SPASE: The Connection Among Solar and Space Physics Data Centers

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The Space Physics Archive Search and Extract (SPASE) project is an international collaboration among Heliophysics (solar and space physics) groups concerned with data acquisition and archiving. Within this community there are a variety of old and new data centers, resident archives, "virtual observatories", etc. acquiring, holding, and distributing data. A researcher interested in finding data of value for his or her study faces a complex data environment. The SPASE group has simplified the search for data through the development of the SPASE Data Model as a common method to describe data sets in the various archives. The data model is an XML-based schema and is now in operational use. There are both positives and negatives to this approach. The advantage is the common metadata language enabling wide-ranging searches across the archives, but it is difficult to inspire the data holders to spend the time necessary to describe their data using the Model. Software tools have helped, but the main motivational factor is wide-ranging use of the standard by the community. The use is expanding, but there are still other groups who could benefit from adopting SPASE.

The SPASE Data Model is also being expanded in the sense of providing the means for more detailed description of data sets with the aim of enabling more automated ingestion and use of the data through detailed format descriptions. We will discuss the present state of SPASE usage and how we foresee development in the future. The evolution is based on a number of lessons learned – some unique to Heliophysics, but many common to the various data disciplines.

Abstract # 0082

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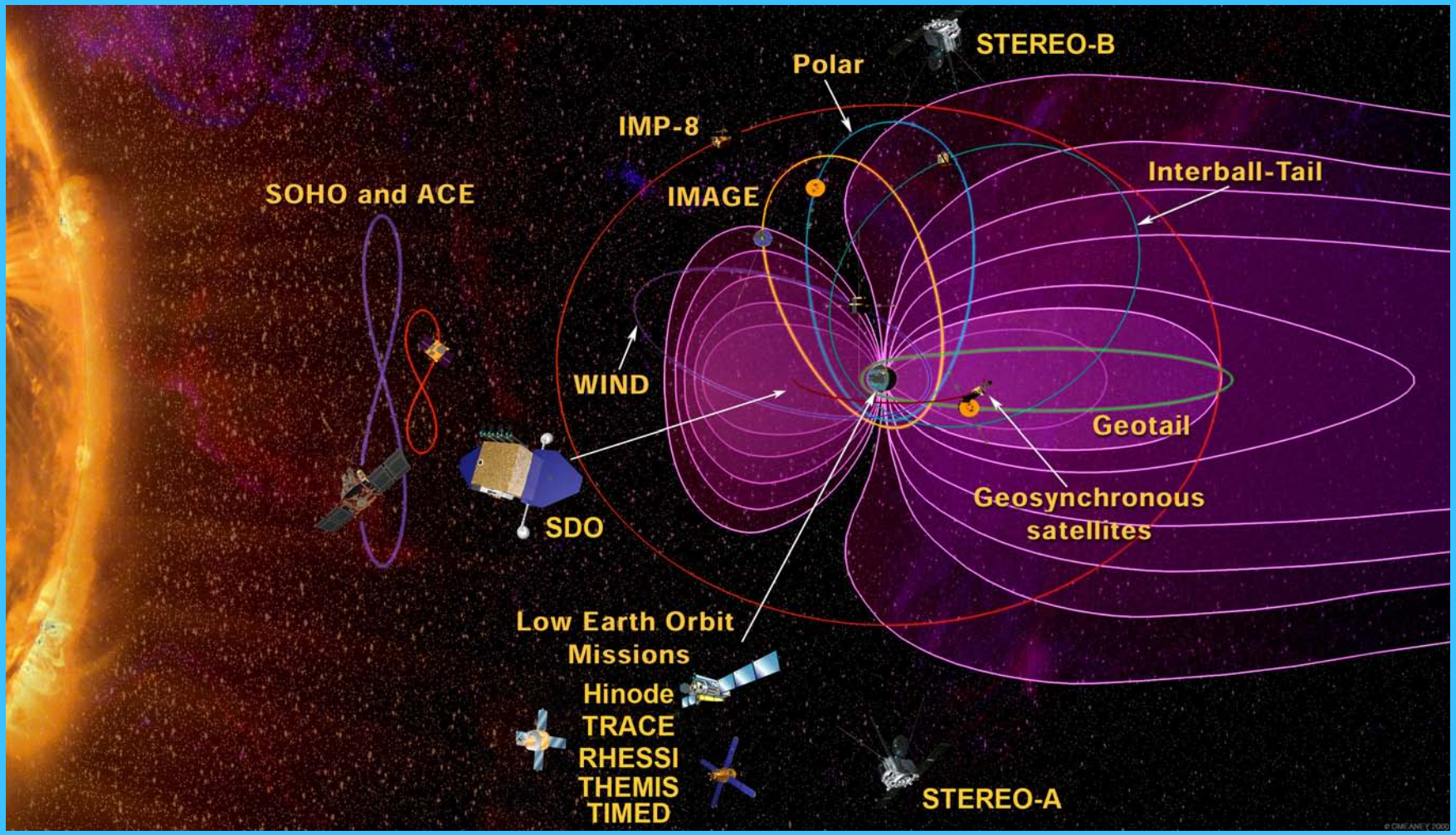
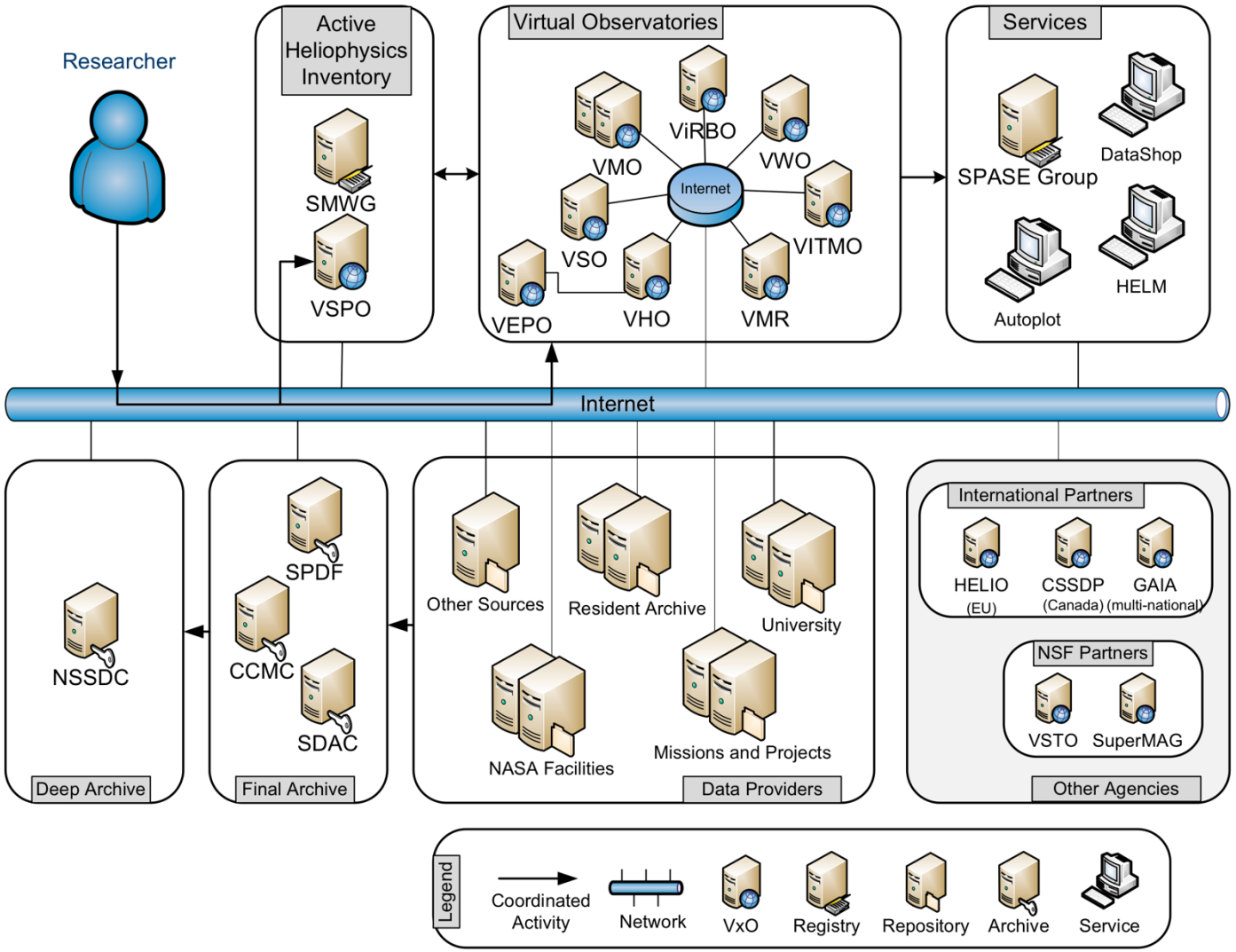
Presentation at the WDS Meeting
Sept. 5, 2011

Heliophysics (Solar and Space Physics) Great Observatory



Heliophysics Data Environment



Heliophysics Virtual Observatories (VOs)

NASA-Funded

- VSO - Virtual Solar Observatory
- VSPO - Virtual Space Physics Observatory
- VMO - Virtual Magnetospheric Observatory
- VITMO - Virtual Ionosphere, Thermosphere, Mesosphere Observatory
- VHO - Virtual Heliophysics Observatory
- ViRBO - Virtual Radiation Belt Observatory
- VEPO - Virtual Energetic Particle Observatory
- VWO - Virtual Wave Observatory
- VMR - Virtual Model Repository

Non-NASA-Funded

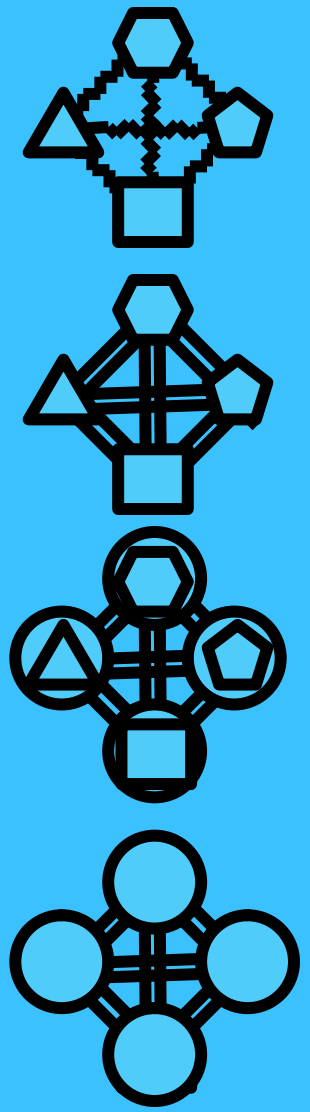
- CAA - Cluster Active Archive
- CDPP - Centre de Données de la Physique des Plasmas
- CSSDP - Canadian Space Science Data Portal
- EGSO - European Grid of Solar Observations
- GAIA - Global Auroral Imaging Access
- VSTO - Virtual Solar Terrestrial Observatory
- ??
- ??

Interoperability

Interoperability (among data centers, information servers, etc.) can be defined as the ability of systems in a heterogeneous network to interconnect, exchange, and use their information content in an efficient and relatively seamless way from a user point of view.

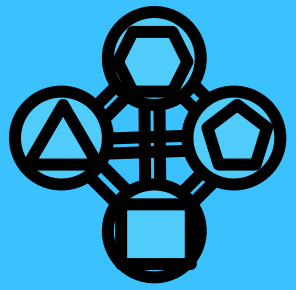
Interoperability Levels

1. Basic Interconnection
2. Information Transfer
3. Limited Standards
4. Uniform System



Level 3 Interoperability – Are We There Yet?

In Level 3 we put a common looking "shell" around the differences in the systems.

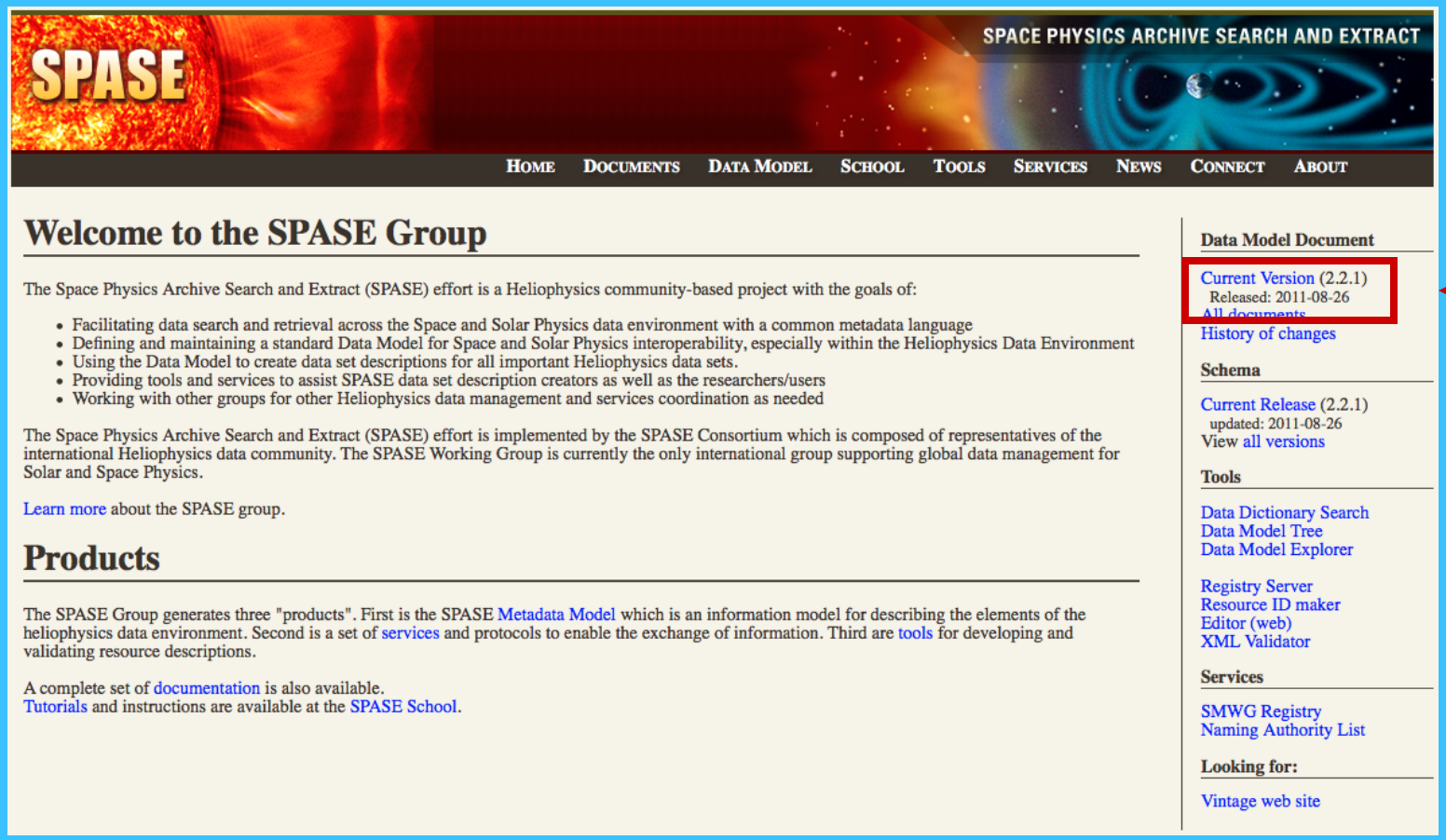


SPASE (Space Physics Archive Search and Extract) is an element of the "shell".

SPASE is a common metadata language facilitating data search and retrieval across the Space and Solar Physics data environment.

The SPASE Group defines and maintains a standard Data Model for Space and Solar Physics interoperability, especially among Heliophysics Virtual Observatories

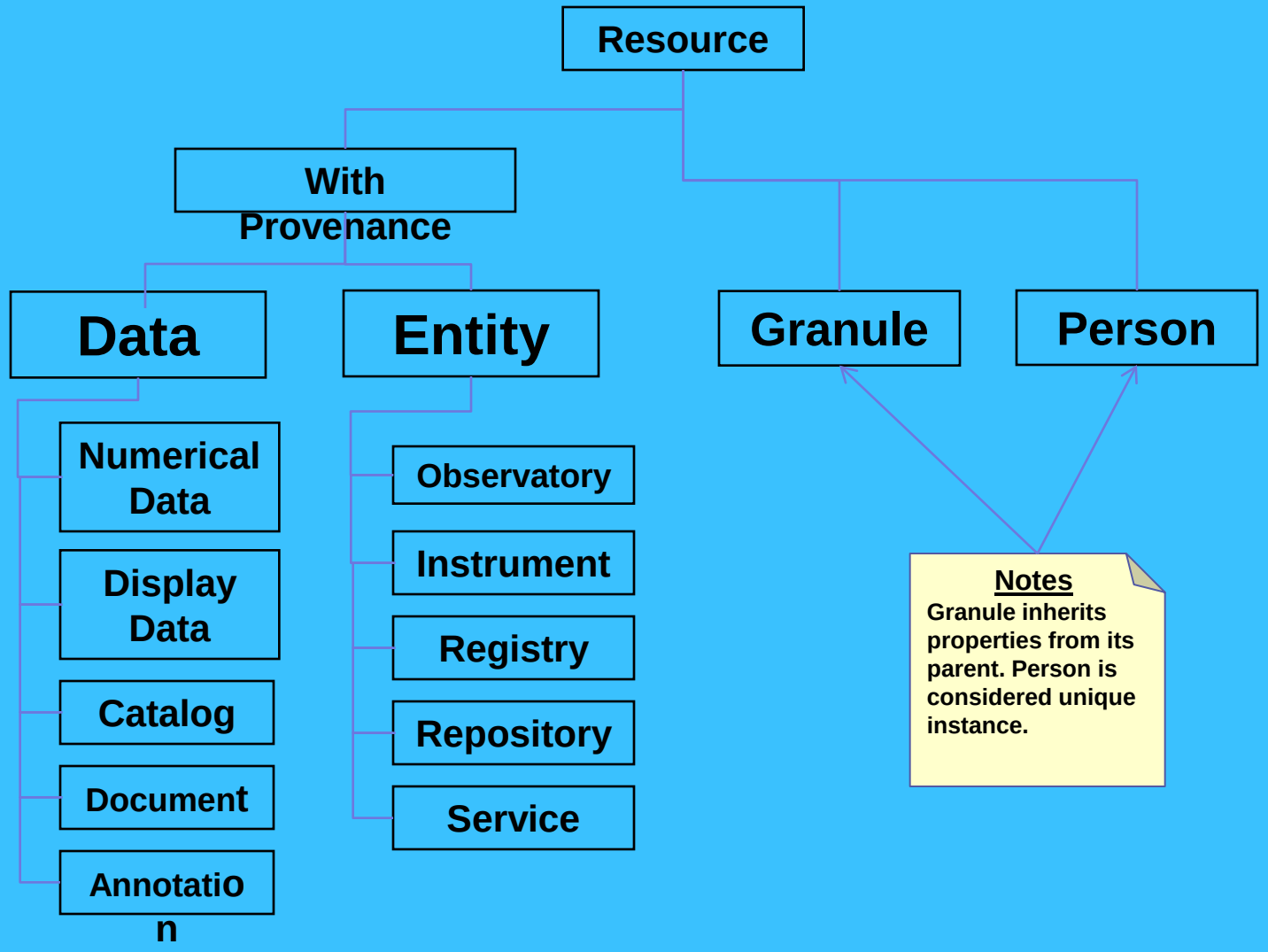
ACCESS TO THE SPASE DATA MODEL



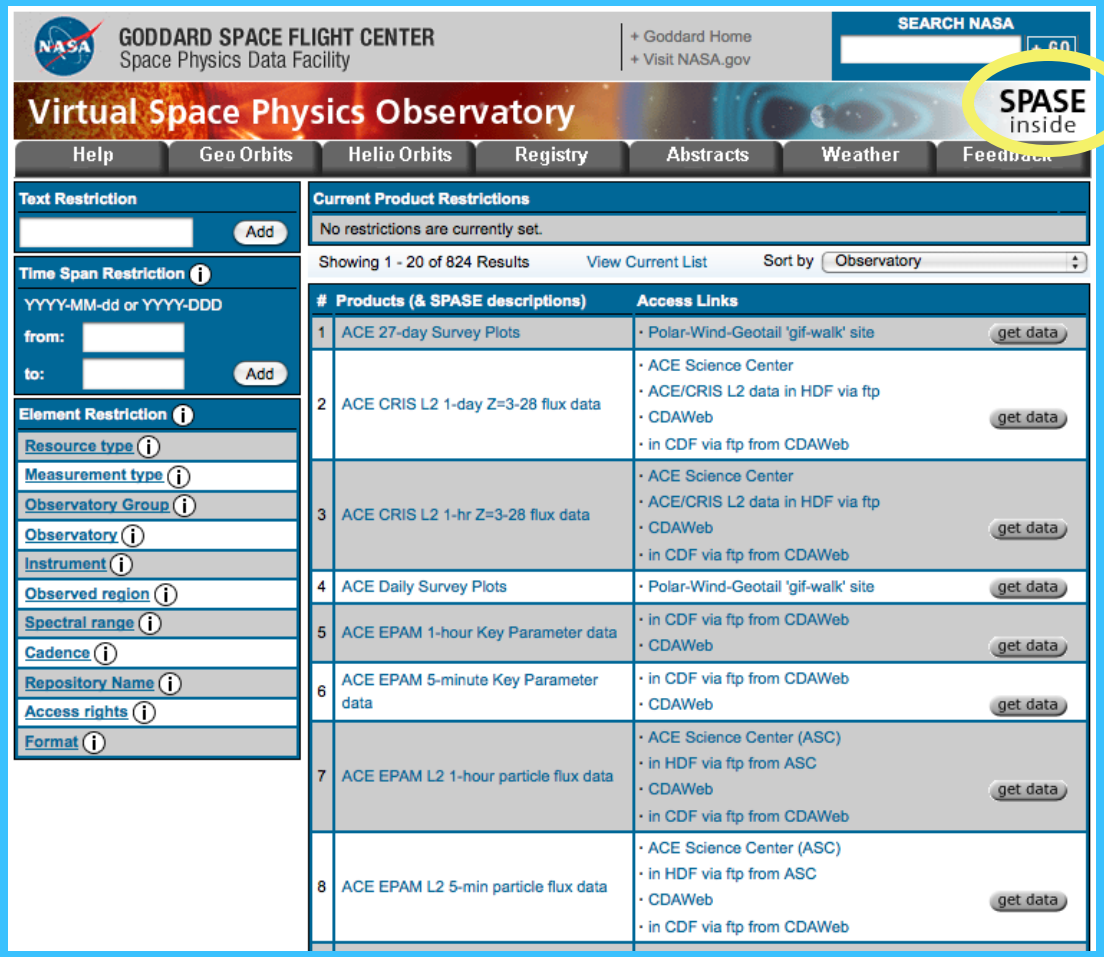
Version 2.2.1 of the Data Model is the current version and can be downloaded from here.

http://spase-group.org

SPASE Information Model



Virtual Space Physics Observatory



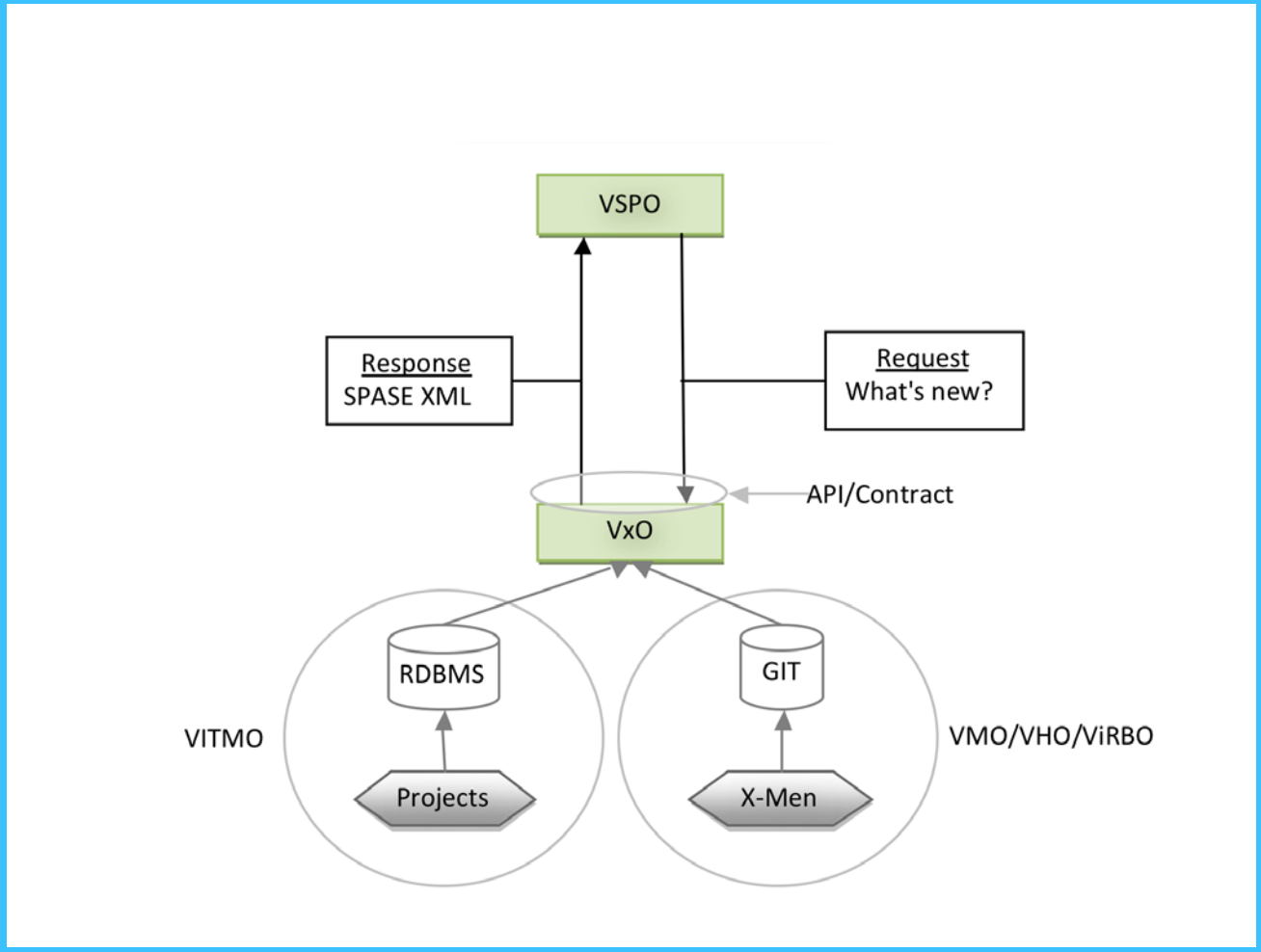
FEATURES

- Contains all SPASE data set descriptions
- Uses SPASE terminology for search keywords
- Provides data access through "get data" links
- Queries easily modified
- Can ingest XML-based SPASE descriptions

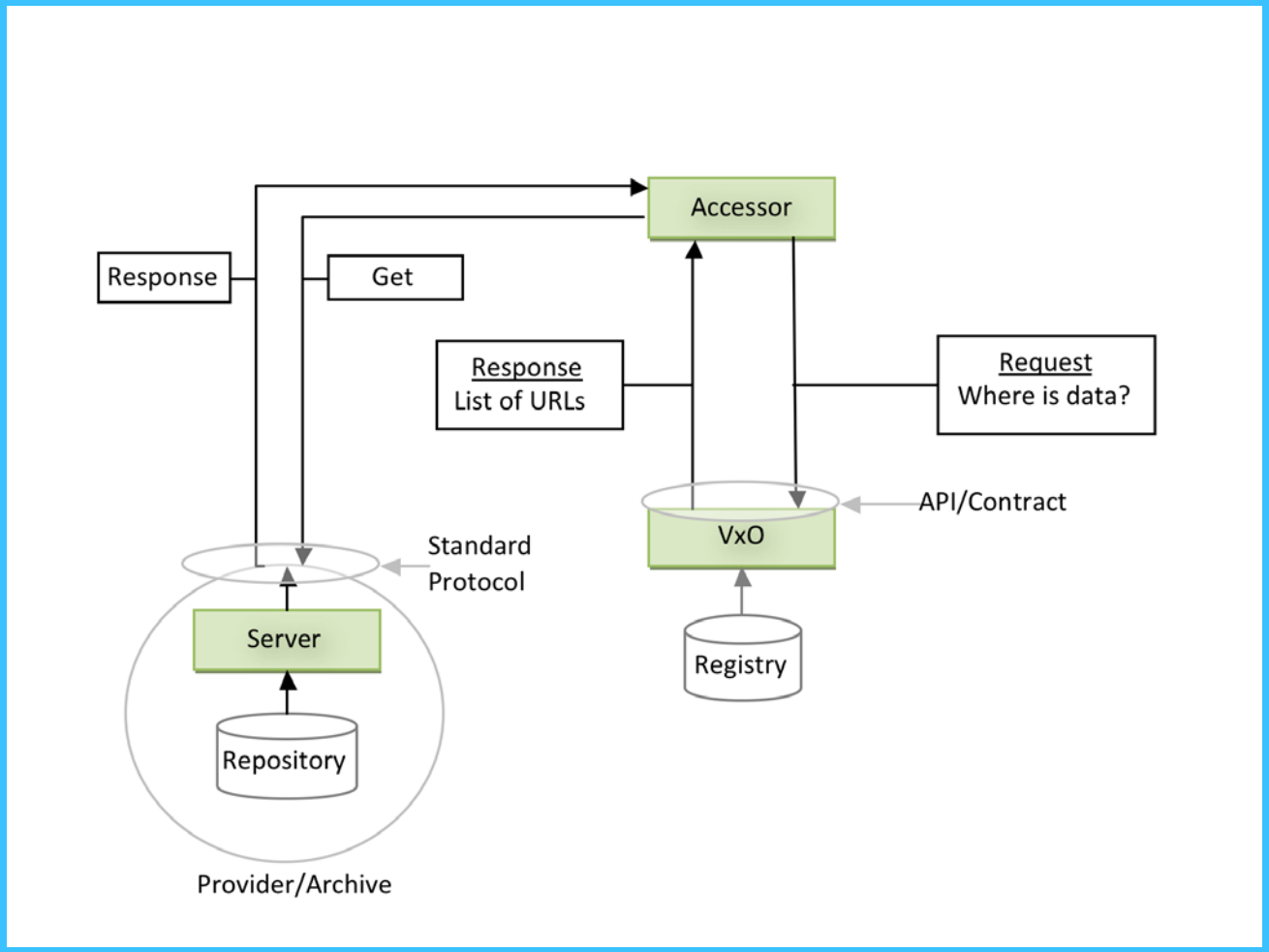
http://vspo.gsfc.nasa.gov/websearch/dispatcher

or google "VSPO"

Harvesting


VSPO
Response
SPASE XML
Request
What's new?
API/Contract
VxO
RDBMS
GIT
VITMO
VMO/VHO/ViRBO
Projects
X-Men

Data Extract



The Human Factor

The use of SPASE depends, of course, on the willingness of the data holders to describe their data via SPASE.

It is human nature to avoid writing data descriptions.

Simple, high-level descriptions are often sufficient for the purpose.

More detailed descriptions are better for the researcher, so many tools have been created to make data descriptions and the use of them easier to do.

Application Tools

Tools for working with SPASE metadata and the SPASE framework.

Generator

Create SPASE descriptions using external sources of information

Ruleset Description Generator

Editor

Web-based Editors

Web Editor

Standalone Editors

SPASE Assistant

Editors with Database Storage

Web+DB Editor

Validator

Determines compliance with a version of the SPASE data model.

XML Validate

Parser

Convert SPASE XML to internal structures

Parser

Harvester

Extracts information from SPASE resource descriptions (or registries)

SPASE Registry Server

SPASE Database Query

Wrapper

Converts or embeds SPASE metadata in other descriptions or forms (i.e., OAI)

Data Dictionary Lookup

SPASE-to-OAI mapping

Correlator

Divide an XML document into individual resource descriptions into a well organized file system

Correlator

Refcheck

Determine the validity of all references in a resource descriptions. Checks Resource IDs and URL

Refcheck

There are additional tools in development:

SPASE Query Language

Java-to-XML Binding Mechanism (JAXB)

SPASE Guidelines Document

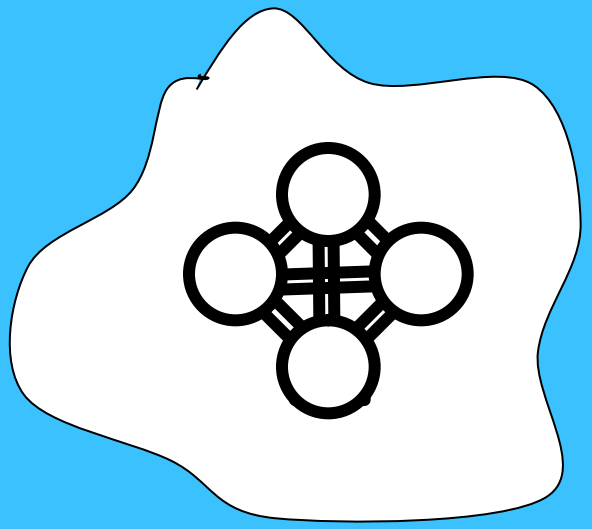
Is Level 4 in the Clouds?

Level 4 Interoperability – indistinguishable from a single all-encompassing system.

Is this achievable?

Is this “the cloud”?

Is this desirable?



Summary

- The Heliophysics Data Environment is historically diverse and widespread, but is being unified
- SPASE provides a standard metadata approach toward unification
- Creation of SPASE data descriptions is key to progress
- Utility of SPASE tools can greatly influence success
- Will cloud computing be a step toward further unification?