

THE STATE OF THE PDS4 INFORMATION MODEL. J.S. Hughes¹, J.H. Padams², R.S. Joyner³, M.S. Bentley⁴, T. Lim⁵, T.G. Loubrieu⁶, ¹Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, CA 91109, USA, John.S.Hughes@jpl.nasa.gov, ²Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, CA 91109, USA, Jordan.H.Padams@jpl.nasa.gov, ³Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, CA 91109, USA, Ronald.Joyner@jpl.nasa.gov, ⁴Space Astronomy Centre ESA - ESAC, 28691 Villanueva de la Cañada, Madrid, Spain, Mark.Bentley@esa.int, ⁵Space Astronomy Centre ESA - ESAC, 28691 Villanueva de la Cañada, Madrid, Spain, tlim@sciops.esa.int, ⁶Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, CA 91109, USA, thomas.g.loubrieu@jpl.nasa.gov.

Introduction: The PDS4 Information Model (IM) Version 1.16.0.0 was released for Build 11.1 in February 2021 with twelve relatively minor Standards Change Requests (SCRs). These minor changes suggest continued convergence toward a stable Common dictionary and provides evidence that the foundational principles under which the IM was developed are sound. International Planetary Data Alliance (IPDA) participation in the development of the IM ensures that the IM and the resulting PDS4 Standards are also meeting the requirements of the international planetary science community. The impact on the IM due to changes in PDS software and services has been negligible due to the IM’s “independence” design principle. The growing number and maturity of the discipline and mission level Local Data Dictionary (LDD) extensions to the Common dictionary provide evidence of the IM’s abilities to stay viable in an evolving science discipline and to maintain the usability of the science data now and into the future.

Significant Changes: Since the 2019 report on the state of the IM, several changes have significantly improved efficiency and use of the IM, aka the Common dictionary and its discipline and mission LDD extensions

An enhanced Local Data Dictionary (LDD) management process has been initiated to couple LDD generation with the PDS4 IM. This includes management of the LDD source and generated files in GitHub as well as the complete re-generation of all LDDs at each build. In addition, an LDD Working Group was formed for developing processes and software for maintaining and managing LDD development activities.

Several changes have been made to LDDTool to make it more stable and enhance its role in the design of Local Data Dictionaries (LDDs) and its use for the generation of operational artifacts. A third version of the PDS4 Data dictionary, the “WebHelp” version as illustrated in Figure 1, provide the same information as in the HTML and PDF versions but in addition offers a

table of contents, index navigation, and text search capabilities.

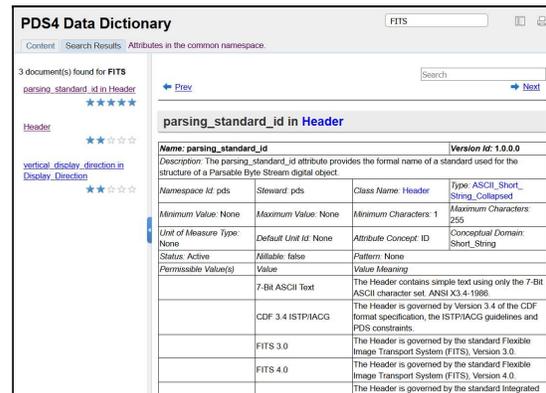


Figure 1 - WebHelp Version of the PDS4 Data Dictionary

The Resource Description Framework (RDF) formatted file generated by LDDTool has been updated to include additional class and property information to better support PDS semantic search and Data Science applications. Figure 2 illustrates the Instrument class hierarchy generated by a graph database.



Figure 2 - PDS4 Instrument Class Hierarchy

The development of a discipline “type list” LDD allowed the Instrument Type enumerated value list to be managed at the discipline level, improving the stability of the Common dictionary. This concept can be applied to other enumerated lists that change frequently.

Conclusion: The resulting PDS4 Data Standards are the de-facto standards for archiving science data for the international planetary science community. They ensure that the community has a world-class knowledge-base and science data archive for current and future planetary science research and data science and data analytic applications. This presentation will provide additional information about improvements to the PDS4 IM and how its original intent continues to be realized.

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References:

[1] PDS4 Information Model Specification, PDS4 Information Model Specification Team, December 23, 2020, Version 1.15.0.0, https://pds.nasa.gov/datastandards/documents/im/current/index_1F00.html.