Heliophysics Integrated Observatory

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Instrument Capabilities Service User Manual

Version 0.1

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1. Introduction

The Instrument Capabilities Service (ICS) was created as a helper service to enable more precise data requests to the Data Provider Access Service (DPAS). The ICS allows a client to determine which instruments are capable of viewing any particular event. The ICS implements the Helio Query Interface (HQI) and provides both SOAP and Resful search capabilities.

1.1. Suggested Reading

To build the service	
Helio Interface Specification	Service Interface Specification.docx
Helio API	Helio API
VOTable	http://www.ivoa.net/Documents/VOTable/20091130/
Java (compile service)	http://www.oracle.com/technetwork/java/javase/overview/index.html
SOAP + WSDL (web service definition)	http://www.w3.org/TR/wsdl (or use a plug-in to your development environment)
Restful Services	http://en.wikipedia.org/wiki/Representational_state_transfer
ICS Database Design	Helio_ICS_ILSDBStructure.doc

2. Use

The ICS service has several methods of access to query on the data and obtain results. ICS by default responds in an XML IVOA Votable format. The ICS response requires the client ot query on a particular table located in a relational database. A client may do simple time based queries or more complex queries to obtain the needed results. Access to the ICS service are described in the following sections:

2.1. Helio Front End

The most common to interact with all Helio services including the ICS is the standard Front End produced by Helio.

Access to the Front end can access with the provided link: http://helio.i4ds.technik.fhnw.ch/Helio-dev/

See Figure 1 for a screen shot of the Helio Front End with a particular link marked to access the ICS service.

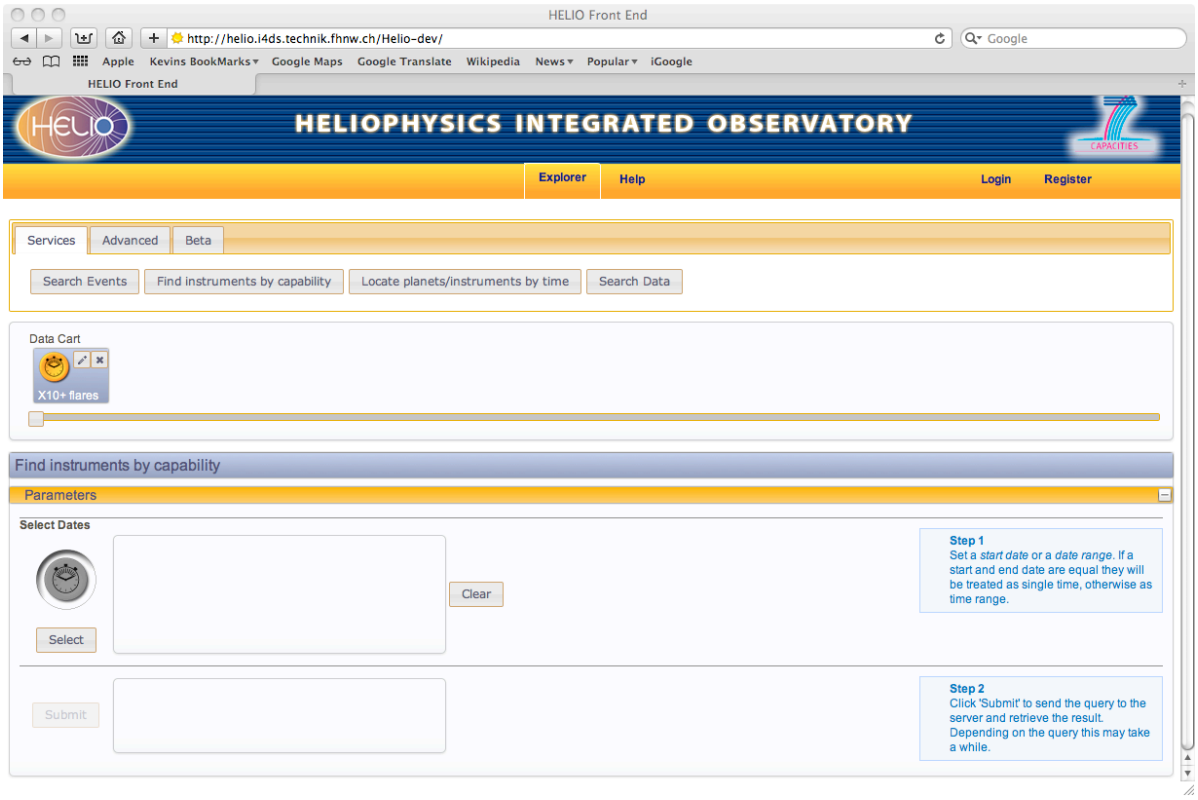

Fig 1. Helio Front-End

2.1.1. Testing Website

A website to test the individual services was produced and a specific ICS entry can be found here:
http://www.helio-vo.eu/services/interfaces/helio-ics_ui9.php

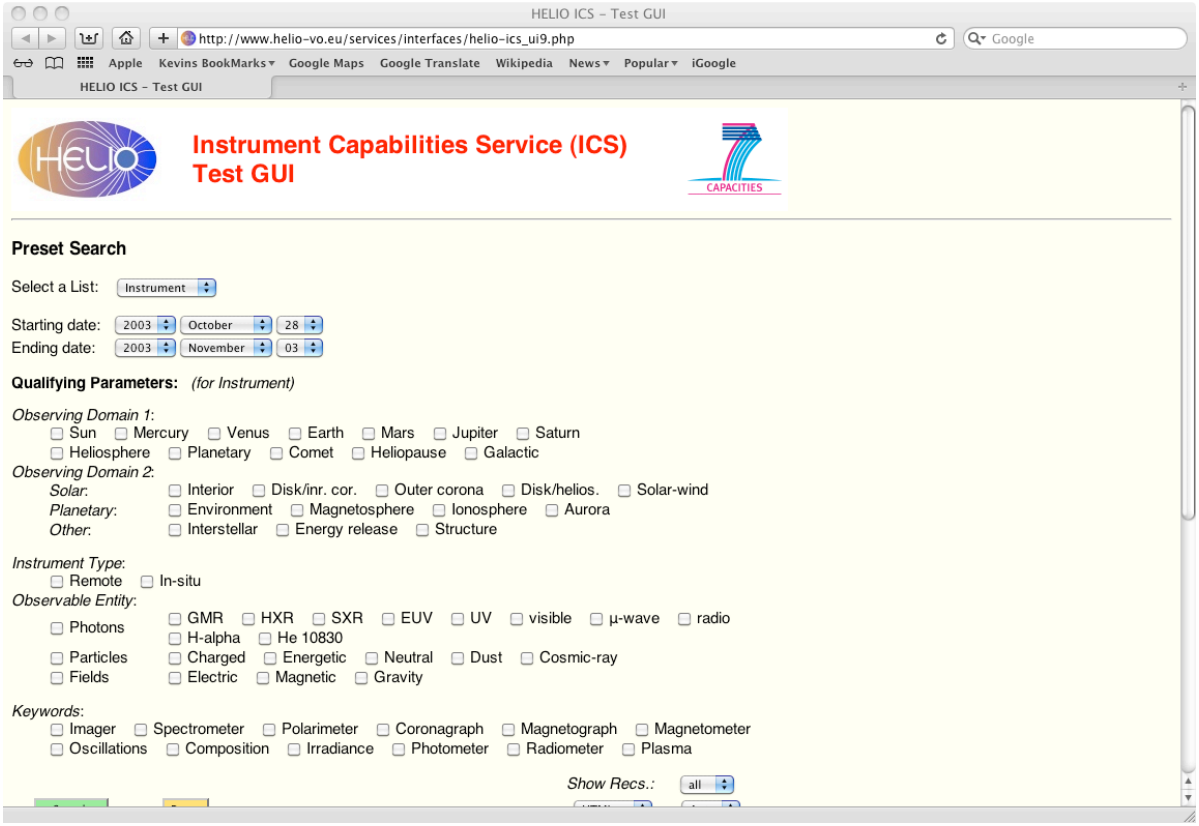

Fig 2. Helio Front End ICS Search page.

2.2. Helio API

Helio Application Programmers Interface is a full API to access many of the Helio services in both Java and IDL. See the Helio API documentation.

2.3. Restful Service

Standard wget, curl, or even a standard web browser can be used to query the ICS. See the DBStructure and Interface Specification documents for detailed querying and available fields to be queried on.
Common Time based query is shown below:

http://mssllkz.mssl.ucl.ac.uk/helio-ics/HelioQueryService?STARTTIME=2009-10-15T20:30:56&ENDTIME=2009-10-20T20:30:56&FROM=instrument_observatory

2.4. SOAP

Several programming languages allow the reading of a WSDL (Web Service Description Language). Primary ICS location wsdl can be found here:
http://mssllkz.mssl.ucl.ac.uk/helio-ics/HelioService1_0?wsdl

2.4.1. Java

Java contains an application called ‘wsimport’ that allows the client to give a url or filename of a WSDL.

2.4.2. Perl

Perl provides two libraries for interactions with SOAP

- SOAP::Light
- SOAP::WSDL

2.4.3. IDL

There is no add-on or library to enable SOAP in IDL. Users would have to create there own SOAP calls.

3. Functionality

Details of the SOAP and Restful interfaces along with parameters are detailed in the Interface Specification. Below is a brief summary of the SOAP interface. The parameters below can also be used on the Restful services.

3.1. Time Query

Common time query frequently used on the ICS.

3.1.1. Inputs (taken from 2.6 of Interface Specification)

- STARTTIME - ISO8601 input Start Time and End Time. YYYY-MM-dd['T'HH:mm:ss[SSS]]
- ENDTIME - ISO8601 input Start Time and End Time. YYYY-MM-dd['T'HH:mm:ss[SSS]]
    - Both start time and end time can have one or array of values; the output response will have data for multiple time(includes start time and end time). Remember MAXRECORDS value is applicable for each pair of start and end time. For example MAXRECORDS=10 and start and end time has 2 pair of value. Votable returned will have 2 tables having 10 records each.
- TIME – Not used by the Helio interface, but defined in the PQL Generic Dataset section. This parameter is best described as STARTTIME/ENDTIME ISO8601 format separated by a '/'.
- **FROM** – Table or Instrument name to query on, one or many tables can be queried; each table name should be separated by comma.

3.1.2. Query

'Query' interface part of the HQI allows more complex queries, it contains all the inputs as a 'TimeQuery' with the added inputs of:

3.1.3. Inputs

- SELECT – specify the returned columns. See section 2.7.2 of the Interface Specification.
- WHERE – See section 2.7.3 of the Interface Specification Document.

3.2. SQLSelect

'SQLSelect' interface is similar to the 'Query' interface, but allows direct SQL where clauses for the WHERE parameter. This is not available for all services, but is available for services that are connected to relational databases i.e. ICS.

3.3. GetTableNames

No Inputs are needed for the GetTableNames interface method and reports all the table names that are connected to the ICS.

3.4. GetFieldNames

Return all the field (or column) information known about a particular table.

3.4.1. Inputs

TableName – String containing a particular table name.

4. VOTable

Outputs of the HQI service including ICS and ILS will contain a IVOA Votable format to describe the returned data. VOTable specification can be found here: http://www.ivoa.net/Documents/VOTable/20091130/

All interfaces to the HQI receive a VOTable format that is normally parsed to be more pleasing to the end-user, though the passing between services is typically a VOTable.

See Helio Query Interface Specification (sections 2.9 and 2.10) for more detailed description of the response of the HQI interface.

4.1. Sample

Below is a smaller version of the Restful Votable result given in section 2.3:
http://msslkz.mssl.ucl.ac.uk/helio-ics/HelioQueryService?STARTTIME=2009-10-15T20:30:56&ENDTIME=2009-10-20T20:30:56&FROM=instrument_observatory

A common easy to use tool used by scientist to process Votables is TopCat and Stilts.
TopCat is a popular GUI version that uses stilts:
http://www.star.bristol.ac.uk/~mbt/topcat/
http://www.star.bris.ac.uk/~mbt/stilts/

Sample:

```
<VOTABLE version='1.1' xmlns="http://www.ivoa.net/xml/VOTable/v1.1">
<RESOURCE>
<DESCRIPTION>Helio ICS time based query</DESCRIPTION> <INFO
name="QUERY_STATUS" value="OK"/>
<INFO name="EXECUTED_AT" value="2012-06-29 14:32:38"/> <INFO
name="MAX_RECORD_ALLOWED" value="5000"/>
<INFO name="QUERY_STRING" >
<![CDATA[SELECT
instrument_observatory.name,instrument_observatory.observatory_name,instru
ment_observatory.obsinst_key,instrument_observatory.experiment_id,instrume
nt_observatory.time_start,instrument_observatory.time_end,instrument_obser
vatory.longname,instrument_observatory.inst_type,instrument_observatory.in
st_od1,instrument_observatory.inst_od2,instrument_observatory.inst_oe1,ins
trument_observatory.inst_oe2,instrument_observatory.inst_fd,instrument_obs
ervatory.inst_nd,instrument_observatory.group_name,instrument_observatory.
net_key,instrument_observatory.keywords,instrument_observatory.obs_name,in
```

```
strument_observatory.loc_gen,instrument_observatory.loc_p1,instrument_obse
rvatory.loc_p2,instrument_observatory.obs_time_start,instrument_observator
y.obs_time_embark,instrument_observatory.obs_time_end,instrument_observato
ry.status,instrument_observatory.obs_longname,instrument_observatory.sat_i
d FROM instrument_observatory WHERE  ( '2009-10-
15T20:30:56'>=instrument_observatory.time_start AND '2009-10-
20T20:30:56'<=instrument_observatory.time_end)  ORDER BY
instrument_observatory.time_start  LIMIT 5000]]></INFO> <INFO
name="QUERY_URL" ><![CDATA[http://mssl.ucl.ac.uk:80/helio-
ics/HelioQueryService?STARTTIME=2009-10-15T20:30:56&ENDTIME=2009-10-
20T20:30:56&FROM=instrument_observatory]]></INFO>
<TABLE name="ics-instrument_observatory"> <FIELD arraysize="*"
datatype="char" name="name"> <DESCRIPTION>Instrument Name</DESCRIPTION>
</FIELD> <FIELD arraysize="*" datatype="char" name="observatory_name">
<DESCRIPTION>Observatory Name</DESCRIPTION> </FIELD> <FIELD arraysize="*"
datatype="char" name="obsinst_key">
<DESCRIPTION>Helio Instrument Name</DESCRIPTION> </FIELD>
<FIELD arraysize="*" datatype="char" name="experiment_id">
<DESCRIPTION>Experiment ID</DESCRIPTION> </FIELD>
<FIELD arraysize="*" datatype="char" name="time_start" xtype="iso8601">
<DESCRIPTION>Instrument Start Date</DESCRIPTION> </FIELD>
<FIELD arraysize="*" datatype="char" name="time_end" xtype="iso8601">
<DESCRIPTION>Instrument End Date</DESCRIPTION> </FIELD>
 <FIELD arraysize="*" datatype="char" name="longname">
<DESCRIPTION>Instrument Full Name</DESCRIPTION> </FIELD> <FIELD
arraysize="*" datatype="char" name="inst_type"> <DESCRIPTION>Instrument
type</DESCRIPTION> </FIELD> <FIELD arraysize="*" datatype="char"
name="inst_od1"> <DESCRIPTION>Instrument observation 1</DESCRIPTION>
</FIELD> <FIELD arraysize="*" datatype="char" name="inst_od2">
<DESCRIPTION>Instrument observation 2</DESCRIPTION> </FIELD> <FIELD
arraysize="*" datatype="char" name="inst_oe1"> <DESCRIPTION>Instrument
observation entity element</DESCRIPTION> </FIELD> <FIELD arraysize="*"
datatype="char" name="inst_oe2"> <DESCRIPTION>Instrument observation
entity type</DESCRIPTION> </FIELD> <FIELD arraysize="*" datatype="char"
name="inst_fd"> <DESCRIPTION>Instrument observation wave length
fd</DESCRIPTION> </FIELD> <FIELD arraysize="*" datatype="char"
name="inst_nd"> <DESCRIPTION>Instrument observation wavelength
nd</DESCRIPTION> </FIELD> <FIELD arraysize="*" datatype="char"
name="group_name"> <DESCRIPTION>Group name</DESCRIPTION> </FIELD> <FIELD
arraysize="*" datatype="char" name="net_key"> <DESCRIPTION>Net
Key</DESCRIPTION> </FIELD> <FIELD arraysize="*" datatype="char"
name="keywords"> <DESCRIPTION>Complete focusing type</DESCRIPTION>
</FIELD> <FIELD arraysize="*" datatype="char" name="obs_name">
<DESCRIPTION>Observatory Name</DESCRIPTION> </FIELD> <FIELD arraysize="*"
datatype="char" name="loc_gen"> <DESCRIPTION>Observation
type</DESCRIPTION> </FIELD> <FIELD arraysize="*" datatype="char"
name="loc_p1"> <DESCRIPTION>latitude</DESCRIPTION> </FIELD> <FIELD
arraysize="*" datatype="char" name="loc_p2">
<DESCRIPTION>longitude</DESCRIPTION> </FIELD> <FIELD arraysize="*"
datatype="char" name="obs_time_start" xtype="iso8601">
<DESCRIPTION>Observatory Start Date</DESCRIPTION> </FIELD> <FIELD
arraysize="*" datatype="char" name="obs_time_embark" xtype="iso8601">
<DESCRIPTION>Time Embark</DESCRIPTION> </FIELD> <FIELD arraysize="*"
datatype="char" name="obs_time_end" xtype="iso8601">
<DESCRIPTION>Observatory End Time</DESCRIPTION> </FIELD> <FIELD
arraysize="*" datatype="char" name="status"> <DESCRIPTION>Observatory
operation status</DESCRIPTION> </FIELD> <FIELD arraysize="*"
datatype="char" name="obs_longname"> <DESCRIPTION>Observatory full
name</DESCRIPTION> </FIELD> <FIELD arraysize="*" datatype="char"
name="sat_id"> <DESCRIPTION>Satellite Id</DESCRIPTION> </FIELD> <DATA>
<TABLEDATA>   <TR>     <TD>PWS</TD>     <TD>Voyager-2</TD>
<TD>VOYAGER_2__PWS</TD>     <TD>1977-076A-13</TD>     <TD>1977-08-
20T00:00:00</TD>     <TD>2020-01-01T00:00:00</TD>     <TD>Plasma Wave
```

```
System</TD>     <TD>in-situ</TD>     <TD>planetary</TD>
<TD>environment</TD>     <TD>fields</TD>     <TD>elect/magn.</TD>
<TD></TD>     <TD></TD>     <TD></TD>     <TD></TD>     <TD></TD>
<TD>Voyager-2</TD>     <TD>HP2</TD>     <TD>T,F</TD>
<TD>Heliosphere</TD>     <TD>1977-08-20T00:00:00</TD>     <TD></TD>
<TD>2020-01-01T00:00:00</TD>     <TD>O</TD>     <TD>Voyager 2</TD>
<TD>1977-076A</TD>   </TR>   <TR>     <TD>CRS</TD>     <TD>Voyager-2</TD>
<TD>VOYAGER_2__CRS</TD>     <TD>1977-076A-08</TD>     <TD>1977-08-
20T00:00:00</TD>     <TD>2020-01-01T00:00:00</TD>     <TD>Cosmic Ray
System</TD>     <TD>in-situ</TD>     <TD>galactic</TD>     <TD>energy
release</TD>     <TD>particles</TD>     <TD>energetic</TD>     <TD>0</TD>
<TD>?</TD>     <TD></TD>     <TD></TD>     <TD>cosmic-ray</TD>
<TD>Voyager-2</TD>     <TD>HP2</TD>     <TD>T,F</TD>
<TD>Heliosphere</TD>     <TD>1977-08-20T00:00:00</TD>     <TD></TD>
<TD>2020-01-01T00:00:00</TD>     <TD>O</TD>     <TD>Voyager 2</TD>
<TD>1977-076A</TD>   </TR>   <TR>     <TD>PLS</TD>     <TD>Voyager-2</TD>
<TD>VOYAGER_2__PLS</TD>     <TD>1977-076A-06</TD>     <TD>1977-08-
20T00:00:00</TD>     <TD>2020-01-01T00:00:00</TD>     <TD>Plasma
Spectrometer</TD>     <TD>in-situ</TD>     <TD>heliosphere</TD>
<TD>solar-wind</TD>     <TD>particles</TD>     <TD>charged</TD>
<TD></TD>     <TD></TD>     <TD></TD>     <TD></TD>
<TD>spectrometer</TD>     <TD>Voyager-2</TD>     <TD>HP2</TD>
<TD>T,F</TD>     <TD>Heliosphere</TD>     <TD>1977-08-20T00:00:00</TD>
<TD></TD>     <TD>2020-01-01T00:00:00</TD>     <TD>O</TD>     <TD>Voyager
2</TD>     <TD>1977-076A</TD>   </TR> </TABLEDATA> </DATA> </TABLE>
</RESOURCE> </VOTABLE>
```