# The first steps of
THE HELIOPHYSICS INTEGRATED OBSERVATORY
Creating an information space for solar system scientists

What is HELIO?
HELIO is an e-Infrastructure implementing a collaborative environment where scientists can discover, understand and model the connection between solar phenomena, interplanetary disturbances and their effects on the planets.
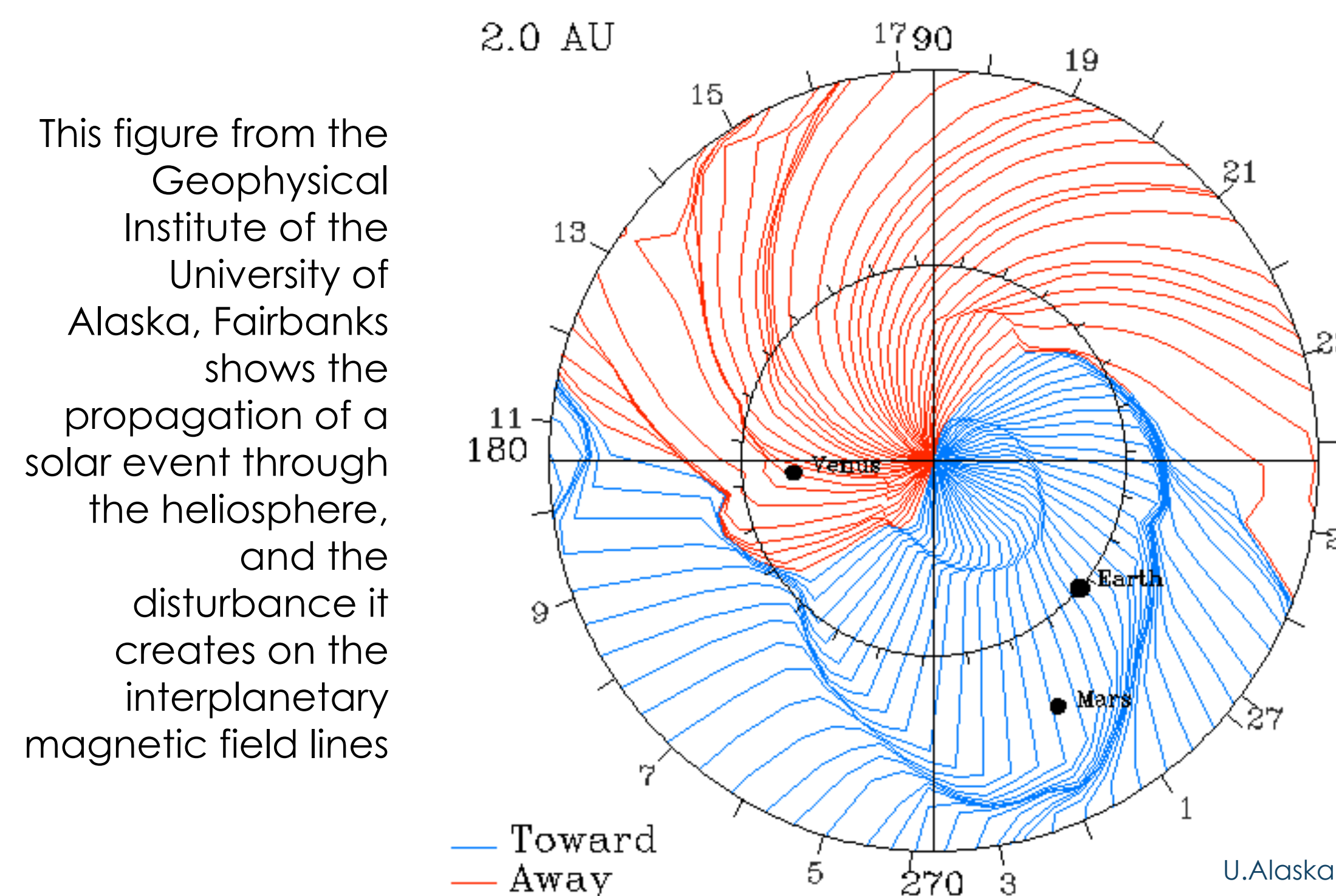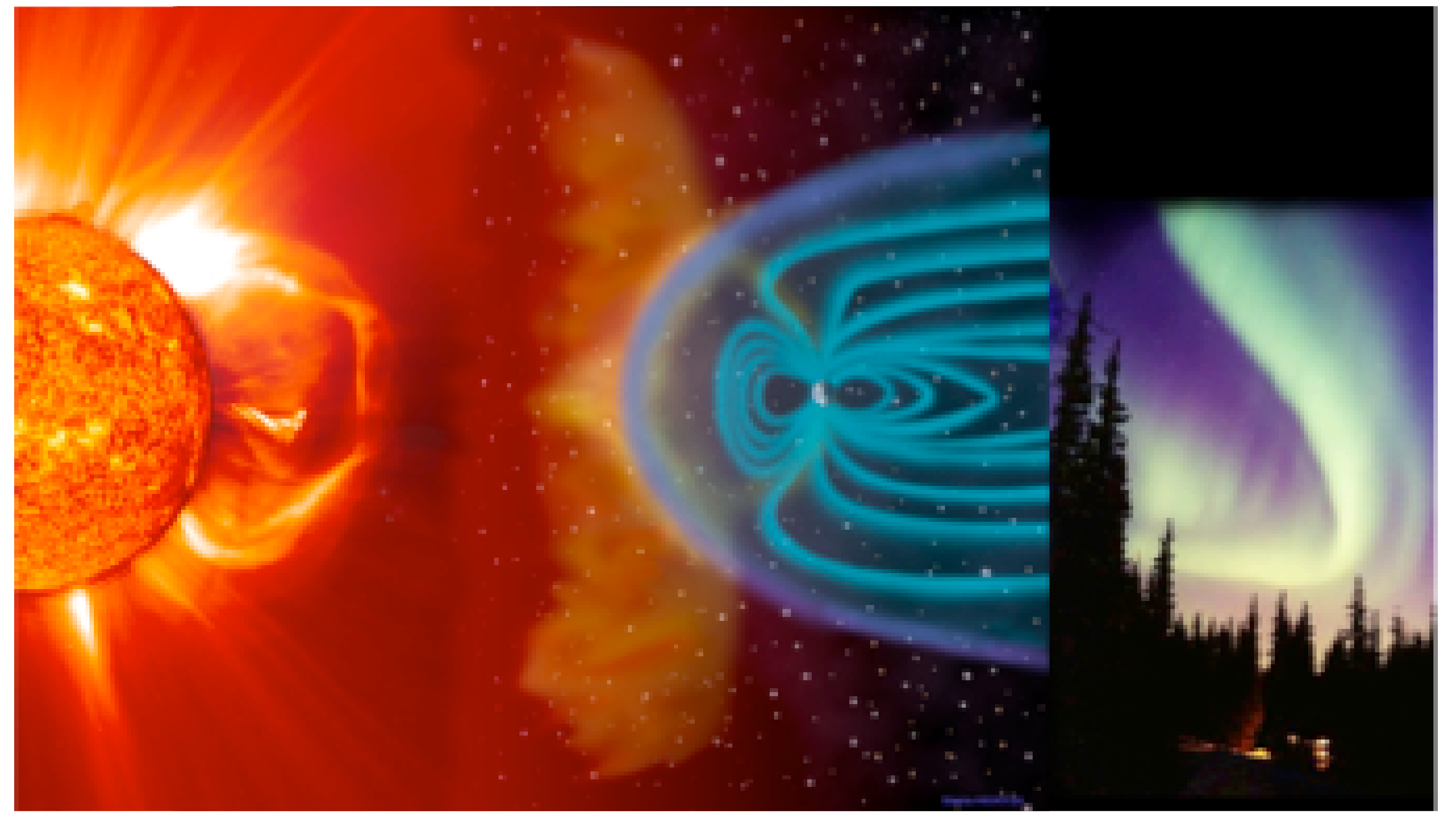
This figure from the Geophysical Institute of the University of Alaska, Fairbanks shows the propagation of a solar event through the heliosphere, and the disturbance it creates on the interplanetary magnetic field lines

What technologies are involved? Service Oriented Architecture, Workflows, Registries

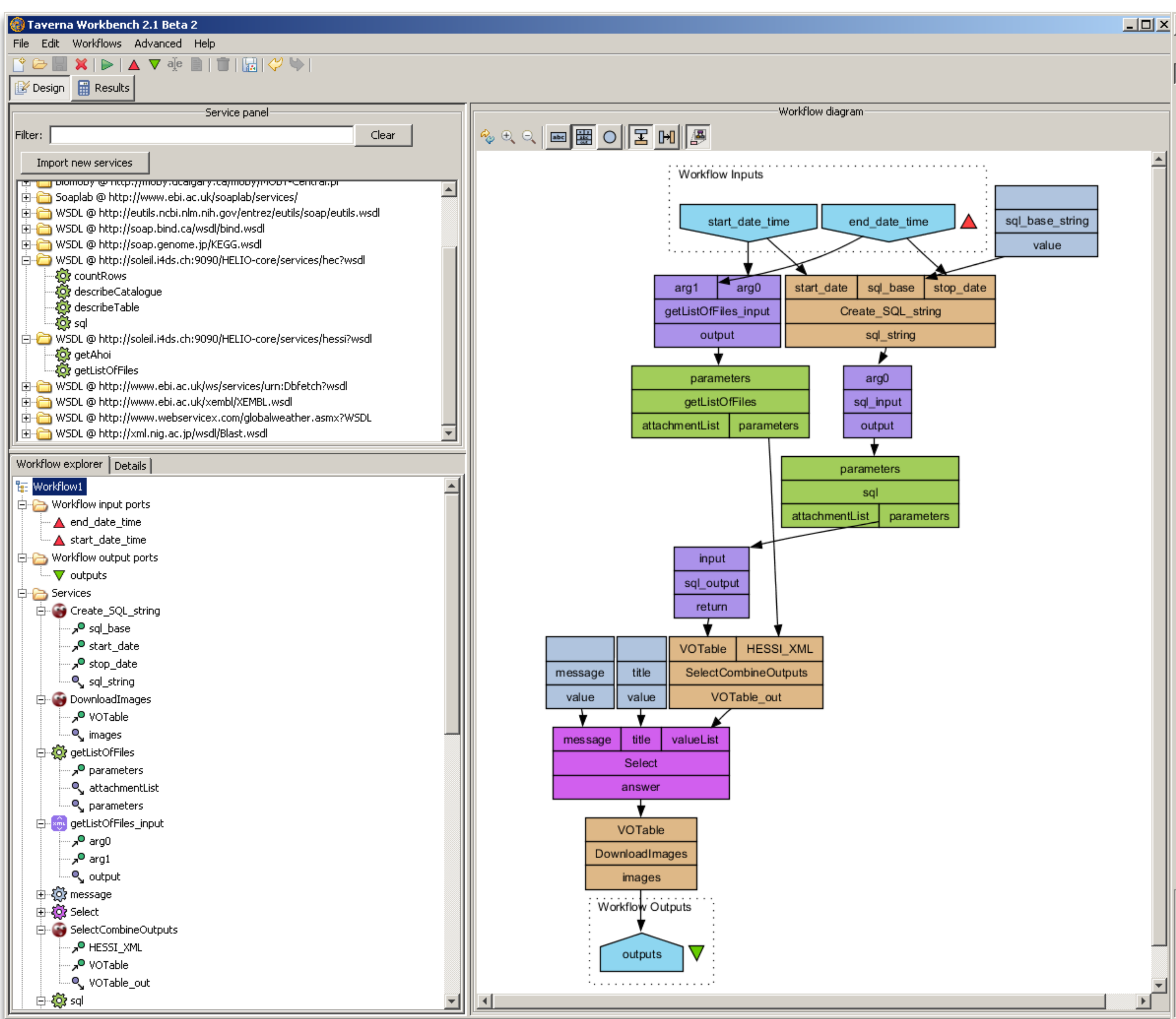### A Service-Oriented Architecture means services, lots of them!

Services to review suitable observations

Heliophysics Event Catalogue (HEC)	Maintains and provides access to event data from all domains
Heliophysics Feature Catalogue (HFC)	Maintains and provides access to feature data from all domains
MetaData Evaluation Service (MDES)	Allows the user to create auxiliary lists based on a *newly-derived* parameters
Context Service (CXS)	Provide context information to help the user make a selection
Ancillary Information Service (AIS)	Provide integrated access to external resources that do not conform to HELIO interface standards
Data Provider Access Service (DPAS)	Provide integrated access to data archives in all domains no matter how the data are stored or accessed

Instrument Capabilities Service (ICS)	Match required observation type to one or more instruments (each part of an observatory)
Instrument Location Service (ILS)	Determine the location of an instrument (part of an observatory) at a specified time
Observation Coverage Service (OCS)	Provide information on whether an instrument was making suitable observations at a specified time

Services to discover data
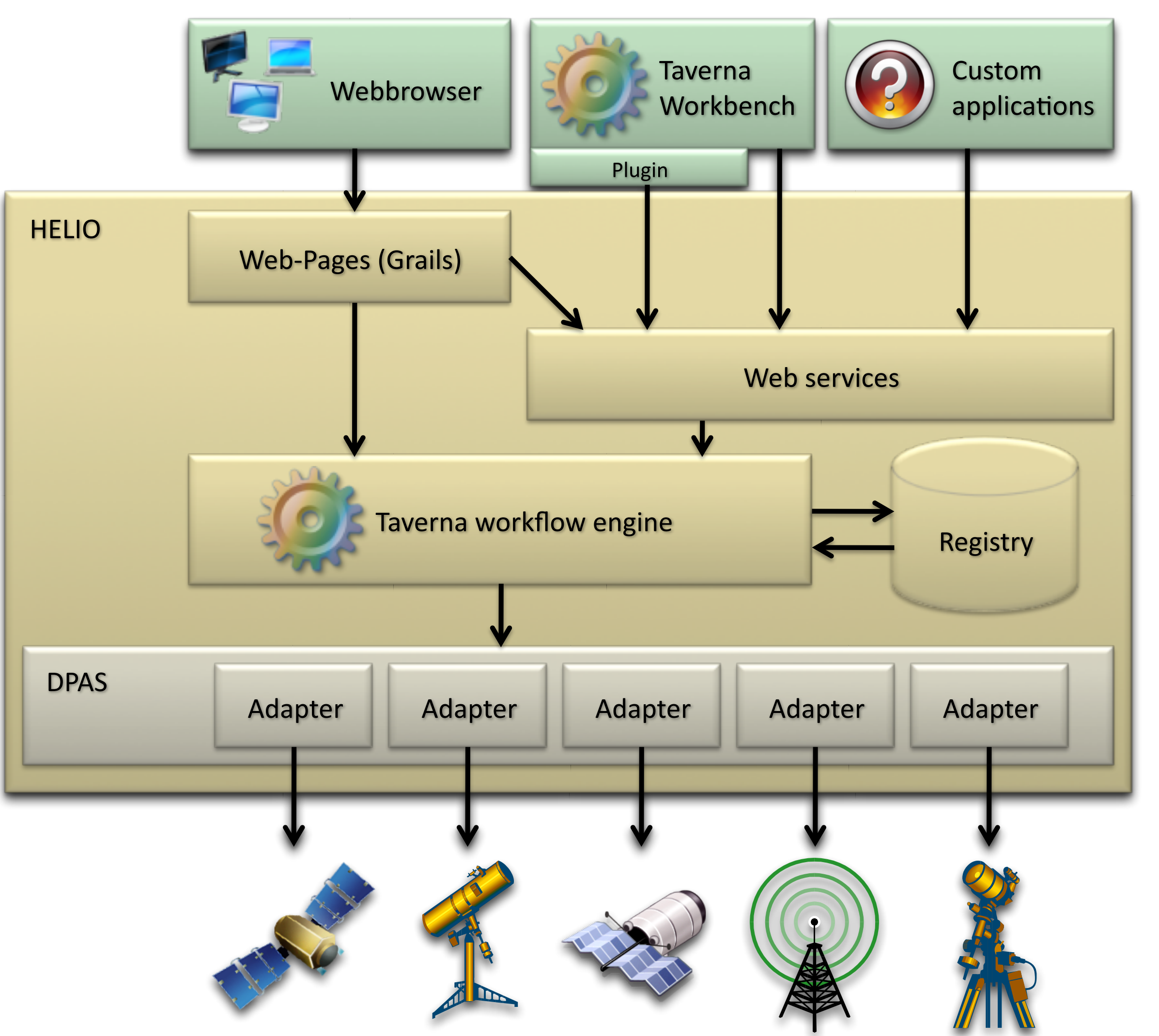
Services to add value to the data

Processing Service	Support processing on demand
Storage Service	Provide storage for user information
Coordinate Transformation Service	Translated between the different coordinate systems used by the communities
Semantic Mapping Service (SMS)	Maps terms used in the metadata from the different communities
HELIO Registry Service (HRS)	Maintain and provide access to a registry that describes the services available
HELIO Monitoring Service (HMS)	Keeps track of the status and performance of the services that the HRS knows about
Community Interaction Service (CIS)	Manages interactions with the community, including authentication and usage statistics

Services can be used individually or orchestrated through a workflow capability, such as the Taverna Workbench

The web services provided by HELIO as seen in the workbench

The workflow discovery panel showing the parameters of the workflow

The first HELIO workflow: Study flares observed in hard X-rays (RHESSI) and in radio waves (a specific Ground Based Observatory)

How is it implemented? We use an agile software development process, starting with a very simple infrastructure, adding more functionality in small but frequent iterations.

The first steps: an initial infrastructure covering a specific workflow

This figure shows the components necessary to execute our first workflow through a web interface. Taverna is embedded in a Spring container. The Data Provider Access Service is the component that enables a standard connection with the data providers.

Coming soon: Semantic-driven approach based on an ontology derived from existing data models.

A. Csillaghy (1), R.D. Bentley (2), S. Felix (1), A. LeBlanc (3), and the HELIO team
(1)Institute of 4D Technologies, University of Applied Sciences North Western Switzerland,
(2) Mullard Space Sciences Laboratory, University College London,
(3) Dept. of Computer Science, University of Manchester

CAPACITIES   www.helio-vo.eu