TOWARDS AN INTERNATIONAL PLANETARY DATA STANDARD BASED ON PDS4

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Introduction

The International Planetary Data Alliance (IPDA) is an international collaboration of space agencies with a mission of providing access to scientific data returned from solar system missions archived at international data centers. In order to improve access and share scientific data, the IPDA was founded to develop data and software standards. The IPDA has focused on promoting standards that drive common methods for collecting and describing planetary science data. An initial starting point for developing such a standard has been the internationalization of NASA's Planetary Data System (PDS) standard, which has become the de-facto archival data standard. Given the demands of supporting more capable and international missions and collaborations, the Planetary Data System, in partnership with the IPDA, has embarked on developing a next generation data standard and system called PDS4. Significant progress has been made on PDS4 and early adopters are beginning to use the emerging standard on new planetary science missions.

Background

The IPDA was formed in 2006 with the purpose of adopting standards and developing collaborations across agencies to ensure data is captured in common formats. It has grown to approximately eight agencies represented by a number of different groups through the IPDA Steering Committee [1]. The IPDA Steering Committee oversees the execution of projects and coordinates the international collaborator. In executing its mission, the IPDA conducts a number of focused projects to enable interoperability, construction of compatible archives, and the operation of the IPDA as a whole. These projects have helped to establish the IPDA and to move the collaboration forward. A key project that is currently underway is the implementation of the emerging PDS4 data standard. Given the international focus, it has been critical that the PDS and the IPDA collaborate on its development.

PDS4: The Next Generation PDS Standard

The Planetary Data System was founded around a set of common standards for defining planetary science data. This has been critical to the construction of planetary science archives. As PDS has grown, the need for modernization of both its system and standards has become apparent. In 2008, the PDS embarked on planning this modernization that has entailed coordination of a number of software and data standards pieces, input and coordination with stakeholders, and a multi year plan for deployment, representing the largest upgrade in its history.

The centerpiece of this upgrade is the data standards. The PDS4 Data Standards provide a framework for capturing planetary science data results in international archives based on a homogeneous set of standards that can be extended for both various planetary science disciplines as well as for each space agency. This framework provides a common information model and a set of structures for capturing annotations of planetary science data through a new markup language in XML, the eXtensible Markup Language [2]. XML has significant tool support and wide adoption by data systems in many different industries. This provides a number of advantages in building compatible archives and providing interoperability across the archives. As a result, the definition of a well-
formed information model describing the planetary science data coupled with the use of XML provides a solid foundation for building systems around the archival data for years to come.

PDS4 Pilot Implementations

To date, the PDS has already been performing regular system releases of the data standards and software for PDS4 and deployment to early adopters is now underway. This incremental approach is providing a mechanism to get input back from the stakeholders and to validate the PDS4 implementation as the number of deployments increase. A series of assessments and beta tests have taken place both within the PDS as well as more globally, via the IPDA.

Several missions have been identified as the first missions to use the PDS4 standards. NASA’s LADEE (Lunar Atmosphere and Dust Environment Explorer) and MAVEN (Mars Atmosphere and Volatile Evolution Mission) missions are currently developing scientific data products based on PDS4 XML. The European Space Agency (ESA) led BepiColombo mission is currently working with the Planetary Science Archive (PSA) and the IPDA to begin defining data products and developing a pipeline for the mission based on PDS4. Following these will be the Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer (OSIRIS-Rex) and InSight missions at NASA that will design PDS4 data products. The Indian and Japanese space agencies are working towards plans for future missions and plan to adopt PDS4 to archive data from their missions, as well.

Both the PDS at NASA and ESA’s PSA are actively working with their missions to ensure that the PDS4 standards and the use of XML can meet their needs. As issues are identified, they are sent back to the development teams to address and improve the future releases of the standards. This process is working well and is helping to mature the overall PDS4 system releases.

Conclusion and Future

The IPDA has grown significantly since its first meetings back in November 2006. Through the collaboration with the PDS, an emerging standard, based on PDS4, is being realized.

Significant effort has been put in place to validate PDS4 as it has matured and the first implementations for missions have begun.

Over the next year, the PDS and IPDA will work together to get PDS4 ready for wider international use. We anticipate a growing number of beta tests that will bring in the international community and allow for feedback that will help in improving the implementation. Systems built around PDS4 will continue to roll out, particularly from the Planetary Data System, that will be taking advantage of the PDS4 format by delivering to the community improved services for data search and access to planetary science data.

The collaborations of IPDA, PDS, and the international community coupled with executing focused projects is proving to be an excellent model for bringing the world-wide planetary archives together into an interoperable system that will serve as a model for sharing data for years to come.

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References: [1]
http://planetarydata.org/members;