

# **NASA PDS Support for Data Analysis Programs & Data Users**

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## U.S. Public Data Access

- ***President's Office of Science & Technology Policy***

- Issued memo on February 22, 2013, signed by Director Holdren
  - [https://www.whitehouse.gov/sites/default/files/microsites/ostp/ostp\\_public\\_access\\_memo\\_2013.pdf](https://www.whitehouse.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf)
- “Increasing Access to the Results of Federally Funded Scientific Research”
- Directs federal funding agencies with an annual R&D budget >\$100 million to develop a public data access plan for disseminating the results of their research

- ***NASA Plan***

- A response was released by NASA on November 21, 2014
  - [http://science.nasa.gov/media/medialibrary/2014/12/05/NASA\\_Plan\\_for\\_increasing\\_access\\_to\\_results\\_of\\_federally\\_funded\\_research.pdf](http://science.nasa.gov/media/medialibrary/2014/12/05/NASA_Plan_for_increasing_access_to_results_of_federally_funded_research.pdf)
- “NASA Plan: Increasing Access to the Results of Scientific Research”
- Part A addresses **Digital Scientific Data**
- Part B addresses **Publications**

## U.S. Public Data Access (cont.)

- **NASA Plan, Part A**

- Affirm and enhance NASA's commitment to [public access to scientific research results](#);
- Ensure [access to and reliable preservation of](#) NASA-funded scholarly publications and [digital data](#) sets for research, development, commercialization, and education...;
- Preserve and increase the use of scientific research results to enhance scientific discovery and application of research results;
- Affirm NASA's commitment to its scientific integrity policy and support the reproducibility of scientific research results;
- Ensure that all extramural researchers receiving NASA grants, cooperative agreements, and contracts for scientific research and intramural researchers develop [data management plans](#) ... describing how they will provide for long-term preservation of, and access to, scientific data in digital format;
- Optimize [archival and dissemination of data](#) and publications, including [long-term stewardship](#);
- Support [training, education, and workforce development](#), related to scientific data management, analysis, storage, preservation, and stewardship;
- Support governance of and best practices for [managing public access](#) to peer-reviewed scholarly publications and digital data across NASA.

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## Planetary Data: Scope & Volume

- ***What are planetary data?***

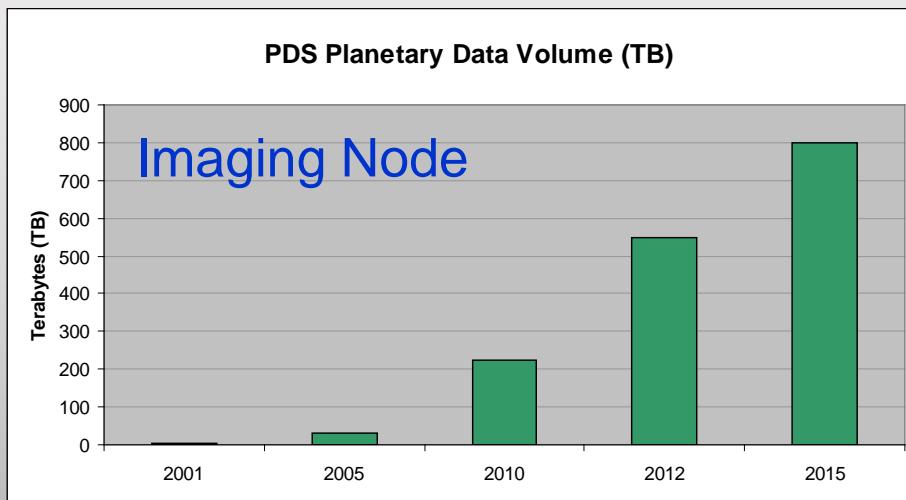
- Documents, hardcopy data, photographic negatives & prints
- Digital data tables, arrays, images, profiles, measurements, etc.

- ***Sources***

- Spacecraft missions, telescopic observations, research, laboratory analyses, etc.

- ***Volume***

- Increased significantly in ~15 years
- Approaching a petabyte
  - 1000 TB
  - 1 quadrillion bytes



High-density digital data storage arrays

# NASA Planetary Data System



**NASA PDS: The Planetary Data System**

HOME ABOUT PDS DATA TOOLS & DOCUMENTS RELATED SITES CONTACT US CITING PDS

**Quick Searches**

- Mercury
- Venus
- Mars
- Jupiter
- Saturn
- Uranus, Neptune, Pluto
- Rings
- Asteroids
- Comets
- Planetary Dust
- Earth's Moon
- Solar Wind

**PDS Nodes**

- Atmospheres
- Geosciences
- Imaging
- Navigational & Ancillary Information (NAIFI)

**Welcome to the PDS**

The PDS archives and distributes scientific data from NASA observations, and laboratory measurements. The PDS Directorate. Its purpose is to ensure the long-term usability of research. [Learn more about PDS.](#)

**Researchers**

- Search or browse for data sets
- Get notified (subscribe) when new data becomes available
- Find images from planetary missions
- Find tools for viewing and working with PDS data
- Learn about PDS data format and structure

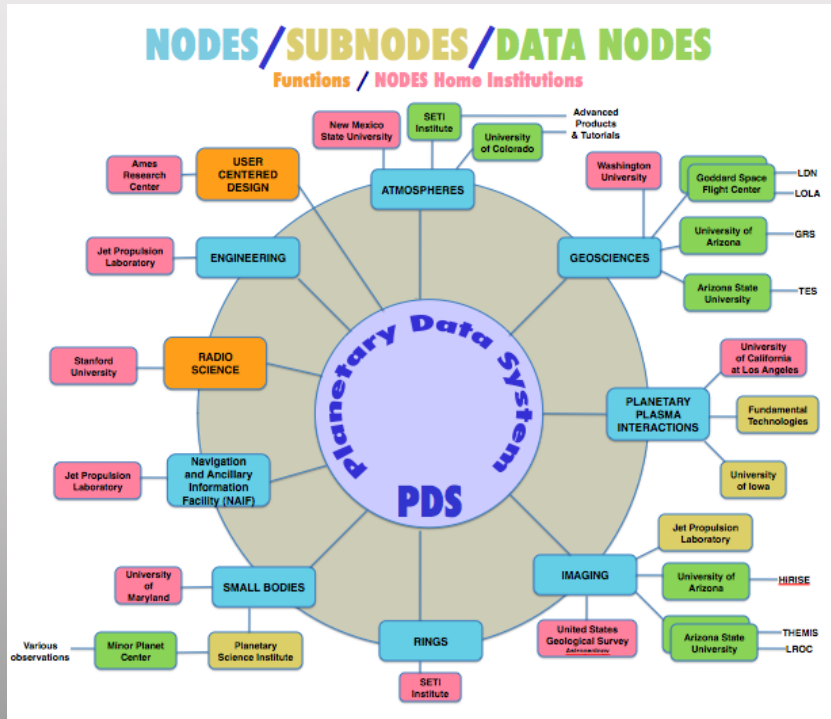
**Data Providers**

- Archive preparation guide
- Tools for data preparation
- Example data and documents
- Archiving standards
- Information for proposers
- Estimating archiving effort
- PDS Node contacts

<http://pds.nasa.gov/>

- In 1982, the US National Academy of Sciences chartered the Committee on Data Management and Computation (CODMAC)
  - Address concerns about how data were managed by NASA
  - No formal archives, unstable media, little documentation usable by any but mission teams
- CODMAC initial recommendations (1982)
  - Scientific involvement & oversight
  - Data availability with usable formats, ancillary data
  - Timely distribution, validated data, proposer documentation
  - Use of proper, stable storage media and facilities
  - Data storage in permanent and retrievable form
  - Structured, transportable, documented software
  - Adequate data system funding
- **Planetary Data System (PDS) established in 1989**
  - Purpose is to ensure the long-term usability of NASA data and to stimulate advanced research
  - Funded by NASA Science Mission Directorate

# A Short History of PDS



<http://pds.nasa.gov/>

*National Space Science Data Center (NSSDC) is the deep archive for PDS and NASA space mission archives*

- **26 years later, PDS archives & serves data from all planetary bodies**
  - Planets, moons, atmospheres, rings, small bodies, fields & particles
  - 53 historic missions (mostly US, a few non-US), 31 currently active missions
  - Now working with next-generation archive system, PDS4
- **Organization**
  - 6 science discipline nodes, 4 sub-nodes
    - Atmospheres, Geosciences, Imaging, Planetary Plasma Interactions, Planetary Rings, Small Bodies
  - 2 overarching support nodes, 1 function
    - Engineering, Navigation & Ancillary Information Facility (NAIF), Radio Science
  - PDS Project Management
    - Solar System Exploration Data Services Office, Goddard Space Flight Center
- **Data Nodes**
  - 10 active data nodes

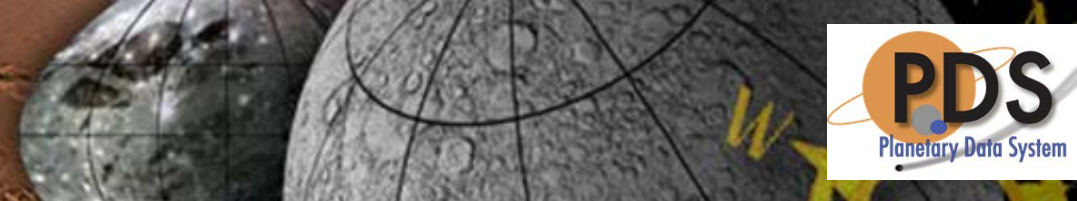
# Planetary Data: PDS Delivery Services

- **Data Access**
  - PDS Home and central catalog provide access to all PDS data
  - All nodes provide search services and science expertise to help you find “the right data”
  - Support for current NASA proposal opportunities
- **Examples of PDS tools & services**
  - **Imaging Node**
    - Photojournal, Planetary Image Atlas, Map-a-Planet, Planetary Image Locator Tool (PILOT), Data Portal
  - **Geosciences Node**
    - Orbital Data Explorers (Mars, Mercury, Moon), Analyst’s Notebook (MER, Phoenix, LCROSS, Apollo), workshops, spectral libraries
  - **Planetary Rings Node**
    - OPUS search tool, Planet Viewers, Moon Trackers, Ephemeris Generators
  - **Small Bodies Node**
    - Data Ferret, Statistical Asteroid Model, Online Archiving Facility (OLAF)
  - Other Nodes point to one or more of these services to avoid duplication & simplify access

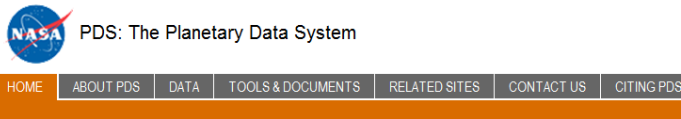
The collage displays several key PDS web services:

- PHOTOJOURNAL**: A page showing planetary orbits and a search interface.
- Planetary Image Atlas**: A NASA website for searching planetary images.
- USGS PDS Imaging Node**: A search interface for planetary images, showing a map of Mars and a mosaic of images.
- ANALYST'S NOTEBOOK**: A tool for exploring planetary data, featuring a "Lunar Orbital Data Explorer" section with various analysis tools like MER Analyst, Phoenix Anal, and LCROSS Ana.
- Small Bodies Data Ferret**: A tool for searching Small Bodies Node data, showing a "General Constraints" panel with filters for Planet, Nominal Target Name, Mission, Instrument Host Name, Observation Time, Target Intercept Time, Observation Duration, and Observation Class.





# Planetary Data: PDS Support Nodes & NASA Software Systems



## • Engineering Node

– Provides systems engineering support to the entire PDS

- Standards, technology, system-wide software, data ordering and distribution, and PDS data catalog & distribution service

– International Planetary Data Alliance (IPDA)

- Supports archives from ESA, JAXA, ISRO, CNSA, etc.

## • Navigation & Ancillary Information Facility (NAIF)

– Navigation node, focus on SS geometry, SPICE

- Information system for space geometry & event data

– SPICE Toolkit & Tutorials

- Large suite of software/subroutines to read SPICE data files and compute derived observation geometry (altitude, latitude/longitude, and lighting angle, etc.)

## • Software systems & environments, viewers

– *Cartography*: VICAR (JPL/MIPL), ISIS (USGS), Ames Stereo Pipeline (ARC)

– *Viewing & Access*: LMMP Data Portal (JPL), ILIADS (GSFC)

– *Mission Planning & Targeting*: JMARS (ASU), REACT (ACT)

– *Non-NASA*: SOCET Set, ENVI, ESRI/ArcMAP, Google Moon/Mars, World-Wide Telescope, Matlab

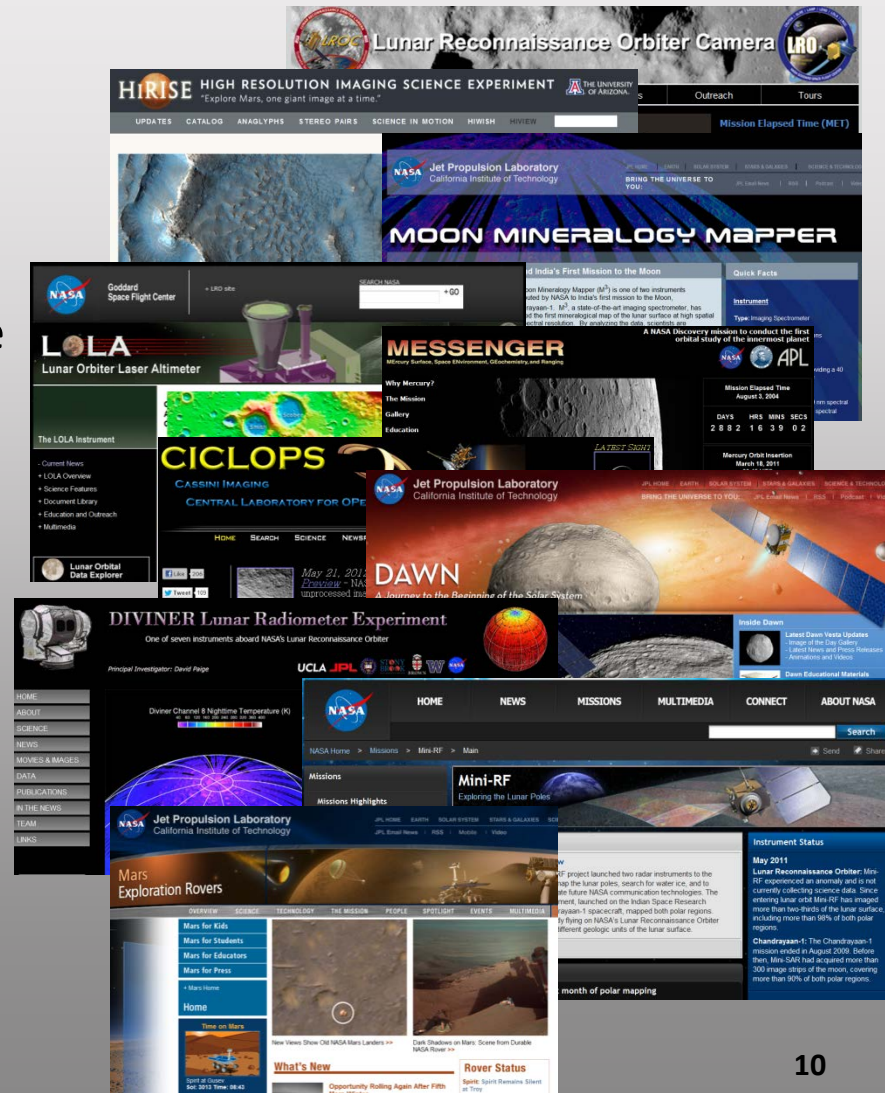
# Planetary Data: Mission Operation Centers & Data Nodes

- **Mission activities**

- Communication, uplink & downlink, targeting, tracking image & data acquisition, surface operations, data viewing, mission planning, documentation, processing, software development, archiving, delivery services, etc.

- **Data nodes**

- 10 currently active
- Temporary adjuncts to PDS structure, funded by NASA flight missions
- Provide direct archiving interface for active flight missions & expert science support for data users
- Scheduled data deliveries to PDS



# Planetary Data: Mission Operation Centers & Data Nodes

- **Examples of tools & services (Mars)**
  - Mars Space Flight Facility (ASU)
    - JMARS, Mars Image Explorer, MO THEMIS Data Map, Global Mars Maps, Davinci
  - MRO HiROC (UA)
    - HiView, Conductor, Kapellmeister
  - MRO CRISM Data viewer, Analysis Toolkit (APL)
- **Examples of tools & services (Moon)**
  - LROC SOC (ASU)
    - ACT/REACT QuickMap LROC & M3 online data viewer
    - LROC WMS Image Map, image browser
  - Apollo Digital Image Archive (ASU)
- **Examples of tools & services (Other)**
  - Cassini CICLOPS



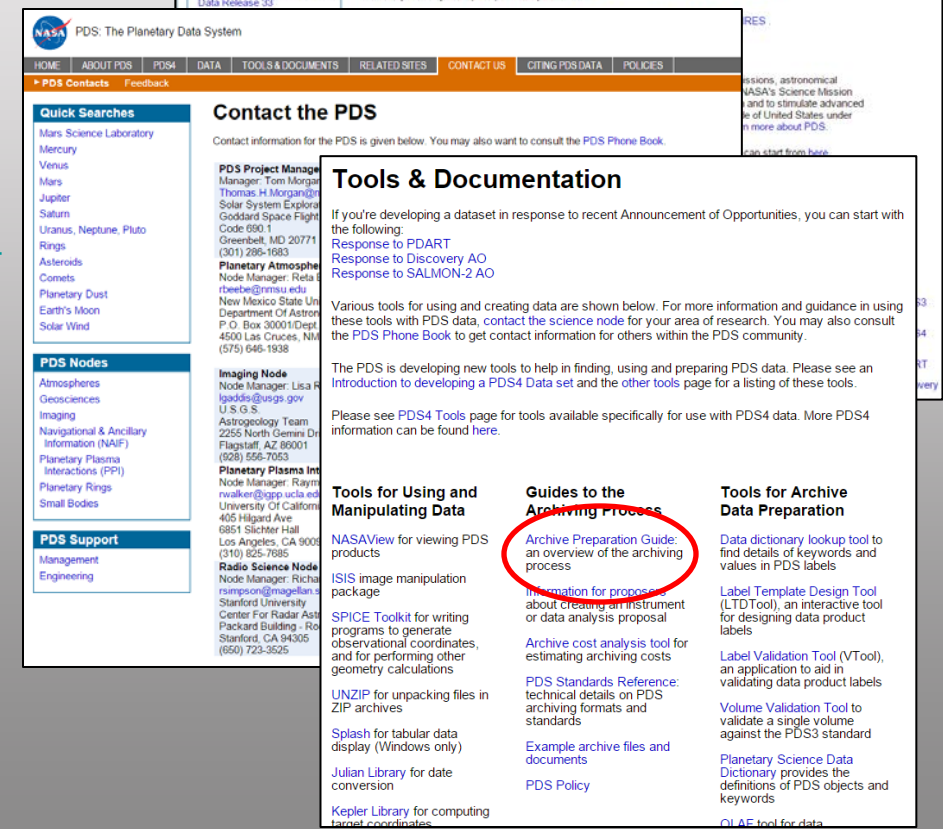
## U.S. Public Data Access (cont.)

- **NASA Plan, Part A**

- (1) – Affirm and enhance NASA’s commitment to **public access to scientific research results**;
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# Planetary Data: Data Management Plans

- PDS Home Page:**
  - Start here: <https://pds.nasa.gov/>
  - Find contacts, tools & documents, examples, etc.
  - Contact a discipline node lead**
- Archive Preparation Guide:**
  - <https://pds.nasa.gov/tools/archiving.shtml>
  - Sample documents (**missions and instruments**)
    - Data Management and Archiving Plans (DMAPS)
    - Interface Control Documents (ICD), interface between provider and node
    - Software Interface Specifications (SIS), archive data structures and volumes



# Planetary Data: Data Management Plans

- **For Data Analysis, Research Programs:**

- Information for Proposers
- Archiving steps, Archive checklist, Costing examples
- <https://pds.nasa.gov/tools/proposing.shtml>

- **Proposers' Archive Guide:**

- Overview of archiving process, elements of an archive, PDS, expected products, etc.

- **Cost Analysis Tool & Model**

- Excel spreadsheet for helping proposers estimate the costs involved in preparing data for archiving in the PDS
- Estimates of effort required, in Full Time Equivalent (FTE) units, for all archiving phases

## Information for Proposers

The [archiving process](#) in the PDS works like this:

1. Agreement with the PDS about what to archive, how, and when.
2. Creation of archive products and data volumes
3. Submission of data and peer review
4. Public availability of the data

More information about each of these steps is given below. For complete details, see the [Proposers Archiving Guide](#) (PDF) and the [Information for Proposers Presentation](#) (PDF).

### Proposing to Archive

Your mission or data analysis proposal must contain information about how you plan to archive your results into the PDS. Typical AO's require that proposals include a discussion of products to be delivered to PDS and that budgets include appropriate funding for this activity. PDS personnel are also available to answer archive design questions from proposal teams on a confidential basis.

To complete your proposal, you may need to use the archiving [Cost Analysis Tool and Model](#).

### Other Helpful Information

**Planetary Data System**  
**Proposer's Archiving Guide (PAG)**

March 29, 2010  
Version 1.4

**JPL**  
Jet Propulsion Laboratory  
Pasadena, California  
JPL D-26359

help you develop a compliant and efficient data

## Archiving Cost Analysis Tool

The PDS has developed a modeling tool for helping proposers estimate the costs involved in preparing data for archiving in the PDS. The Cost Analysis Tool is an Excel spreadsheet that implements the details of the model and gives estimates of effort required in Full Time Equivalent (FTE) units.

### Cost Analysis Model

The model implemented by the spreadsheet estimates the costs to a mission or instrument team for designing and delivering PDS-compliant data products. It does not include the costs incurred by the PDS.

Phase A-D contains Orientation, Archive Planning, Data Set Design, Volume Design, Data Products Process Design, and Data Validation Process Design.

Phase E contains Data Product Preparation, Data Set Production and Validation, Data Delivery, Review, and Archive.

### Phase A-D Costs

Phase A-D costs in FTEs, which can be called the "Handshaking" costs, are expressed as:

$$0.25 * \text{number of instruments} * E * C * E$$

where:

**B** is the baseline cost for designing the archive format when done for a product that requires no changes to the PDS data model and done by a team very experienced in delivery to PDS (usually B = 0.25 FTE)

**C** is the data Complexity factor: 1 for data consistent with the current PDS data model, 2 for data products which require significant modifications to the PDS data model as would be the case for a new instrument type or a new observation type

**E** is the team Experience factor: 1 for a team that is very experienced in producing PDS-compliant data products; 2 for a team that is very inexperienced in producing PDS-compliant data products

**0.25** is the fixed cost for production of the mission Data Management Plan

Note that different instruments in the same mission may have differing experience and complexity values.

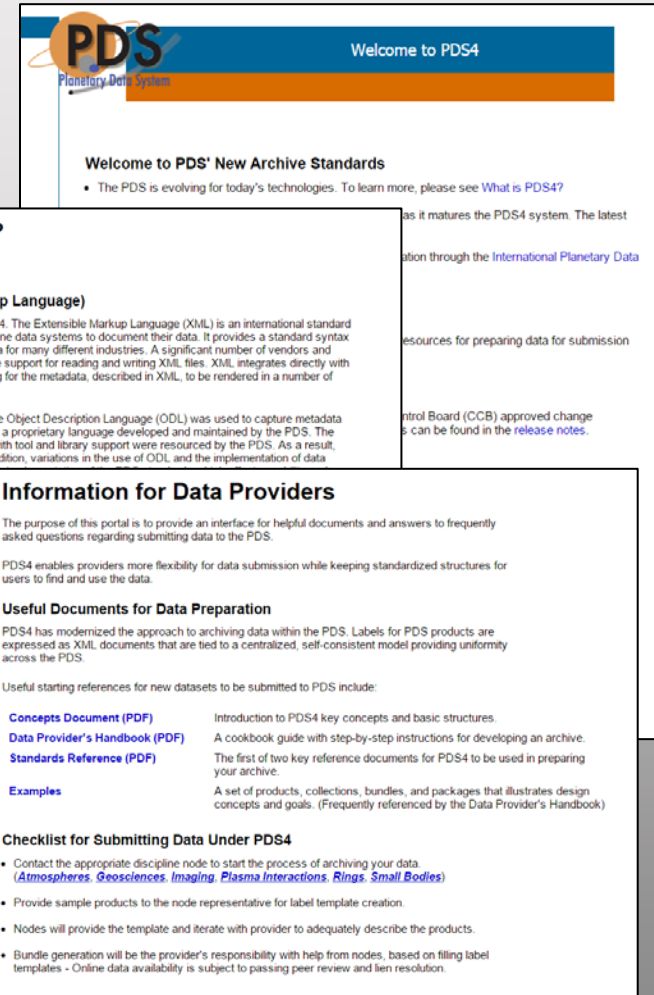
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# Planetary Data: Data Stewardship

- **PDS4:**
  - *The new PDS*, an integrated data system to improve access to PDS data
  - A re-architected, modern, online data system
  - Improves efficiency both ingestion and distribution of data
  - Uses Extensible Markup Language (XML) and standard data format templates with keywords & labels
  - Self-consistent information model & software system
    - <https://pds.nasa.gov/pds4/about>
  - Concepts, examples, checklist, *software*
    - Use templates to make labels, validate them, etc.



**What is PDS4?**

**What is changing?**

**XML (Extensible Markup Language)**

PDS has adopted XML for PDS4. The Extensible Markup Language (XML) is an international standard that is widely used by many online data systems to document their data. It provides a standard syntax and structure for describing data for many different industries. A significant number of vendors and programming languages provide support for reading and writing XML files. XML integrates directly with web-based applications allowing for the metadata, described in XML, to be rendered in a number of different formats.

In previous versions of PDS, the Object Description Language (ODL) was used to capture metadata labels for archived data. ODL is a proprietary language developed and maintained by the PDS. The standards management along with tool and library support were resourced by the PDS. As a result, limited tool support exists. In addition, variations in the use of ODL, and the implementation of data products led to differences in interoperability.

For PDS4, the use of XML with a wealth of software and tools resources to improve access to templates that can be used to improve data search across PDS.

PDS is ensuring that its adoption of XML is popular off the shelf XML tool.

**PDS Standards and Information Model**

PDS is developing PDS4 using a self-consistent information model. In addition, common templates and tools are being developed by the teams.

**Software System**

The PDS is a geographically distributed system in order to deliver and integrate the system to develop the system to develop efficiency of ingestion and the software system will provide search, access and transform will be described using the PDS4.

**Information for Data Providers**

The purpose of this portal is to provide an interface for helpful documents and answers to frequently asked questions regarding submitting data to the PDS.

PDS4 enables providers more flexibility for data submission while keeping standardized structures for users to find and use the data.

**Useful Documents for Data Preparation**

PDS4 has modernized the approach to archiving data within the PDS. Labels for PDS products are expressed as XML documents that are tied to a centralized, self-consistent model providing uniformity across the PDS.

Useful starting references for new datasets to be submitted to PDS include:

- Concepts Document (PDF)** Introduction to PDS4 key concepts and basic structures.
- Data Provider's Handbook (PDF)** A cookbook guide with step-by-step instructions for developing an archive.
- Standards Reference (PDF)** The first of two key reference documents for PDS4 to be used in preparing your archive.
- Examples** A set of products, collections, bundles, and packages that illustrates design concepts and goals. (Frequently referenced by the Data Provider's Handbook)

**Checklist for Submitting Data Under PDS4**

- Contact the appropriate discipline node to start the process of archiving your data. (*Atmospheres, Geosciences, Imaging, Plasma Interactions, Rings, Small Bodies*)
- Provide sample products to the node representative for label template creation.
- Nodes will provide the template and iterate with provider to adequately describe the products.
- Bundle generation will be the provider's responsibility with help from nodes, based on filling label templates - Online data availability is subject to passing peer review and lien resolution.



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# Planetary Data: User Training & Education

- **Planetary Data Workshop:**
  - *You are here!*
  - Every two years
  - *Please complete the online survey*
- **PDS Guides, Tools & Tutorials:**
  - Many nodes offer tutorials and workshops for specific data
  - Often data access & delivery services offer user guides & tutorials
- *If you don't find what you need, contact a node manager!*

**2ND PLANETARY DATA WORKSHOP**  
FLAGSTAFF, ARIZONA  
JUNE 8-11, 2015

**USGS Astrogeology Science Center**  
Home About Labs / Facilities Maps / Products Missions / Research Tools

**PDS Imaging Node**  
National Aeronautics and Space Administration  
HOME DATA VOLUMES INDEX ALL DATA HOLDINGS DATA PORTAL DATA RELEASES TOOLS & TUTORIALS HELP

**Software, Tools, Tutorials & Viewers**

**Cassini**  
Cassini ISS Data Users' Guide (PDF)  
Cassini RADAR Users' Guide (PDF)  
How to Obtain Cassini Data (Tutorial)  
Cassini Orbiter Image Viewer (Piotr Masek)  
Cassini Isis Workshop

**Chandrayaan**  
M<sup>3</sup> ENVI User's Guide  
Working with M<sup>3</sup> Data  
Working with M<sup>3</sup> L1B Data  
M<sup>3</sup> Data Tutorial  
M<sup>3</sup>ACT-REACT QuickMap  
M<sup>3</sup>ACT-REACT QuickMap Tutorial (PDF)

**Clementine**  
CLEMDCMP/CLIMDISP (Clementine Image Decompression)  
CLEMDCMP, an image decompression program, requires a few minutes to decompress an image on hardware in tests on a Macintosh iMac, the decompression takes approx

**PDS Geosciences Node**  
Washington University in St. Louis

**Workshops**

The Geosciences Node hosts occasional workshops to help users learn the most effective ways to use a particular data set. Presentations and other workshop materials are posted here. To suggest a topic for a workshop, please email [geosc@wunder.wustl.edu](mailto:geosc@wunder.wustl.edu).

This list includes workshops hosted by other groups that may be of interest to our users:

Workshop / Host	When and Where
M <sup>3</sup> L ChemCam Workshop (ChemCam Science Team)	Wednesday, March 18, 2015, 6:00 pm Lunar and Planetary Science Conference Fletcher Creek Room, The Woodlands Waterway Marriott, Houston, TX
MESSENGER MARSIS VIRS Workshop Presentations (PDF, 10 MB) (MARSIS Science Team)	Monday, March 17, 2014, 12:00-1:15 pm Lunar and Planetary Science Conference Fletcher Creek Room, The Woodlands Waterway Marriott, Houston, TX
MRO SHARAD / Mars Express MARSIS Workshop Presentations (SHARAD and MARSIS science teams)	Sunday, March 16, 2014, 3:00-7:00 pm Lunar and Planetary Science Conference Montgomery Ballroom A, The Woodlands Waterway Marriott, Houston, TX
M <sup>3</sup> L ChemCam Workshop (ChemCam Science Team)	Sunday, March 16, 2014, 3:00-6:00 pm Lunar and Planetary Science Conference, Alden Bridge, The Woodlands Waterway Marriott, Houston, TX
LRO Data Users' Workshop (Noah Petro, OSFC)	Sunday, March 16, 2014, 8:00 am-5:00 pm Lunar and Planetary Science Conference Room TED, The Woodlands Waterway Marriott, Houston, TX
LRO Diviner Data Users Forum (Diviner Science Team)	Lunar and Planetary Science Conference, Houston, Texas, March 17, 2013
Planetary Data Workshop (USGS Astrogeology Group)	Northern Arizona University, Flagstaff, AZ, June 25-29, 2012
MRO CRISM Data Users' Workshop 2012 (CRISM Science Team)	Lunar and Planetary Science Conference, Houston, Texas, March 18, 2012
LRO Diviner Data Users' Forum (Diviner Science Team)	Lunar and Planetary Science Conference, Houston, Texas, March 6, 2011
Chandrayaan-1 Moon Mineralogy Mapper (M <sup>3</sup> )	AGU, San Francisco, December 13, 2010

## Summary

- PDS provides a **wide variety** of data and support services for creating data archives and using planetary data
- PDS addresses many aspects of Part A of the NASA Plan of 2014 (response to OSTP memo of 2/22/13)
- This quick overview provides context for presentations & discussions this week
  - I've left some elements and details out!

- **Links to online data services**

- PDS Home: <http://pds.nasa.gov/>
- Atmospheres Node: <http://atmos.pds.nasa.gov/>
- Geosciences Node: <http://geo.pds.nasa.gov/>
- Imaging Node: <http://pds-imaging.jpl.nasa.gov/>
- Planetary Plasma Interactions Node: <http://pds-ppi.igpp.ucla.edu/>
- Planetary Rings Node: <http://pds-rings.seti.org/>
- Small Bodies Node: <http://pds-smallbodies.astro.umd.edu/>
- Engineering Node: <http://pds-engineering.jpl.nasa.gov/>
- NAIF: <http://naif.jpl.nasa.gov/naif/>
- NSSDC: <http://nssdc.gsfc.nasa.gov/>
- IPDA: <http://planetarydata.org/>

- **Links to online data services**

- Geosciences Node:
  - Mars Orbital Data Explorer: <http://ode.rsl.wustl.edu/mars/>
  - Mercury Orbital Data Explorer: <http://ode.rsl.wustl.edu/mercury>
  - Lunar Orbital Data Explorer: <http://ode.rsl.wustl.edu/moon/>
  - Analyst's Notebooks: <http://an.rsl.wustl.edu/>
- Imaging Node:
  - Photojournal: <http://photojournal.jpl.nasa.gov/index.html>
  - Planetary Image Atlas: <http://pds-imaging.jpl.nasa.gov/search>
  - Data Portal: <http://pds-imaging.jpl.nasa.gov/portal/>
  - Map a Planet: <http://www.mapaplanet.org/>
  - PILOT: <http://pilot.wr.usgs.gov/>
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- Small Bodies Node:
  - Data Ferret: <http://sbn.psi.edu/ferret/>
- NAIF:
  - SPICE Toolkit: <http://naif.jpl.nasa.gov/naif/toolkit.html>

- **Links to online data services**

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- MRO HiRISE HiView: <http://hirise.lpl.arizona.edu/hiview/>
- LROC QuickMap: <http://target.lroc.asu.edu/da/qmap.html>
- LROC WMS Map: <http://wms.lroc.asu.edu/lroc/>
- MRO CRISM Data Viewer: <http://crism-map.jhuapl.edu/>
- MO THEMIS Maps: <http://global-data.mars.asu.edu/bin/themis.pl>
- Mars Global Data: <http://www.mars.asu.edu/data/>
- JMars/JMoon: <http://jmars.asu.edu/>
- RPIF Network: <http://www.lpi.usra.edu/library/RPIF/>
- Mars Handlens-Scale Image Database: <http://pds-geosciences.wustl.edu/missions/labdata/marshandlens.htm>
- Lunar Sample Catalog:  
<http://curator.jsc.nasa.gov/lunar/samplecatalog/index.cfm>
- Meteor Crater Sample Collection:  
<http://astrogeology.usgs.gov/research/Meteor-Crater-Sample-Collection>
- Apollo Digital Image Archive: <http://apollo.sese.asu.edu/>
- Gazetteer of Planetary Names: <http://planetarynames.wr.usgs.gov/>
- Astropedia: <http://astrogeology.usgs.gov/astropedia>

- **Links to online data services**

- Cassini CICLOPS: <http://ciclops.org/?js=1>
- Lunar Orbiter Digitization Project: <http://astrogeology.usgs.gov/Projects/LunarOrbiterDigitization/>
- VICAR: <http://www-mipl.jpl.nasa.gov/external/vicar.html>
- ISIS: <http://isis.astrogeology.usgs.gov/>
- Ames Stereo Pipeline: <http://ti.arc.nasa.gov/tech/asr/intelligent-robotics/ngt/stereo/>
- LMMP Data Portal: <http://pub.lmmp.nasa.gov/>
- ILIADS: <http://esc.gsfc.nasa.gov/exploration/esp/Exploration-Support.html>
- ACT/REACT: <http://www.actgate.com/home/act-react.htm>
- HRSC Data Explorer: <http://hrscview.fu-berlin.de/cgi-bin/ion-p?page=entry2.ion>
- SELENE Kaguya online archive: <http://l2db.selene.darts.isas.jaxa.jp/>
- Chang'e-2 Lunar Global Mosaic: <http://159.226.88.30:8080/CE2release/cesMain.jsp>
- ESA Multimedia Image Gallery: <http://www.esa.int/esa-mm/mmg.pl?collection=Space+Science&type=l>

# Planetary Data: Other Resources

- **Examples of tools & services (Other)**
  - Regional Planetary Image Facility Network
    - Globally distributed network of data libraries
      - 9 U.S. & 8 in other countries
    - Maintain photographic & digital data, mission documentation & cartographic data
  - Cartographic and photogrammetric products
    - Gazetteer of Planetary Names, PIGWAD/MRCTR, Astropedia
    - Lunar Orbiter Digitization Project
    - LMMP portal & products
  - Data Analysis Program, Science Institute, Participating Scientist products
    - Lunar Sample (Image) Catalog
    - Mars Analog Handlens-Scale Image Database
    - Meteor Crater Database

The collage features several key planetary data resources:


- RPIF Network (Regional Planetary Image Facility):** A network of data libraries for planetary images.
- Gazetteer of Planetary Nomenclature (IAU):** The official source for planetary names, including the Solar System section.
- USGS Astrogeology Research Program:** Focuses on the Lunar Orbiter Digitization Project, providing global status and download options for various lunar data sets.
- Curation Lunar:** A platform for lunar sample collections, including Meteorite, Stardust, Genesis, Cosmic Dust, and Space Exposed Hardware.
- PDS Geosciences Node (Washington University in St. Louis):** Provides access to the Mars Analog Handlens-Scale Image Data Base, detailing a collection of potential martian analog features.
- Astrogeology Science Center:** Offers detailed information on the Meteor Crater Sample Collection, including drill hole data and interactive maps.



# Planetary Data: Non-US Archives & Services

- International Planetary Data Alliance:**
  - 12 International members
  - An international standard for query, access and usage of data across international planetary data archive systems
- Examples of tools & services:**
  - ESA Multimedia Image Gallery
  - MEX HRSC Data Explorer, CraterTools
  - SELENE Kaguya online archive, Image Gallery, 3D GIS
  - Chang'e-2 Lunar Global Mosaic

# PDS Contacts

 PDS: The Planetary Data System

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## Contact the PDS

Contact information for the PDS is given below. You may also want to consult the [PDS Phone Book](#).

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<https://pds.nasa.gov/contact/contact.shtml>