

## Requirements Mapping from PDS3 to PDS4

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PDS Requirement	PDS3 Applicability / Implementation	PDS4 Applicability / Implementation
<b>1. PDS will provide expertise to guide and assist missions, programs, and individuals to organize and document digital data supporting NASA's goals in planetary science and solar system exploration.</b>		
1.1 Single Point of Contact: PDS will provide a single point of contact to each mission, program, agency, or individual ( <i>i.e.</i> , data providers) wishing to submit archival data		
1.1.1 PDS will assign a lead node for each data provider submitting data to PDS	PDS assigns a lead node in accordance with the guidelines outlined in the PDS Archive Preparation Guide (APG).	No change anticipated.
1.1.2 PDS will assign a lead individual, designated by the lead node, who is authorized to negotiate for PDS	The lead node assigns a lead individual who has authority to negotiate for PDS.	No change anticipated.
1.1.3 The PDS lead node will delegate responsibility for subordinate contacts ( <i>e.g.</i> , instrument teams within a mission) to the appropriate PDS nodes	The lead node delegates responsibility for subordinate contacts to the appropriate PDS nodes.	No change anticipated.
<b>1.2 Expert Help: PDS will provide expert help in designing archival data sets</b>		
1.2.1 PDS will provide examples and suggestions on organization of data products, metadata, documentation and software	PDS provides examples and suggestions on the organization of data products, metadata, documentation, and software.	Under PDS4, PDS will continue to provide examples and suggestions on the organization of data products, metadata, documentation, and software using PDS4 data standards.
1.2.2 PDS will provide expertise in applying PDS standards	PDS provides expertise, in the form of tools and a help desk, in applying PDS standards.	No change anticipated.
1.2.3 PDS will provide expertise to support the design of scientifically useful archival data sets	PDS provides expertise, in the form of tools and a help desk, to support the design of scientifically useful archival data sets.	No change anticipated.
1.2.4 PDS will provide training to support the design of archival data sets for data providers on: PDS standards, tools and services	PDS provides training, in the form of documentation and a help desk, to support the design of archival data sets for data providers on: PDS standards, tools, and services.	No change anticipated.
1.2.5 PDS will provide training to develop and maintain staff expertise in data engineering, standards and tools	PDS provides training, in the form of documentation and a help desk, to develop and maintain staff expertise in data engineering, standards, and tools.	No change anticipated.

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1.3 Plans and Documents: PDS will assist data providers in developing archive plans, interface documents, validation procedures, and delivery schedules for PDS approval		
1.3.1 PDS will provide examples of data management and archive plans (including interface documents, procedures, schedules and templates)	PDS provides examples, in the form of online documentation, of data management and archive plans (including interface documents, procedures, schedules, and templates).	Under PDS4, PDS intends to have a more comprehensive set of examples, in the form of online documentation, of data management and archive plans (including interface documents, procedures, schedules, and templates).
1.3.2 PDS will determine whether data management and archive plans and relevant interface documents meet PDS requirements	PDS makes the determination as to whether the data management and archive plans and relevant documents meet PDS requirements.	No change anticipated.
1.3.3 PDS will provide criteria for validating archival products	PDS provides criteria, in the form of PDS standards and examples, for validating archival products.	Under PDS4, PDS will update its criteria based on PDS4 standards.
1.3.4 PDS will coordinate with the data providers to establish schedules for delivery of archival products to the PDS	PDS coordinates with data providers to establish schedules for delivery of archival products to the PDS.	Under PDS4, PDS intends on utilizing tracking capabilities of the new system to coordinate with data providers to establish schedules for delivery of archival products to the PDS.
1.3.5 PDS will coordinate with data providers to establish schedules for public release of archival products	PDS coordinates with data providers to establish schedules, in the form of a Data Management Plan, for public release of archival products.	Under PDS4, PDS intends on utilizing tracking capabilities of the new system to coordinate with data providers to establish schedules, in the form of a Data Management Plan, for public release of archival products.
1.4 Archiving Standards: PDS will have archiving standards for planetary science data		
1.4.1 PDS will define a standard for organizing, formatting, and documenting planetary science data	PDS defines standards for organizing, formatting, and documenting planetary science data.	Under PDS4, PDS intends on having a more robust and comprehensive set of standards for organizing, formatting, and documenting planetary science data.
1.4.2 PDS will maintain a dictionary of terms, values, and relationships for standardized description of planetary science data	PDS Data Dictionary, which is stored in a Sybase relational database, is accessible via a web page and is exported as a tool dictionary.	PDS4 Data Dictionary will be stored in the PDS4 Information Model and will export the content in a format usable by the Dictionary service and the PDS4 tools.
1.4.3 PDS will define a standard grammar for describing planetary science data	PDS Standards Reference defines the ODL grammar / syntax for labeling PDS products.	PDS4 Information Model, with supplementary information provided in the PDS4 Standards, will define the XML grammar / syntax for labeling PDS products.
1.4.4 PDS will establish minimum content requirements for a data set (primary and ancillary data)	PDS Standards Reference defines the minimum content requirements for an archival quality volume and data set.	PDS4 Information Model, with supplementary information provided in the PDS4 Standards, will define the minimum content requirements for both an archival quality data set
1.4.5 PDS will, for each mission or other major data provider, produce a list of the minimum components required for archival data	PDS "Data Management Archiving Plan (DMAP)", an agreement between each instrument team, mission, and PDS, defines writing documentation, generation of PDS labels, definition and production of ancillary files, product delivery, and archive assembly.	No change anticipated.

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1.4.6 PDS will develop, publish and implement a process for managing changes to the archive standards	PDS manages changes to the PDS Standards in accordance with the "Standards Change Request" process document as written by R.Simpson.	No change anticipated.
1.4.7 PDS will keep abreast of new developments in archiving standards	PDS appointed a working group that is responsible for staying abreast of new developments in archiving standards.	No change anticipated.
<b>1.5 Archiving Tools: PDS will have tools to assist data producers in assembling, validating, and submitting archival products</b>		
1.5.1 PDS will provide tools to assist data producers in generating PDS compliant products	As part of the PDS3 tool suite, PDS has tools that assist data producers in generating PDS compliant products.	PDS intends on having a more robust and comprehensive PDS4 tool suite that will assist data producers in generating PDS compliant products.
1.5.2 PDS will provide tools to assist data producers in validating products against PDS standards	As part of the PDS3 tool suite, PDS has tools that assist data producers in validating products against PDS standards.	PDS intends on having a more robust and comprehensive PDS4 tool suite that will assist data producers in validating products against PDS standards.
1.5.3 PDS will provide tools to assist data producers in submitting products to the PDS archive	As part of the PDS3 tool suite, PDS has tools that assist data producers in submitting products to the PDS archive.	PDS intends on having a more robust and comprehensive PDS4 tool suite that will assist the data producers in submitting products to the PDS archive.
1.5.4 PDS will provide documentation for installing, using, and interfacing with each tool	As part of the PDS3 tool suite, PDS provides documentation for installing, using, and interfacing with each tool.	As part of the PDS4 tool suite, PDS will have documentation for installing, using, and interfacing with each tool.
<b>2. PDS will collect suitably organized and well-documented data into archives that are peer reviewed and maintained by members of the scientific community.</b>		
2.1 Solicit: PDS will seek complete and comprehensive archives from data providers consistent with interests and resources available.		
2.1.1 PDS will compare proposed archival submissions against nominal content standards for similar archives and will seek augmentations when the submission is deficient	PDS Standards Reference defines the minimum content requirements for an archival quality volume and data set.	Under PDS4, PDS intends on having a more robust and comprehensive set of standards for defining the minimum content requirements for an archival quality volume and data set.
2.1.2 PDS will identify and maintain a list of proposed planetary science data sets to be added to the archive	PDS works closely with the missions to identify science data set to be added to the PDS archive.	No change anticipated.
2.1.3 PDS will work with relevant NASA program officials to ensure that products resulting from data analysis programs are submitted to the Archive	PDS works closely with NASA to ensure that products resulting from data analysis programs are submitted to the PDS Archive.	No change anticipated.
2.1.4 PDS will provide a mechanism for the planetary science community to propose new additions to the archive	PDS has processes which defines the mechanisms by which the planetary science community proposes additions to the PDS archive.	No change anticipated.
<b>2.2 Receive: PDS will receive, acknowledge and track data submissions.</b>		

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2.2.1 PDS will develop and publish the procedures for delivery of data to the PDS	PDS Standards Reference in combination with the PDS3 Archive Preparation Guide (APG) defines procedures for delivery of data submissions to the PDS.	Under PDS4, PDS intends on having a more robust and comprehensive set of standards and a PDS4 APG that collectively will define procedures for delivery of data submissions to the PDS.
2.2.2 PDS will track the status of data deliveries from data providers through the PDS to the deep archive	PDS tracks the status of data deliveries at each Node responsible for the data deliveries.	Under PDS4, PDS will have tracking capabilities that will allow users to track data submissions throughout the archive lifecycle.
2.2.3 PDS will provide the necessary resources for accepting data deliveries	PDS provides and maintains the necessary resources required for accepting data deliveries.	No change anticipated.
2.3 Validation: PDS will validate data submissions to ensure compliance with standards.		
2.3.1 PDS will develop and publish procedures for determining syntactic and semantic compliance with its standards	PDS Standards Reference defines the grammar rules which govern both the syntactic and semantic compliance.	Under PDS4, PDS intends on having a more robust and comprehensive set of standards that defines the grammar rules which govern both the syntactic and semantic compliance.
2.3.2 PDS will implement procedures to validate all data submissions to ensure compliance with standards	PDS Standards Reference in with the PDS Archive Preparation Guide (APG) define procedures that describe the validation process of data submissions.	Under PDS4, PDS intends on having a more robust and comprehensive set of standards and a PDS4 APG that collectively will define procedures that describe the validation process of data submissions.
2.4 Peer Review: PDS will conduct peer reviews of all data submissions to ensure completeness, accuracy, and scientific usability of content.		
2.4.1 PDS will develop and publish procedures for peer review of archival products (which includes all data submissions and ancillary information)	PDS Archive Preparation Guide (APG) defines the Peer-review process for the archival of data submissions.	Under PDS4, PDS intends on having a more comprehensive APG that more thoroughly defines the Peer-review process for the archival of data submissions.
2.4.2 PDS will establish success criteria for peer review of archival products	PDS Archive Preparation Guide (APG) defines the Peer-review process; including success and failure criteria, for the archival of data submissions.	Under PDS4, PDS intends on having a more comprehensive APG that more thoroughly defines the Peer-review process; including success and failure criteria, for the archival of data submissions.
2.4.3 PDS will implement peer reviews, coordinated and conducted by the lead node, to ensure completeness, accuracy and scientific usability of content	PDS Archive Preparation Guide (APG) defines the Peer-review process for the archival of data submissions.	Under PDS4, PDS intends on having a more comprehensive APG that more thoroughly defines the Peer-review process for the archival of data submissions.
2.4.4 PDS will publish a summary of the results of each peer review	PDS Archive Preparation Guide (APG) defines the Peer-review process; including how to publish a summary of results, for the archival of data submissions.	Under PDS4, PDS intends on having a more comprehensive APG that more thoroughly defines the Peer-review process; including how to publish a summary of results, for the archival of data submissions.
2.4.5 PDS will track the status of each peer review	PDS Archive Preparation Guide (APG) defines the Peer-review process, including how to track the peer-review status, for the archival of data submissions.	Under PDS4, PDS intends on having a more comprehensive APG that more thoroughly defines the Peer-review process, including how to track the peer-review status, for the archival of data submissions.
2.5 Acceptance: PDS will accept or reject submitted data.		

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2.5.1 PDS will develop and publish procedures for accepting archival data	PDS Archive Preparation Guide (APG) defines the Peer-review process; including success and failure criteria, for the archival of data submissions.	Under PDS4, PDS intends on having a more comprehensive APG that more thoroughly defines the Peer-review process; including success and failure criteria, for the archival of data submissions.
2.5.2 PDS will implement procedures for accepting archival data	PDS Archive Preparation Guide (APG) defines the Peer-review process; including the procedures for accepting archival quality data submissions.	Under PDS4, PDS intends on having a more comprehensive APG that more thoroughly defines the Peer-review process; including the procedures for accepting archival quality data submissions.
2.5.3 PDS will inform a data provider why a rejected archival product does not meet archiving standards	PDS Archive Preparation Guide (APG) defines the Peer-review process; including success and failure criteria, for the archival of data submissions.	Under PDS4, PDS intends on having a more comprehensive APG that more thoroughly defines the Peer-review process; including success and failure criteria, for the archival of data submissions.
2.6 Catalog: PDS will maintain a catalog of accepted archival data sets.		
2.6.1 PDS will develop and publish procedures for cataloging archival data	PDS Standards Reference in combination with the PDS Archive Preparation Guide (APG) defines procedures that describe the publication process of data submissions.	Under PDS4, PDS intends on having a more robust and comprehensive set of standards and a PDS4 APG that collectively will define procedures that describe the publication process of data submissions.
2.6.2 PDS will design and implement a catalog system for managing information about the holdings of the PDS	PDS maintains a distributed catalog of archival quality data sets.	No change anticipated.
2.6.3 PDS will integrate the catalog with the system for tracking data throughout the PDS	PDS loosely integrates the catalog with the system for tracking the status of data deliveries at each Node responsible for the data deliveries.	Under PDS4, PDS intends on tightly integrating the catalog with the system for tracking the status of data deliveries at each Node responsible for the data deliveries.
2.7 Storage: PDS will develop and maintain appropriate storage for its archive.		
2.7.1 PDS will develop and publish procedures for storing archival data	PDS Standards Reference in combination with the PDS Archive Preparation Guide (APG) defines procedures that describe the process for storing archival data.	Under PDS4, PDS intends on having a more robust and comprehensive set of standards and a PDS4 APG that collectively will define procedures that describe the process for storing archival data.
2.7.2 PDS will maintain appropriate storage for the PDS archive	PDS has defined and maintains a "PDS Policy on Data Delivery and Backup" policy for ensuring PDS maintains adequate storage for its archive.	No change anticipated.
2.7.3 PDS will review its storage capacity and its anticipated storage requirements on a yearly basis	PDS reviews its storage capacity annually.	No change anticipated.
2.7.4 PDS will maintain appropriate storage for non-archived data managed by the PDS	PDS has defined and maintains a "PDS Policy on Data Delivery and Backup" policy for ensuring PDS maintains adequate storage for the non-archived data.	No change anticipated.
2.8 Architecture: PDS will maintain a distributed architecture based on scientific Expertise		
2.8.1 PDS will maintain a distributed archive where holdings are maintained by Discipline Nodes, specializing in subsets of planetary science	PDS maintains a distributed archive where archival holdings are held by Discipline Nodes that are specialized in planetary science disciplines.	No change anticipated.

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2.8.2 PDS will maintain a distributed catalog system which describes the holdings of the archive	PDS maintains a distributed catalog of archival quality data sets.	Under PDS4, PDS will maintain a federated system of registries allowing for registration at the product level.
2.8.3 PDS will provide standard protocols for accessing data, metadata and computing resources across the distributed archive	PDS-D provides REST-based protocols for accessing data and metadata	Under PDS4, PDS will be expanded to provide access to data and services using common REST protocols.
2.8.4 PDS will work with other space agencies to provide interoperability among planetary science archives	PDS participates in the International Planetary Data Alliance	Under PDS4, PDS will ensure its distributed architecture is interoperable with the IPDA
2.9 External Controls: PDS will adhere to applicable federal statutes, NASA policies and Memoranda of Understanding with other organizations.		
2.9.1 PDS will accept and distribute only those items which are not restricted by the International Traffic in Arms Regulations (ITAR)	PDS works closely with ITAR to ensure that PDS only distributes ITAR compliant data.	No change anticipated.
2.9.2 PDS will ensure that online interfaces comply with required NASA Guidelines	PDS works closely with NASA to ensure that all online interfaces comply with NASA guidelines.	No change anticipated.
2.9.3 PDS will meet U.S. federal regulations for the preservation and management of data.	PDS works closely with NASA to ensure PDS meets U.S. federal regulations for the preservation and management of data.	No change anticipated.
2.9.4 PDS will fulfill obligations detailed in any applicable NASA Memorandum of Understanding (MOU)	PDS works closely with NASA to ensure that PDS fulfills obligations detailed in any applicable NASA Memorandum of Understanding (MOU).	No change anticipated.
2.10 System Development and Operations: PDS will follow best practices in system and software engineering for developing and operating the system		
2.10.1 PDS will monitor the system and ensure continuous operation	PDS provides basic monitoring of servers	Under PDS4, the monitoring services will be extended to ensure reliability for PDS-wide services.
2.10.2 PDS will follow best practices in system and software engineering for the development and operations of the PDS.	PDS follows industry standard best practices in both system and software engineering.	Under PDS4, PDS will move towards a model-driven architecture for software and data standards development.
<b>3. PDS will make these data accessible to users seeking to achieve NASA's goals for exploration and science.</b>		
3.1 Search: PDS will allow and support searches of its archival holdings		
3.1.1 PDS will develop and maintain online interfaces allowing users to search the archive	As part of the PDS3, there are search mechanisms that allow users to search the PDS archive for data submissions.	Under PDS4, PDS will enhance its distribution system to allow for greater interoperability across PDS.
3.1.2 PDS will develop and maintain online interfaces for discipline-specific searching	As part of the PDS3, discipline nodes provide discipline-specific search interfaces	Under PDS4, discipline nodes will continue to provide discipline-specific search interfaces but they will be built on the PDS4 search infrastructure.

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3.1.3 PDS will allow products identified within a search to be selected for Retrieval	As part of the PDS3, there are mechanisms that allow users to search the PDS archive for data submissions and subsequently retrieve / save the data locally.	Under PDS4, PDS will allow users to subsequently retrieve / save the data locally from across the PDS archive.
3.2 Retrieval: PDS will facilitate transfers of its data to users		
3.2.1 PDS will develop and maintain online mechanisms allowing users to download portions of the archive	As part of the PDS3 portal, there are search mechanisms that allow users to search the PDS archive for data submissions and subsequently retrieve / save the data locally.	Under PDS4, PDS intends on having a more comprehensive and user friendly portal that allow users to search the PDS archive for data submissions and subsequently retrieve / save the data locally.
3.2.2 PDS will develop and maintain a mechanism for offline delivery of portions of the archive to users	PDS has a PDS Operator who is responsible for the offline delivery of PDS data to users.	No change anticipated.
3.2.3 PDS will provide mechanisms to ensure that data have been transferred intact	PDS has defined and maintains a policy for ensuring long term preservation of the archive: " <a href="#">PDS Policy on Checksums in Data Deliveries (2008-04-04)</a> "	No change anticipated.
3.3 Services: PDS will provide value added services to aid in using archive products.		
3.3.1 PDS will provide expert help in use of data from the archive	PDS maintains a help desk for the purpose of providing expert assistance in the use of data holdings within the PDS.	No change anticipated.
3.3.2 PDS will provide a capability for opening and inspecting the contents (e.g. label, objects, groups) of any PDS compliant archival product	PDS has tools that assist data producers in visualizing / inspecting products.	Under PDS4, PDS will provide a PDS4 tool suite that will assist data producers in visualizing / inspecting products.
3.3.3 PDS will provide tools for translating archival products between selected formats	PDS provides and maintains a minimal suite of tools for translating archival products between a select set of formats.	Under PDS4, PDS will provide tools and services that allow users to translate between selected products as part of the distribution system.
3.3.4 PDS will provide tools for translating archival products between selected coordinate systems	PDS provides and maintains a suite of tools for translating archival products between a select set of coordinate systems.	Under PDS4, PDS will provide a PDS4 services that allow users to translate between selected coordinates as part of the distribution system.
3.3.5 PDS will provide tools for visualizing selected archival products	PDS has tools that assist data producers in visualizing / inspecting products.	Under PDS4, PDS will provide a PDS4 tool suite that will assist data producers in visualizing / inspecting products.
3.3.6 PDS will develop and maintain a mechanism for notifying subscribed users when a data set is released or updated	PDS has a Subscription / Notification tool that notifies subscribers when data is released.	Under PDS4, the Subscription service will generate notifications by monitoring the federated system of registries allowing for finer detailed subscriptions.
3.3.7 PDS will solicit input from the user community on services desired	As part of the PDS3 portal, there is a link that allows users to submit suggestions on services desired.	No change anticipated.
<b>4. PDS will ensure the long-term preservation of the data and maintain their usability.</b>		
4.1 Long-Term Preservation: PDS will determine requirements for and ensure long term preservation of the data		

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4.1.1 PDS will define and maintain a set of quality, quantity, and continuity (QQC) requirements for ensuring long term preservation of the archive	PDS has defined and maintains a policy for ensuring long term preservation of the archive: " <a href="#">PDS Policy on Checksums in Data Deliveries (2008-04-04)</a> "	No change anticipated.
4.1.2 PDS will develop and implement procedures for periodically ensuring the integrity of the data	PDS has developed and implemented procedures for periodically ensuring the integrity of the data: " <a href="#">PDS Policy on Data Integrity Checking (2008-08-29)</a> "	No change anticipated.
4.1.3 PDS will develop and implement procedures for periodically refreshing the data by updating the underlying storage technology:	PDS has developed and implemented procedures for periodically refreshing the data by updating the underlying storage technology:	No change anticipated.
4.1.4 PDS will develop and implement a disaster recovery plan for the archive	PDS has developed and implemented a disaster recovery plan." for the PDS archive: " <a href="#">PDS Policy on Data Integrity / Disaster Recovery (2006-11-30)</a> "	No change anticipated.
4.1.5 PDS will meet U.S. federal regulations for preservation and management of the data through its Memorandum of Understanding (MOU) with the National Space Science Data Center (NSSDC)	PDS delivers data to the NSSDC as the deep archive.	It is anticipated that under PDS4, additional services will be added to improve this process online.
4.2 Long-Term Usability: PDS will establish long-term usability requirements and implement procedures for meeting them		
4.2.1 PDS will define and maintain a set of usability requirements to ensure ongoing utility of the data in the archive	PDS defines and maintains a set of usability requirements to ensure ongoing utility of the data in the archive.	No change anticipated.
4.2.2 PDS will develop and implement procedures for periodically monitoring the user community interests and practices and verifying the usability of the products in the archive	PDS works with various science groups to solicit requirements and ensure they archive is usable.	No change anticipated.
4.2.3 PDS will monitor the evolution of technology including physical media, storage, and software in an effort to keep the archiving technology decisions relevant within the PDS	PDS has appointed a working group to monitor the evolution of technology including physical media, storage, and software in an effort to keep the archiving decisions relevant within the PDS.	No change anticipated.
4.2.4 PDS will provide a mechanism to upgrade products or data sets which do not meet usability requirements (e.g., data sets from old missions)	PDS provides mechanisms for upgrading products / data sets which do not meet PDS3 usability requirements.	PDS will provide software to upgrade PDS3 data sets to be PDS4 compliant. This will be integrated both as part of migration to the PDS4 catalog system as well as migration of key data sets in the archive.