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Planetary Data System (PDS) Tools and Tool Registry

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Abstract

The NASA Planetary Data System (PDS) [1] captures, archives, and distributes data from exploration of the solar system. In supporting this mission, it has developed an innovative architectural approach called "PDS4" along with a suite of core software and tools to its highly diverse and large amount of heterogeneous data from over 600 instruments. As PDS looks forward, it is focused on increasing access and use of the data in the big data era. PDS4 has provided an international foundation for archiving planetary science data, as well as a suite of tools and services for providing stewardship and accessibility to that data. In addition, PDS offers a Tool Registry to allow users to access PDS software services, tools and libraries for archive and use with planetary big data. The Tool Registry enables search and discovery of tools, services, and APIs for working with data following the PDS4 standards. Tools available in the registry have been submitted from the broad planetary science community across multiple institutions, including those from members of the International Planetary Data Alliance (IPDA) [2]. This presentation will provide an overview of PDS core tools; the Tool Registry and how the broader community can contribute their software for inclusion in the registry; other examples of the tools that are available via the registry; as well as a view of next generation tools and services.

1. PDS core Tools

The current core suite of PDS tools and services for providing accessibility and usability of the data include:

- **High-level Search**: Various APIs have been developed to access PDS4 collections and bundles, including PDS Search API [3], PDAP [4], etc.
- **Product-level Search**: Various APIs developed specific to archive/discipline. E.g. PDS Imaging Atlas Search API [5].
- **Access**: Multiple libraries exist for accessing and manipulating PDS4 metadata and products in both Python [6] and Java [7].
- **Transform**: Tool developed to enable transformation to common formats. [8].
- **Visualize**: Basic inspection of PDS4 products included in PDS Inspect Tool [9].

2. PDS Tool Registry

The full list of software packages related to the search, access, and use of planetary science data can be found in the PDS Tool Registry[10]. The registry's interface (see Figure 1) allows users to browse, search, and access the tools, services, and APIs for working with data following the PDS4 standards. Tools have been submitted from the broad planetary science community across multiple institutions, including those from members of the International Planetary Data Alliance (IPDA). The interface also allows tool providers to submit their software for inclusion in the registry.

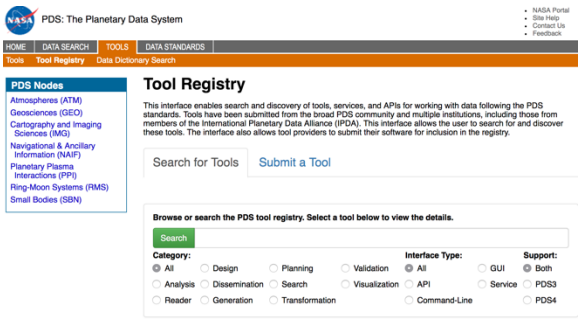

Figure 1 – PDS Tool Registry Interface.

Figure 2 below lists some examples of tools can be found in the registry.

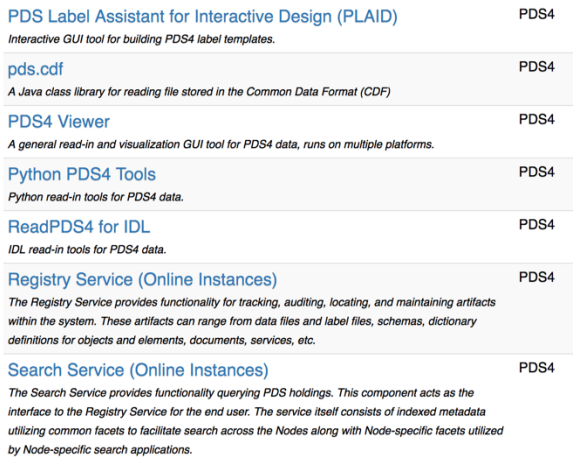

Figure 2 – Example list of PDS4 tools in the registry.

3. Next Generation PDS4 Tools

Looking forward, the next generation of tools and services can harness the power of PDS4 and focus on the development of user-centric services listed below:

- **Search**: Integrated search of PDS4-compliant federated archives.
- **Access**: Return every product, including both labels and data, from any PDS4-compliant archive.
- **Transform**: Provide standard library of transformations.
- **Compute**: Provide standard processing services (e.g., subsetting, coordinate translation, etc).
- **Use**: Support integration with common tools and frameworks.
- **Dynamic Tagging and Indexing**: Further enhance discovery and use of data through auto labelling using machine learning feature detection and classification methods based on PDS4 model.

4. Summary and Conclusions

The NASA PDS is a long-term archive of digital data products returned from exploration of the solar system. It offers many useful tools and services to facilitate stewardship, access and usage of the enormous amount of data returned from international planetary missions. These tools and services are readily available through the PDS Tool Registry, including a set of PDS core tools and tools contributed by planetary community. Looking ahead PDS will continue to improve existing capabilities, develop additional user-centric tools and services, open source tools, support collaborative tool development, and work with international community to ensure that planetary data can facilitate, and can easily be discovered and accessed for big data analysis.

Acknowledgements

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