A Space Physics Archive Search & Exchange (SPASE) for Data Finding, Comparison, and Retrieval

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OUTLINE

What is SPASE?
Objectives
Participating Groups
System Elements
Steps to Completion
Summary

WHAT IS SPASE?

FORMAL NAME - SPASE

What was:

Space Physics Archive Search Engine or is now:

Space Physics Archive Search & Exchange To emphasize not just search capabilities, but also <u>data retrieval.</u>

SPASE OBJECTIVES

The main objective is to promote collaboration and coordination of archiving activity for the Space Physics community.

- ➢ Build a system that meets the global Space Physics User Requirements.
- Facilitate the circulation of related scientific and technical information.
- Facilitate the (two-way) interface with international technical standards and development organizations.
- Avoid duplication of effort between geographically distant archiving centers.
- Ensure the compatibility of the architectures used for the global distributed system and as many of the individual data centers as possible.
- Reduce costs by development of a system that
 - uses widely approved technical standards,
 - is easy to maintain (both globally, and in each archiving center),
 - can easily evolve so as to profit from future technological developments,
 - can be interfaced with the systems of adjacent disciplines and, hopefully one day, with a global system.

SPACE PHYSICS DATA NEEDS

Cross Archive Search Capability

Common Data Dictionary/Terminology

Easy Method of Data Intercomparison

Rapid Retrieval of Data of Interest

WHY NOT JUST USE WEB BROWSERS AND LINK LISTS?

- Hundreds of links are applicable
- Difficult for any one group to maintain
- Data information differs at each site
- Data access methods must be learned for each data provider
- No easy method of comparing data from differing sites
- No common method of acquiring data

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SPASE CONSTRAINTS

- Search and retrieval must work with data centers current search systems and data formats
- Effort necessary for data centers or even individual data holders to be included in SPASE must be minimal

The data must be freely available to the community (some data may be proprietary for an initial period)

P RESENT PARTICIPANTS

- CNES/CNSR Plasma Physics (CDPP) Data Archive
- NASA/National Space Science Data Center
- Planetary Data System- UCLA Plasma Physics (IGPP) Node
- Planetary Data System- Technology Group
- Rutherford Appleton Laboratory
- Southwest Research Institute



Council for the Central Laboratory of the Research Councils



CIRC







Centre de Données



de la Physique des Plasmas

SOUTHWEST RESEARCH INSTITUTE VIRTUAL INSTRUMENT FILE BROWSER

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SPACE PHYSICS APPROACH

To enable cross system searching in Space Physics we must adopt: > a common search and retrieval protocol > a common terminology The terminology must be mapped to the terms used by each individual system.

TERMINOLOGY COMPARISON

		•		Search System	Attribute Comp		
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1		NMD	NMC	PDS	SvRI	Astrobrowse	
2							
3	Spacecraft	Source	Spacecraft	Instrument_Host_Name			
4				Instrument_Host_Type			
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6	Instrument	Sensor	Experiment	Instrument_Name			
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STEPS TO COMPLETION

- Step 1a Simple cross-system searches enabled by spacecraft, experiment and time with link to data center for requesting data
- Step 1b Develop a common data dictionary/terminology
- Step 2 Search by location, parameter measured, instrument type, etc. with link to data center for requesting data
- Step 3 Information from searches on whole data sets or subsets of the data can be sorted according to criteria of interest and directly ordered
- Step 4 Search can be set to order only data sets or parts of data sets that follow a given search rule

POTENTIAL TECHNOLOGY U SAGE

A number of data system technologies are being considered for use with SPASE, standard items as well as systems already developed from standards:

- XML
- SOAP
- OODT
- DITDOS

EXAMPLE: OODT USE IN PDS-D (Distribution)

- Challenge: To integrate a collection of resources and provide seamless access to distributed data repositories
- Solution: A system that is fully functional, operationally reliable and extensible, and is capable of:
 - Adapting to mission(s) having more complex payloads and significantly larger data volumes.
 - Adapting to not yet compliant PDS data sets.
 - Providing unified web based search-and-retrieval user interface to novice and sophisticated users.
 - Using Internet as the primary method of data distribution.
 - Supporting real time (on demand) distribution of data to users.
 - Provide ability for users to subscribe for notification of released data.

PDS-D What was done

Implemented a multi-tiered information architecture

- Application Clients (Browsers/Interfaces)
- Middleware Object Oriented Data Technology (OODT)
- Data and Metadata Servers (product server, profile server)
- Data Repositories and Catalogs

Simplified and standardized system interfaces through middleware

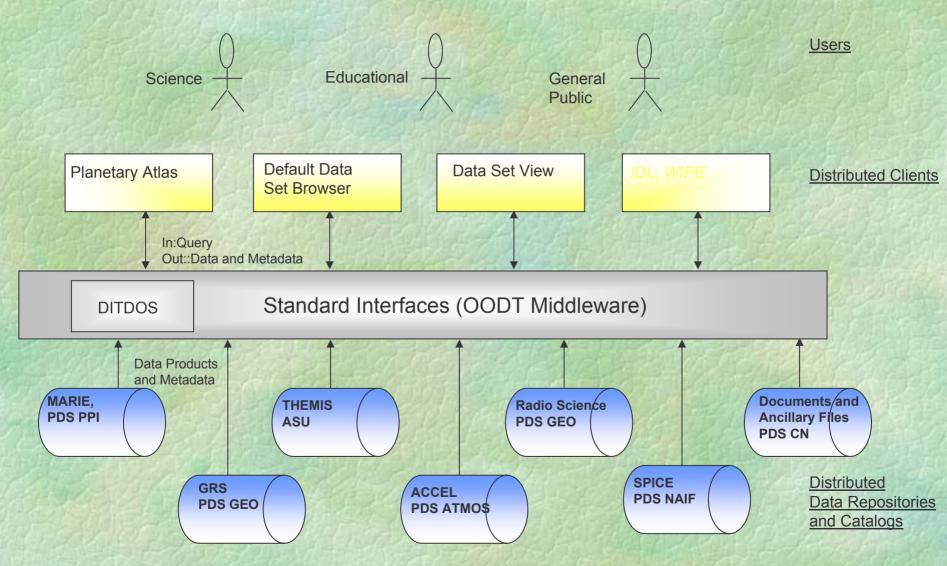
Subsystems but hide heterogeneity

- User Interfaces (Atlas, DITDOS)
- Data repositories (disk farms)
- Catalog databases (Sybase, Gatesware,...)
- Remained geographically distributed and locally managed

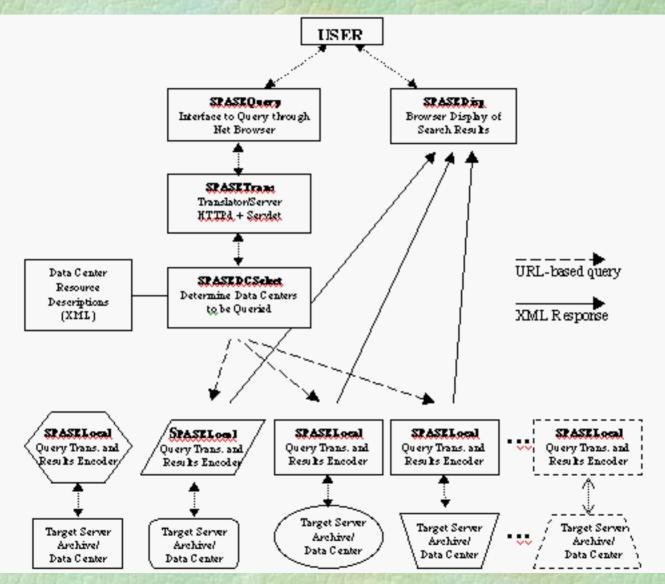
Separated Data Architecture from Technology Architecture

- Used archive *metadata* to its full potential
- Evolved technology architecture

PDS-D APPROACH (MARS ODYSSEY)



SPASE SYSTEM ELEMENTS EXAMPLE ARCHITECTURE



SUMMARY

- The Space Physics Archive Search & Exchange (SPASE) is being developed by CDPP, NSSDC, PDS, RAL, and SwRI
- Common architecture and terminology approaches are being prototyped
- Data set search and information about available data sets will be provided first
- Intercomparison of data sets and elements of data sets is a later phase
- Direct retrieval of comparable data of interest from multiple sites is the final phase
- Other space physics data holders are welcome to join the effort

Background Information

NSSDC MASTER CATALOG

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	NASA Goddard Space Flight Center Greenbelt, MD 2077, USA
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Description

IMP 8 (Explorer 50), the last satellite of the IMP series, was a drum-shaped spacecraft, 135.6 cm across and 157.4 cm high, instrumented for interplanetary and magnetotail studies of cosmic rays, energetic solar particles, plasma, and electric and magnetic fields. Its initial orbit was more elliptical than intended, with apogee and perigee distances of about 45 and 25 earth radii. Its eccentricity decreased after launch. Its orbital inclination varied between 0 deg and about 55 deg with a periodicity of several years. The spacecraft spin axis was normal to the ecliptic plane, and the spin rate was 23 rpm. The

data telemetry rate was 1600 bps. The spacecraft was in the solar wind for 7 to 8 days of every 12.5 day orbit. Telemetry coverage was 90% in the early years, but only 60-70% through most of the 1980's and early 1990's. The objectives of the extended IMP-8 operations were to provide solar wind parameters as input for magnetospheric studies and as a 1-AU baseline for deep space studies, and to continue solar cycle variation studies with a single set of well-calibrated and understood instruments.

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Discipline(s)

NSSDC MASTER CATALOG (cont.)

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ASTROBROWSE

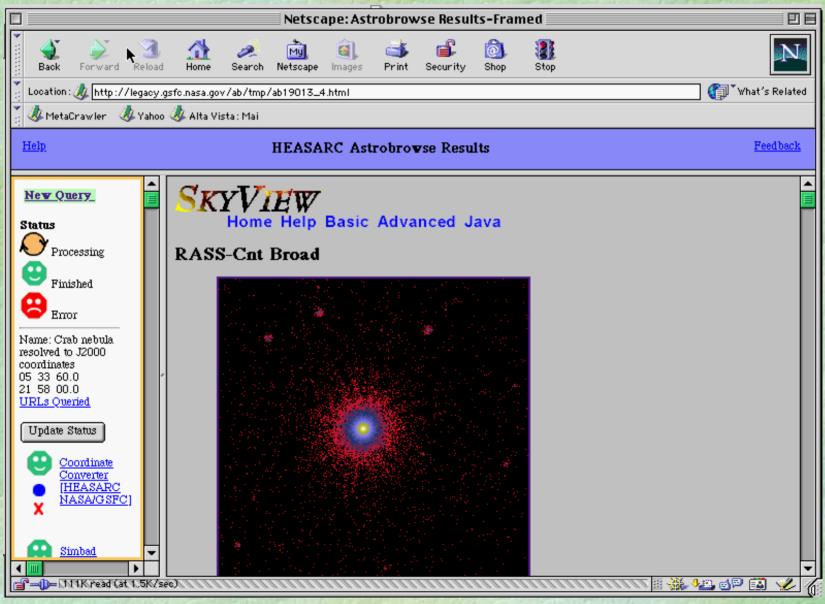
Permits search for astronomy data by:
 Object location (RA/Dec)
 Object name (lookup translation to location)
 Object search is done at all or selected data centers

Results are displayed in a common interface and often include the actual images or other data of interest

ASTROBROWSE INTERFACE

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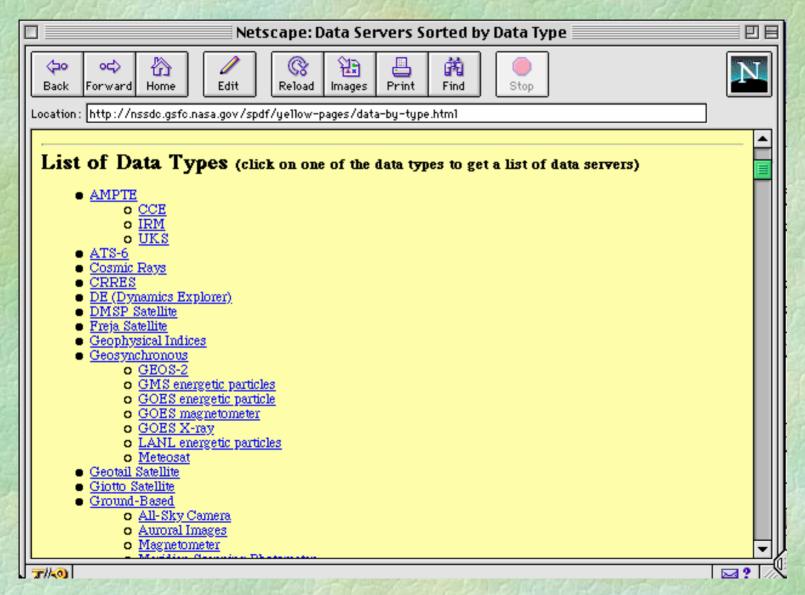
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	Keyword	Values			
	LOCATION	AURORAL ZONE COMET GIACOBINI-ZINNE CUSP EQUATORIAL IONOSPHERE FORESHOCK HIGH LATITUDE IONOSPH			
	PARAMETERS GROUP	CHARGED PARTICLES MAGNETIC AND ELECTRIC RADIANCE AND IMAGERY SPACECRAFT	FIELDS		
		COMPOSITION CROSS-SPECTRA DIFFERENTIAL FLIP		田 送 4	▼ ■ 619 = 11

MAGNETOSPHERIC YELLOW PAGES



TERMINOLOGY COMPARISON -IN TERLINGUA

DISCIPLINE SPACE PHYSICS, CONCEPT = LOCATION

(Column 2 needs to be improved, its shown here for "the idea")

ID	Definition	CDPP	NSSDC	SwRI
401 010 0	Location = Solar Wind	Solar Wind		Interplanetary Medium
401 010 1	Location = Interplanetary	Interplanetary (Deep Space)	Interplanetary (deep space)	
401 010 2	Location = Interplanetary	Interplanetary (Near Earth)	Interplanetary (near Earth)	
401	Location = Foreshock	Foreshock		
010 5				
	Location = Magnetosphere > Bow shock			Magnetosphere > Bow Shock
401 030 0	Location = Magnetosheath	Magnetosheath		Magnetosphere > Magnetosheath

SPACE PHYSICS DATA AVAILABILITY CATALOG

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kont	- 1	hysics Data Availab Mission Overview M	latrix	Catalog
	Mission	PS/PI	Home Page	Contact Info on Home Page?
	ACE	Edward C. Stone	<u>Y</u>	Y
	AMPTE/CCE	S. M. Krimigis	<u>Y</u>	N
	DE	Robert Hoffman	<u>¥</u>	N
	FAST	Charles W. Carlson	<u>¥</u>	Y
	<u>GEOTAIL</u>	Don Fairfield (NASA), A. Nishida (ISAS)	<u>¥</u>	Y
	GGS Geosynchronous Investigations	Don Fairfield (NASA)	<u>¥</u>	Y
	GGS Ground-Based Investigations	Steven Curtis (NASA)	<u>¥</u>	Y
	IMP-8	Joseph King	<u>¥</u>	Y
	ISEE 1	Keith W. Ogilvie	<u>¥</u>	Y
	ISEE 2	Keith W. Ogilvie	<u>¥</u>	Y
	ISEE 3 / ICE	Keith W. Ogilvie	<u>¥</u>	Y
	ISIS	John Jackson	<u>¥</u>	N
	ISTP	Mario Acuna	<u>¥</u>	Y
	POLAR	Robert Hoffman (& Mario Acuna for ISTP)	<u>Y</u>	Y
	POLAR			
	Pioneer 10/11	Palmer Dyal	<u>¥</u>	N
		Palmer Dyal Glenn M. Mason	<u>⊻</u> ⊻	<u> </u>
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