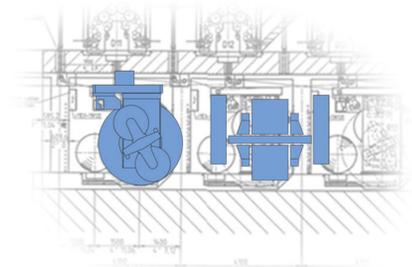




# Implementing a Virtual Observatory: Models, Frameworks and Tools



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## The Origins

Hypertext (Nelson 1970)  
HTTP (Berners-Lee 1990)  
Graphical Browser (Andreesen, 1993)  
Virtual Observatory (NVO, 2000)

## Community Interest

Navigating today's Space Physics data environment feels like you've been dropped into Escher's "Relativity".



## Five Biggest Complaints

- 1) I know the data is available, but I can't find it.
- 2) The data format is not what I need.
- 3) The cadence is different than what I need.
- 4) The data system limits how much I can download.
- 5) I have to download each granule one at a time. Why can't I get it all at once?

There must be a better way.

...and its called a  
Virtual Observatory

## What it Takes to Build a Virtual Observatory

- Definition of the domain
- Dictionary of terms
- Ontology of objects
- Documentation Standards
- Services
  - Search
  - Retrieval
  - Rendering
- Ubiquitous Access

Scope

Data Model

Expressive Form

System Model

Enabling Technology

- ...but its got be easy to
- Generate descriptions
  - Add to inventory
  - Search inventory
  - Perform task patterns

Tools

## What We Have

### Heliophysics

Data Model: SPASE  
 Expressive Form: XML  
 System Model: Repository, Registry  
                   Access Points  
 Enabling Technology: HTTP, FTP, Browsers  
 Tools: Parsers, Validator,  
        Generator (Rulesets, Assistant, Web Editor),  
        Transformation (with XSLT),  
        Harvesters, Registry Server

**We need: More deployment, more integration, standardized services.**

### Planetary

Data Model: PDS (IPDA)  
 Expressive Form: ODL  
 System Model: Discipline Nodes  
                   Product Server,  
                   Profile Server  
 Enabling Technology: HTTP, FTP, Browsers  
                           OODT (RMI, CORBA)  
 Tools: Parsers, Validator,  
        Node specific Generators

**We need: More tools, broader framework.**

## What We've Learned

- Design:** It takes 2-3 years to develop a community based data model.
- Clarity:** It takes broad usage over time to refine the data model.
- Development:** It takes infrastructure investment to make virtual observatories a reality.
- Deployment:** Tools are critical to providers and users.

