged data objects.

61	Product_Bundle	V1.0	pds	A Product_Bundle is an aggregate product and has a table of references to one or more collections.
62	Product_Collection	V1.0	pds	A Product_Collection has a table of references to one or more basic products. The references are stored in a table called the inventory.
63	Product_Document	V1.0	pds	A Product Document is a product consisting of a single logical document that may be comprised of one or more document formats.
64	Product_File_Text	V1.0	pds	The Product File Text consists of a single text file with ASCII character encoding.
65	Product_Observational	V1.0	pds	A Product_Observational is a set of one or more information objects produced by an observing system.
66	Product_SPICE_Kernel	V1.0	pds	The Product SPICE Kernel class defines a SPICE kernel product.
67	Product_XML_Schema	V1.0	pds	The Product_XML_Schema describes a resource used for the PDS4 implementation into XML.
68	Record	V1.0	pds	The Record class defines a record of a file and is the parent class of all specific record classes.
69	Record_Binary	V1.0	pds	The Record_Binary class is a component of the table class and defines a record of the table.
70	Record_Character	V1.0	pds	The Record_Character class is a component of the table class and defines a record of the table.
71	Record_Delimited	V1.0	pds	The Record_Delimited class is a component of the delimited table (spreadsheet) class and defines a record of the delimited table.
72	Reference_List	V1.0	pds	The Reference_List class provides lists general references and cross-references for the product. References cited elsewhere in the label need not be repeated here.
73	Special_Constants	V1.0	pds	The Special Constants class provides a set of values used to indicate special cases that occur in the data.
74	SPICE_Kernel	V1.0	pds	The SPICE Kernel class describes a SPICE object.
75	Stream_Text	V1.0	pds	The Stream text class defines a text object.
76	Table_Base	V1.0	pds	The Table Base class defines a heterogeneous repeating record of scalars. The Table Base class is the parent class for all heterogeneous repeating record of scalars.
77	Table_Binary	V1.0	pds	The Table Binary class is an extension of table base and defines a simple binary table.
78	Table_Character	V1.0	pds	The Table Character class is an extension of table base and defines a simple character table.
79	Table_Delimited	V1.0	pds	The Table_Delimited class defines a simple table (spreadsheet) with delimited fields and records.
80	Target_Identification	V1.0	pds	The Target_Identification class provides detailed target identification information.

81	Time_Coordinates	V1.0	pds	The Time_Coordinates class provides a list of time coordinates.
82	Uniformly_Sampled	V1.0	pds	The Uniformly_Sampled class provdes parameters for a uniformly sampled table.
83	Vector	V1.0	pds	The Vector class provides the components of either a velocity or position vector.
84	Vector_Cartesian_3	V1.0	pds	The Vector_Cartesian_3_Base class is the parent class of 3 element cartesian vectors.
85	Vector_Cartesian_3_Acceleration	V1.0	pds	The Vector_Cartesian_3_Acceleration class is a 3 element cartesian vector for acceleration coordinates.
86	Vector_Cartesian_3_Pointing	V1.0	pds	The Vector_Cartesian_3_Pointing class is a 3 element normalized cartesian vector for pointing.
87	Vector_Cartesian_3_Position	V1.0	pds	The Vector_Cartesian_3_Position class is a 3 element cartesian vector for position coordinates.
88	Vector_Cartesian_3_Velocity	V1.0	pds	The Vector_Cartesian_3_Velocity class is a 3 element cartesian vector for velocity coordinates.
89	Vector_Component	V1.0	pds	The Vector_Component class provides a component of a vector.
90	XML_Schema	V1.0	pds	The XML Schema class defines a resource used for the PDS4 implementation into XML.
91	Agency	Internal	pds	The Agency class provides a description of an entity that provides regional or national level governance over nodes within the federated Planetary Data System.
92	Data_Set_PDS3	Internal	ops	The Data Set PDS3 class is used to capture the data set information from the PDS3 Data Set Catalog.
93	DD_Association	Internal	ops	The DD_Association class defines the association between two classes or a class and an attribute in a data dictionary.
94	DD_Association_External	Internal	ops	The DD_Association_External class defines the association between classes and attributes within the local data dictionary and those external to the local data dictionary.
95	DD_Attribute	Internal	ops	The DD_Attribute class defines an attribute for a data dictionary.
96	DD_Attribute_Full	Internal	ops	The DD_Attribute_Full class provides a more complete definition of an attribute in the data dictioonary.
97	DD_Class	Internal	ops	The DD_Class class defines a class for a data dictionary.
98	DD_Class_Full	Internal	ops	The DD_Class_Full class provides a more complete definition of a class for a data dictionary.
99	DD_Permissible_Value	Internal	ops	The DD_Permissible_Value class lists permissible values and their meanings.
100	DD_Permissible_Value_Full	Internal	ops	The DD_Permissible_Value_Full class lists permissible values, their meanings, and the dates when active.

101	DD_Value_Domain	Internal	ops	The DD_Value_Domain class defines an attribute's permissible values and their constraints.
102	DD_Value_Domain_Full	Internal	ops	The DD_Value_Domain_Full class provides a more complete definition of a attribute's value domain.
103	External_Reference_Extended	Internal	ops	The External_Reference_Extended class is used to reference a source outside the PDS registry system. This extension is used in the local data dictionary.
104	Facility	Internal	pds	The Facility class provides a name and address for a terrestrial observatory or laboratory.
105	File_Area_Service_Description	Internal	ops	The File Area Service Description class describes a file that contains a service description.
106	Ingest_LDD	Internal	ops	The Ingest_LDD class provides a form for collecting class and attribute definitions.
107	Instrument	Internal	pds	The Instrument class provides a description of a phyiscal object that collects data.
108	Instrument_Host	Internal	pds	The Instrument Host class provides a description of the phyiscal object upon which an instrument is mounted.
109	Instrument_Host_PDS3	Internal	ops	The Instrument Host class provides a description of the phyiscal object upon which an instrument is mounted. This class captures the PDS3 catalog Instrument Host information.
110	Instrument_PDS3	Internal	ops	The Instrument class provides a description of a phyiscal object that collects data. This class captures the PDS3 catalog Instrument information.
111	Investigation	Internal	pds	The Investigation class provides a description of activities involved in the collection of data.
112	Mission_PDS3	Internal	ops	The Mission PDS3 class describes an activity involved in the collection of data. This class captures the PDS3 catalog Mission information.
113	Node	Internal	pds	The Node class provides a description of an entity that provides local governance within the federated Planetary Data System.
114	Other	Internal	pds	The Other class provides a description of activities involved in the collection of data which are not otherwise modeled.
115	PDS_Affiliate	Internal	pds	The PDS Affiliate class provides a description of a person who has an association with the planetary science community and has access to PDS resources not normally allowed to the general public.
116	PDS_Guest	Internal	pds	The PDS_Guest class is the default description of a person who has an association with the planetary science community and who has the most limited access to PDS resources.
117	Product_Attribute_Definition	Internal	ops	The Product Attribute Definition provides an attribute definition in XML encoding.
118	Product_Class_Definition	Internal	ops	The Product Class Definition provides a class definition in XML encoding.
119	Product_Context	Internal	pds	The Product Context class describes something that provides context and provenance for an observational product.
120	Product_Data_Set_PDS3	Internal	ops	The Data Set PDS3 product is used to create proxy labels for the data sets in the PDS3 Data Set catalog.

121	Product_Instrument_Host_PDS3	Internal	ops	An Instrument Host product describes an instrument host. This product captures the PDS3 catalog instrument host information.
122	Product_Instrument_PDS3	Internal	ops	An Instrument product describes an instrument. This product captures the PDS3 catalog instrument information.
123	Product_Mission_PDS3	Internal	ops	An Mission product describes a mission. This product captures the PDS3 catalog mission information.
124	Product_Proxy_PDS3	Internal	ops	The Product Proxy PDS class defines a product with enough information to to register a PDS3 data product.
125	Product_Subscription_PDS3	Internal	ops	The Product_Subscription_PDS3 class provides the list of subscriptions for a PDS3 subscriber.
126	Product_Target_PDS3	Internal	ops	A target product describes a target. This product captures a reduced set of the PDS3 catalog target information.
127	Product_Volume_PDS3	Internal	ops	A Product Volume PDS3 product captures the PDS3 volume information.
128	Product_Volume_Set_PDS3	Internal	ops	A Product Volume Set PDS3 product captures the PDS3 volume set information.
129	Resource	Internal	pds	The Resource class provides a description of a web resource.
130	Subscriber_PDS3	Internal	ops	The Subscriber PDS3 class provides the name of the subscriber and their subscription list.
131	Target	Internal	pds	The Target class provides a description of a phyiscal object that is the object of data collection.
132	Target_PDS3	Internal	ops	The Target class provides a description of a phyiscal object that is the object of data collection. This class captures the PDS3 catalog Target information.
133	Telescope	Internal	pds	The Telescope class provides coordinates and parameters for terrestrial, ground-based telescopes.
134	Volume_PDS3	Internal	ops	The Volume_PDS3 class is used to capture the volume information from the PDS3 Data Set Catalog.
135	Volume_Set_PDS3	Internal	ops	The Volume_Set_PDS3 class is used to capture the volume set information from the PDS3 Data Set Catalog.
136	Array_3D_Image	V1.1	pds	The Array 3D Image class is an extension of the Array 3D class and defines a three dimensional image.
137	File_Area_Browse	V1.1	pds	The File Area Browse class describes a file and one or more tagged_data_objects contained within the file.
138	Group	V1.1	pds	The Group class defines a group of fields and is the parent class of all specific group classes.
139	Group_Field_Binary	V1.1	pds	The Group_Field_Binary class allows a group of table fields.
140	Group_Field_Character	V1.1	pds	The Group_Field_Character class allows a group of table fields.

141	Group_Field_Delimited	V1.1	pds	The Field_Group_Delimited class allows a group of delimited fields.
142	Product_Browse	V1.1	pds	The Product Browse class defines a product consisting of one encoded byte stream digital object.
143	Product_DIP_Deep_Archive	V1.1	ops	The Product DIP_Deep_Archive class defines a product for the Dissemination Information Package for the deep archive.
144	Product_SIP	V1.1	ops	The Product SIP class defines a product for the Submission Information Package.
145	Product_Thumbnail	V1.1	pds	The Product Thumbnail class defines a product consisting of one encoded byte stream digital object.
146	Alias	V0.3b	pds	The Alias class provides a single alternate name and identification for this product in this or some other archive or data system.
147	Alias_List	V0.3b	pds	The Alias_List class provides a list of paired alternate names and identifications for this product in this or some other archive or data system.
148	Archival_Information_Package	V0.3b	ops	The Archival Information Package (AIP) class defines an Information Package consisting of the Content Information and the associated Preservation Description Information (PDI), which is preserved within an archive that conforms to the Open Archive Information System (OAIS) Reference Model.
149	Array_3D_Movie	V0.3b	pds	The Array 3D Movie class is an extension of the Array 3D class and defines a movie as a set of two dimensional images in a time series.
150	Cartography	V0.3b	img	The Cartography class is a placeholder for soon forthcoming Imaging cartography classes.
151	Checksum_Manifest	V0.3b	ops	The Checksum_Manifest class defines a two column table for file references and checksums. The table structure is compatible with the output from an MD5 checksum utility.
152	DIP_Deep_Archive	V0.3b	ops	The Dissemination Information Package Deep Archive class is an Information Package derived from one or more AIPs and is received by the National Space Science Data Center (NSSDC).
153	Dissemination_Information_Package	V0.3b	ops	The Dissemination Information Package (DIP) class defines an Information Package, derived from one or more AIPs, that is received by a consummer.
154	Encoded_Binary	V0.3b	pds	The Encoded Binary class describes a binary encoded byte stream.This class is used to describe files in the repository that are being registered using Product_File_Repository.
155	Encoded_Header	V0.3b	pds	The Encoded Header class describes a header that has been encoded using an encoding scheme that is compliant to an external standard.
156	Geometry	V0.3b	pds	The Geometry class groups geometry information.
157	Information_Package	V0.3b	ops	The Information Package class defines the Information Package as described in the OAIS Reference Model and is the parent class of all specific IP classes.
158	Information_Package_Component	V0.3b	ops	The Information_Package_Component class associates a Bundle, Collections or Basic Products with Checksum and Storage Manifests.
159	NSSDC	V0.3b	ops	The NSSDC Information class provides identification information for data submitted to the NSSDC.
160	Product_AIP	V0.3b	ops	The Product AIP class defines a product for the Archival Information Package.

161	Product_DIP	V0.3b	ops	The Product DIP class defines a product for the Dissemination Information Package.
162	Product_File_Repository	V0.3b	ops	The Product File Repository class consists of a single text file. This product is used to register a file in a repository.
163	Product_Service	V0.3b	ops	The Product Service class defines a product for registering services. Service descriptions from this product are used to register services as intrinsic registry objects.
164	Product_Software	V0.3b	ops	Product Software is a product consisting of a set of one or more software formats.
165	Product_Update	V0.3b	pds	The Product Update class defines a product consisting of update information and optional references to other products.
166	Product_Zipped	V0.3b	ops	The Product_Zipped is a product with references to other products. The referenced products and all associated products and files are packaged into a single ZIP file.
167	Quaternion	V0.3b	pds	The Quaternion class models a mathematical construct that consists of four individual numeric components. Quaternions are a convenient mechanism for encapsulating orientation information since they require only four units of numeric storage, as opposed to the nine needed for a rotation matrix.
168	Quaternion_Component	V0.3b	pds	The Quaternion_Component class provides a component of a quaternion.
169	Service_Description	V0.3b	ops	The Service Description class defines a file that contains a standardized service specification.
170	Software	V0.3b	ops	The Software class describes a software product
171	Software_Binary	V0.3b	ops	The Software Script class provides a description of a software code that is stored as a compiled binary file.
172	Software_Script	V0.3b	ops	The Software Script class provides a description of a software code that is stored as a script.
173	Software_Source	V0.3b	ops	The Software Script class provides a description of a software code that is stored as source code.
174	Submission_Information_Package	V0.3b	ops	The Submission Information Package (SIP) class is an Information Package that is delivered by a Data Provider to an archive that conforms to the Open Archive Information System (OAIS) Reference Model for use in the construction of one or more AIPs.
175	Telemetry_Parameters	V0.3b	img	The Telemetry_Parameters class contains downlink-related attributes used primarily during mission operations.
176	Terminological_Entry	V0.3b	ops	The terminological_entry class provides the name (designation) and definition of the attribute in a specified natural language.
177	Transfer_Manifest	V0.3b	ops	The Transfer_Manifest class defines a table that maps product LIDVIDs to the file_specificaition_names of the products' XML label files.
178	Update	V0.3b	pds	The Update class consists of update information.
179	Update_Entry	V0.3b	pds	The Update Entry class provides the date and description of an update.
180	Zip	V0.3b	pds	The Zip class describes a zip file.

Appendix B – Other Resources for Core Services / Tools

The PDS is continuing to maintain a list of the desired tools and services in an offline matrix. The PDS4 Integrated Tool List [7] is available from the EN web site and will continue to be discussed at the March PDS MC meeting to plan future releases.

The Release Description Document (RDD) [8] for the Build 3a release, details the total suite of PDS4 software released to date.

Appendix C – References

[1] http://pds.nasa.gov/pds4
[2]http://pds-engineering.jpl.nasa.gov/pds2010/design/system_design/pds_2010_preparation_design.pdf
[3]http://pds-engineering.jpl.nasa.gov/pds2010/design/system_design/pds_2010_registry_design.pdf
[4]http://pds-engineering.jpl.nasa.gov/pds2010/design/system_design/pds_2010_harvest_design.pdf
[5] http://pds-engineering.jpl.nasa.gov/pds2010/design/system_design/pds_2010_search_design.pdf
[6] http://pds-engineering.jpl.nasa.gov/pds2010/Format_Transformations.pdf
[7] http://pds-engineering.jpl.nasa.gov/pds2010/Tool_List.pdf
[8] http://pds-engineering.jpl.nasa.gov/pds2010/development/3.0.0/release/index-3.0.0.html
[9] http://pds-engineering.jpl.nasa.gov/index.cfm?pid=145

Appendix D – Revision History

01/14/2013: Initial version.

- Node comments posted at the EN web site [9].

02/08/2013: Key updates, based on comments,are as follows:

- Restructured document to include purpose, scope, and other overview information.
- Scoped release to focus on PDS4 data provider support.
- Added Array 3D Spectrum as part of V1.0.
- Separated critical software from non-critical software to support data provider scope.
- Updated software tool descriptions.