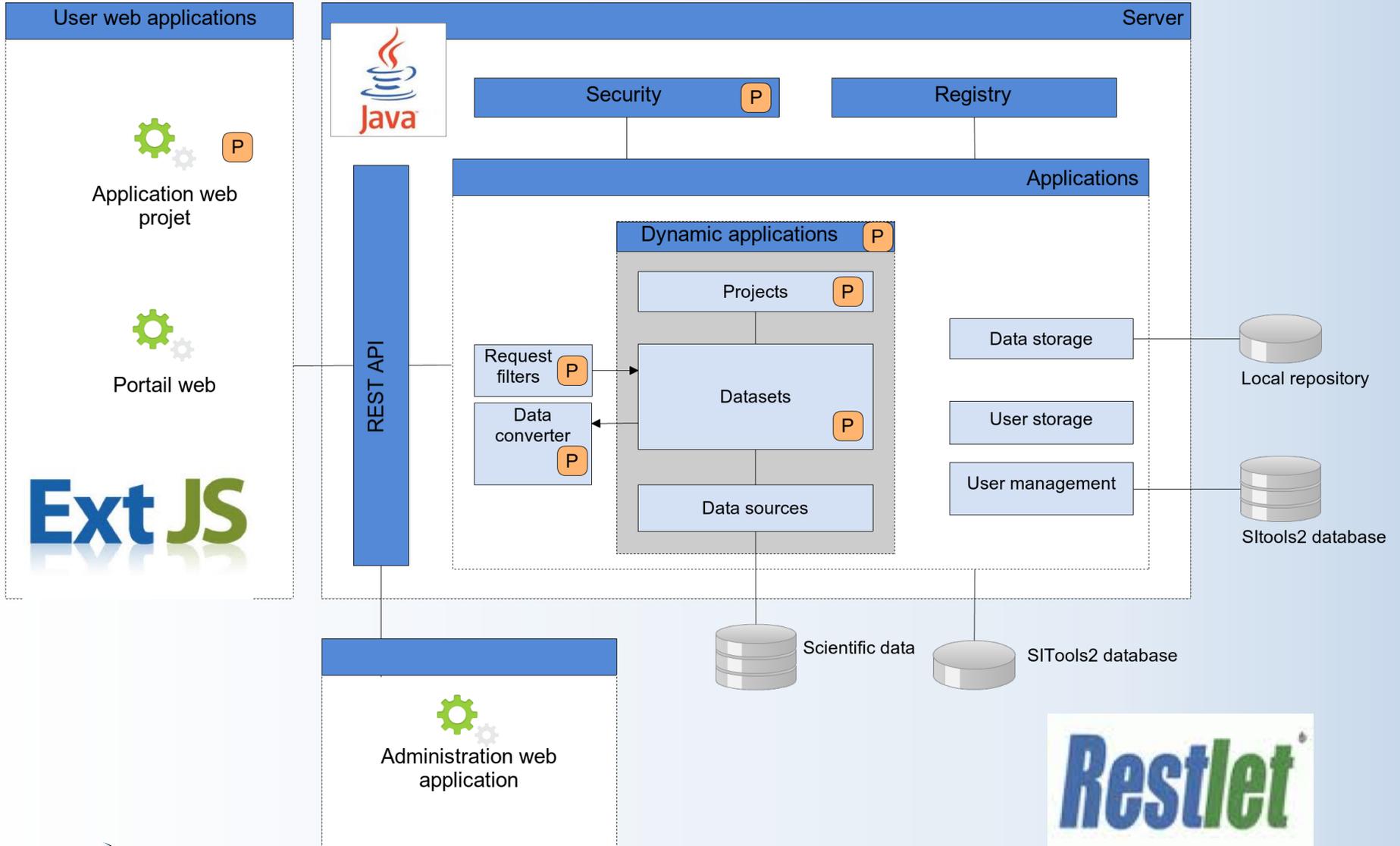




SITools2 as VO service provider: an example with Herschel at IDOC (Integrated Data and Operation Center)

- SITools2 is a CNES generic tool performed by a joint effort between CNES and scientific laboratories.
- It offers common services through an “easy-to-use” open source web platform.
- The aim of SITools is to provide a self-manageable data access layer deployed on already existing scientific laboratory databases.
- <http://sitools2.sourceforge.net/>
- <https://github.com/SITools2>
- Contact: jean-christophe.malapert@cnes.fr



Herschel in a nutshell

- **Herschel** was the fourth cornerstone mission in the European Space Agency science programme. It has performed photometry and spectroscopy in the far infrared and submillimetre part of the spectrum, covering approximately the **55-672 μm** range.
- **Objectives:** the formation of stars and galaxies, and the interrelation between the two, the physics of the interstellar medium, astrochemistry, and solar system studies.
- Two cameras and two medium resolution spectrometers (**PACS** and **SPIRE**) and a very high resolution heterodyne spectrometer (HIFI)
- It was launched in mai 2009, and run out of helium in april 2013.



HESIOD (HErSchel IdOc Database) Portal

IDOC = Integrated Data and Operation Center

<http://idoc-herschel.ias.u-psud.fr/sitools/client-user/>

The screenshot displays the HESIOD portal interface. At the top, there are logos for IDOC, HESIOD, IAS, Université Paris Sud, CNRS, CNES, ESA, and Herschel. Below the logos, the interface is divided into two main sections: 'Public Project' and 'Private Projects'.

Public Project:

- Herschel SAG 4 public Archive:** Represented by a green cloud icon with a red 'PUBLIC' stamp.

Private Projects:

- Herschel-Private:** All Herschel data at IAS, represented by a Herschel spacecraft icon.
- SAG-4-Private:** Represented by a green square icon.
- SAG-1:** Represented by a blue square icon.
- OT1_mmiville:** Represented by a blue square icon.
- OT1_lho:** Represented by a red square icon.
- SAG-3:** Represented by a blue square icon.
- H-ATLAS:** Represented by a red square icon.
- OT1_atielens:** Represented by a 3D bar chart icon.
- OT2_ehabart:** Represented by a heatmap icon.
- DDT_MustDo_4:** Represented by a red square icon.
- Planck High-z:** OT2_hdole OT1_lmontier and DDT_mustdo_5, represented by a blue square icon.

Interstellar medium guaranteed time key project (SAG-4) in HESIOD

The screenshot displays the HESIOD web interface. At the top, there are logos for IDOC, HESIOD, IAS, Université Paris Sud, CNRS, CNES, ESA, and HESIOD. The main content area shows a table of data for the project 'spire_photo_j2'. The table has columns for 'preview', 'download', 'filesize (Mo)', 'header', 'obsids', 'object', 'program', 'combine', 'release', and 'filename'. The data rows show various observations with their respective file sizes and names.

preview	download	filesize (Mo)	header	obsids	object	program	combine	release	filename
		0.72	HEADER		HH_dense_core	SAG-4	false	R2_spire_photo	OD301_0x500039e4L_SpirePhotoLargeScan_HH_dense_coreMedianbslineAll_PMW.fits
		0.57	HEADER		HH_dense_core	SAG-4	false	R2_spire_photo	OD301_0x500039e4L_SpirePhotoLargeScan_HH_dense_core_offsetPerScan_ExtEmiG...
		0.86	HEADER		HH_dense_core	SAG-4	false	R2_spire_photo	OD301_0x500039e4L_SpirePhotoLargeScan_HH_dense_core_offsetPerScan_ExtEmiG...
		1.73	HEADER		HH_dense_core	SAG-4	false	R2_spire_photo	OD301_0x500039e4L_SpirePhotoLargeScan_HH_dense_coreMedianbslineAll_PSW.fits
		1.87	HEADER		HH_dense_core	SAG-4	false	R2_spire_photo	OD301_0x500039e4L_SpirePhotoLargeScan_HH_dense_core_offsetPerScan_ExtEmiG...
		0.42	HEADER		HH_dense_core	SAG-4	false	R2_spire_photo	OD301_0x500039e4L_SpirePhotoLargeScan_HH_dense_coreMedianbslineAll_PLW.fits
		175.65	HEADER		polaris	SAG-3	false	R2_spire_photo	OD162_0x500022f9L_SpirePacsParallel_polaris_ExtEmiGainsApplied_destriped_PSW.fits

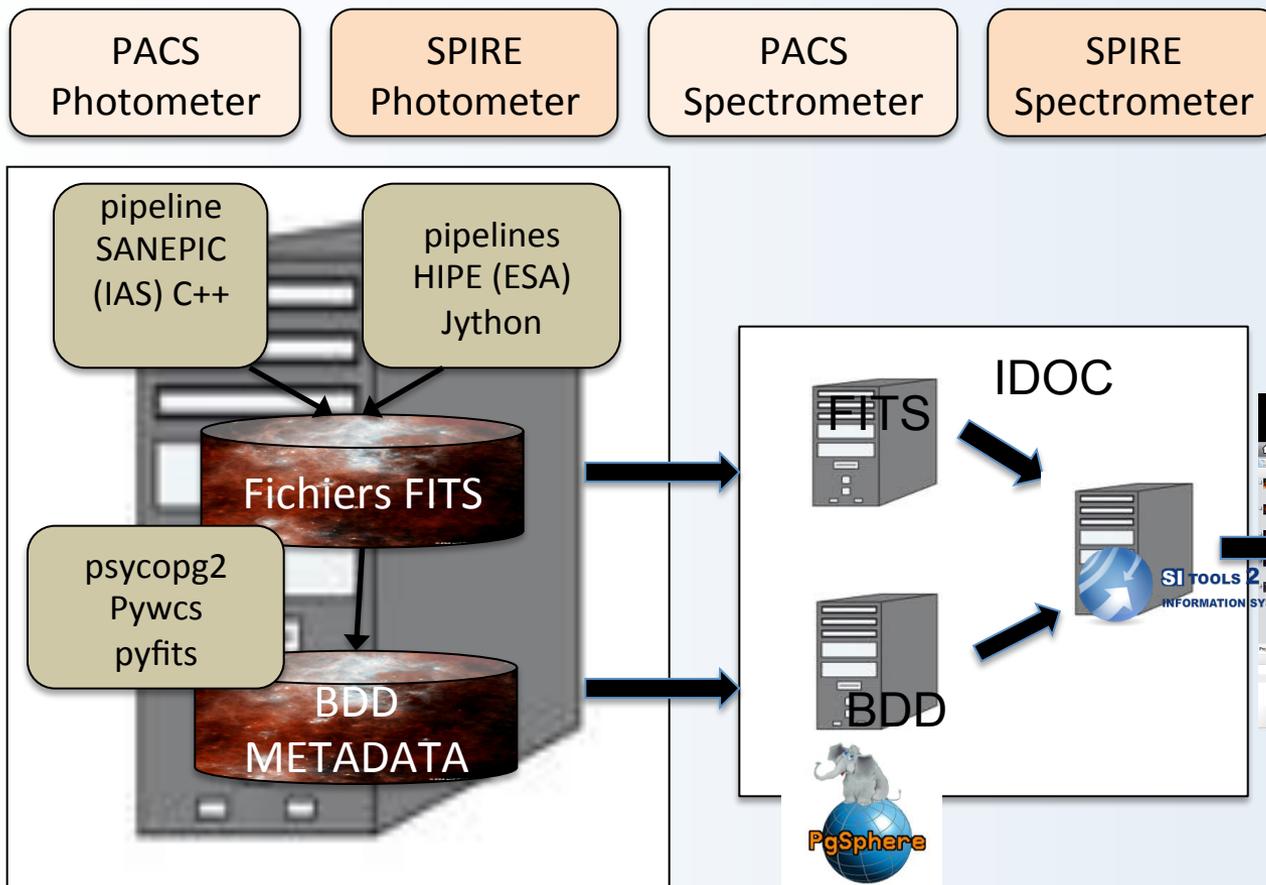
At the bottom of the interface, there is a footer with the logo for SI TOOLS 2 INFORMATION SYSTEM TOOL, the text 'Build by SITools2 framework, Copyright 2012', and links for 'Contacts', 'Help', and 'Acknowledgements'.



Interstellar medium guaranteed time key project (SAG-4) from HESIOD in VO

- Level 2 and L2.5 PACS (60 or 100 170) and SPIRE (250, 350, 500 micrometers) Public Maps
- Reprocessed at IAS with the latest ESA pipeline (last release only) and with home made pipeline (SANEPIC)

HESIOD General Architecture



SITools2 SIAP Module



<http://idoc-herschel.ias.u-psud.fr/ds/pub/spirephoto2/services/sia?>

<http://voparis-validator.obspm.fr>

The screenshot shows the SITools2 Admin web interface. A dialog box titled 'Edit service' is open, showing the configuration for the 'Simple Image Access Protocol'. The 'Field mapping' section is active, displaying a table of parameters.

Name	Type	Value	Updatable
Description	PARAMETER_INTERN	Herschel Pacs SIA protocol	
fileName	PARAMETER_USER_INPUT		<input type="checkbox"/>
geoAttribut	PARAMETER_INTERN	spoly	
image	PARAMETER_INTERN		
Image service	PARAMETER_INTERN	Pointed Image Archive	
Instrument	PARAMETER_INTERN	Herschel PACS	
INTERSECT	PARAMETER_INTERN	OVERLAPS	
Max file size	PARAMETER_INTERN		
Max image size	PARAMETER_INTERN		
Max query size	PARAMETER_INTERN	64800	
Max records	PARAMETER_INTERN	-1	
methods	PARAMETER_INTERN	GET	

Below the table, there are sections for 'Description' and 'Spatial Coverage' with text input fields. The 'Description' field contains: 'List of methods implemented for this resource, separate by |'. The 'Spatial Coverage' field contains: 'SIADico'. The 'Responsible party' field is empty. The 'Owner' is listed as CNES. There are 'OK' and 'Cancel' buttons at the bottom of the dialog.

On the right side of the interface, there is a 3D visualization of a sphere with a red and blue polygon overlaid on its surface. Below this is the 'PgSphere' logo, which features a blue elephant standing on a globe.



SITools2 SIA Module – dataset columns



Edit dataset [X]

Dataset information | Properties | Select tables | Select fields | **Fields setup** | Criteria | View Configuration

+ Create | Edit | Delete | Action ▾

SQL definition	Table name	Table alias	Column alias	Format	Unit	Label	Width	Sortal
mesize	pacs_photo...		mesize			mesize	100	
release	pacs_photo...		release			release	100	
last	pacs_photo...		last			last	100	
spoly	pacs_photo...		spoly			spoly	100	
'http://idoc-herschel....			download			download	100	
'2'			naxes			naxes	100	
naxis1 ' ' naxis2			naxis			naxis	100	
crpix1 ' ' crpix2			crpix			crpix	100	
crval1 ' ' crval2			crval			crval	100	
cdelt1 ' ' cdelt2			scale			cdelt	100	
cdelt1 ' ' crota2 ' ' ...			cdmatrix			cdmatrix	100	
'ICRS'			coordref			coordref	100	
'TAN'			projection			projection	100	
'image/fits'			format			format	100	
'Herschel PACS'			insid			insid	100	
'SAG-4'			observingpr...			observingpr...	100	

OK Cancel



SITools2 SIA Module – dictionnaire

Dataset's semantic / dictionary mapping

SIADico Default dictionary

Dataset's columns	Dictionary's concepts									
Column alias	Name	Description	ID	ucd	utype	ref	datatype	width	precision	
z	Title	Short description of the image		VOX:Image_Title	Observ...	Acces...	char			
filesize_bytes	RA	ICRS right-ascension of the center of the image		POS_EQ_RA_MAIN			double			
filesize	DEC	ICRS declination of the center of the image		POS_EQ_DEC_MAIN			double			
release	NAXES	Number of image axes		VOX:Image_Naxes			int			
last	NAXIS	Array value giving the length in pixels of each ima...		VOX:Image_Naxis			int			
spoly	Scale	Array value giving the scale in degrees per pixel ...		VOX:Image_Scale			double			
download	Format	MIME-type of the object associated with the imag...		VOX:Image_Format			char			
naxes	AccessRef	URL to be used to access or retrieve the image		VOX:Image_AccessReference			char			
naxis	InstID	Instrument or instruments used to make the obser...		INST_ID			char			
crpix	JulianDate	Mean modified Julian date of the observation		VOX:Image_MJDateObs			double			
crval	CoordRefFrame	Coordinate system reference frame, selected fro...		VOX:STC_CoordRefFrame			char			
scale										

Mapping column/concept

Name	Description	ID	ucd	utype	ref	datatype	width	precision	unit	type	xtype	arraysize
ImageFile...	Actual or estimated size of the encoded image in bytes (not pixels!)		VOX:Image_FileSize			int						
Column alias: format (1 Item)												
Format	MIME-type of the object associated with the image acref		VOX:Image_Format			char					*	
Column alias: instid (1 Item)												
InstID	Instrument or instruments used to make the observation		INST_ID			char					*	
Column alias: naxes (1 Item)												
NAXES	Number of image axes		VOX:Image_Naxes			int						
Column alias: naxis (1 Item)												
NAXIS	Array value giving the length in pixels of each image axis		VOX:Image_Naxis			int					*	
Column alias: observingprogramname (1 Item)												

HESIOD through Aladin

The screenshot displays the Aladin v7.5 interface. On the left, the 'Server selector' panel shows a tree view of data sources under 'Aladin' and 'Herschel Idoc Database (HESIOD) SPIRE'. The 'Filter Name: PSW' section is expanded, listing various FITS files. The main window shows a multi-view visualization of the PSW field, with a central view and a smaller thumbnail view in the bottom right. The central view displays a color-coded map of the field, with a grid overlay and a scale bar indicating a size of 5.847° x 5.203°. The right-hand side contains a 'Basic controls' panel with various tools for navigation and data manipulation, such as 'select', 'pan', 'zoom', 'dist', 'phot', 'draw', 'tag', 'filter', 'cross', 'x-y', 'rgb', 'assoc', 'crop', 'cont', 'pixel', 'prop', 'opac', 'zoom', and 'del'. The bottom status bar shows '(c) 2012 UDS/CNRS - by CDS - Distributed under GNU CPL v3' and '0 sel / 0 src 175Mb'.

HESIOD through Aladin

Aladin v7.5

Location

Frame ICRS

Optical IR UV Radio DSS Simbad NED

PLANCK-HFI 857GHz

PSW.polaris_combined_PSW[1]

maBurstv

denseCore

1.506° x 1.61°

[View A1] - PLANCK-HFI 857GHz

Search

0 sel / 1395 src 143fps / 102Mb

TIP: Define the object size and shape rules (filter button)

VO Issues or questions

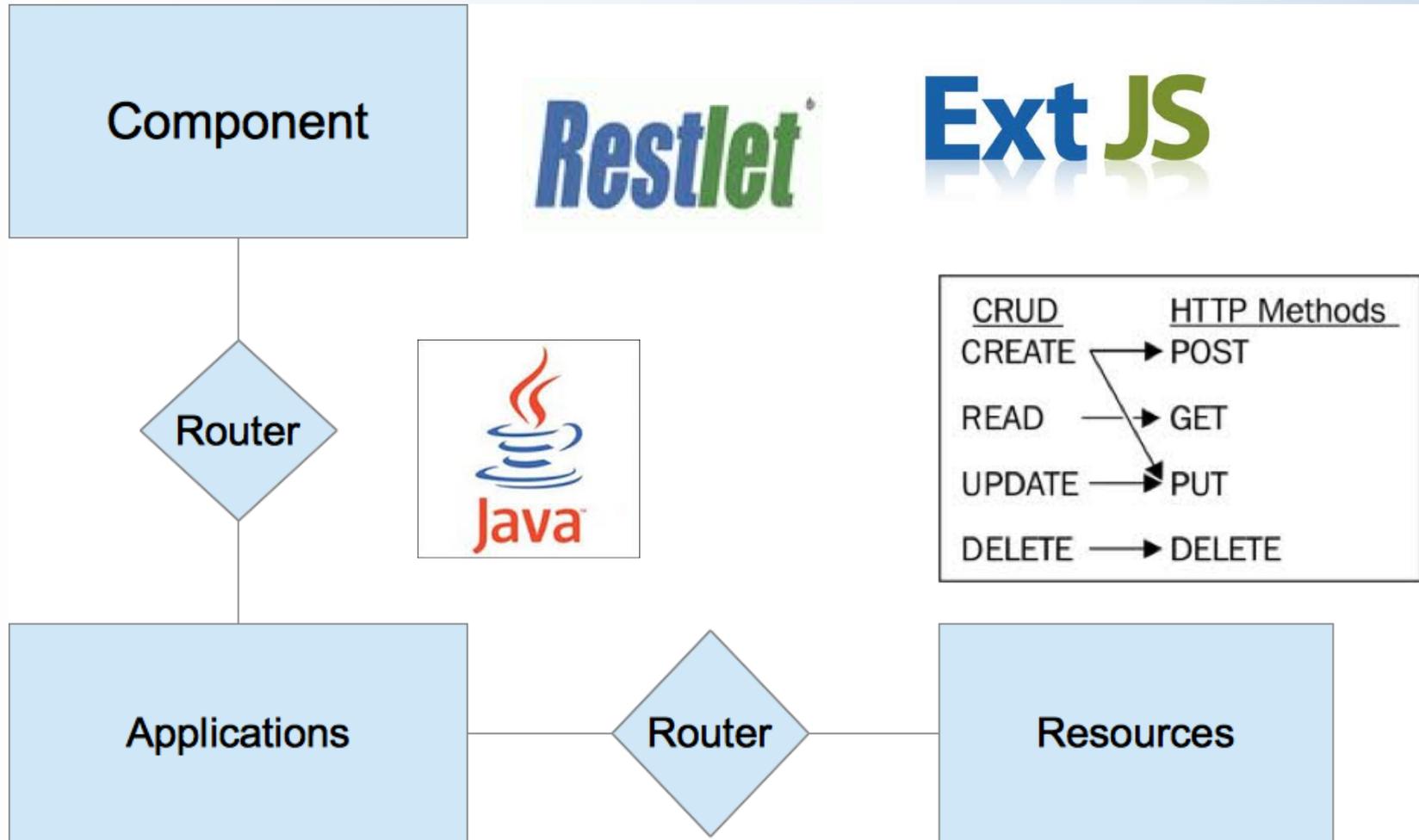
- Registration was not so straightforward
- Not always easy to know which fields to fill in to display information in Aladin (for instance sortorder in the votable)
- Communication between euroVO and VAO?

To be done

- Extension of SIAP to other HESIOD programs
- Cutfits
- SSAP (cubes?)
- Stats on Data usage (distinction from VO and from direct access)

ANNEXES

SITools2 General Architecture: REST



SITools2 SIA Module spoly



```
def calculateSpoly(filepath=""):
    hdulist=pyfits.open(filepath)
    try:
        Image = hdulist['Image']
        wcs = pywcs.WCS(Image.header)
        hdr1=hdulist[1].header
    except:
        try:
            ##### for SCANAMORPHOS fits files
            Image=hdulist['PrimaryImage']
            PrimaryHeader=hdulist['Primary'].header
            wcs = pywcs.WCS(PrimaryHeader)
            hdr1=Image.header
            print wcs
            print hdr1
        except KeyError:
            print "EE - No 'Image' extension in "+os.path.basename(inputImage)
            return 2
    poly1=wcs.wcs_pix2sky([[0.5,0.5]],0)
    print poly1
    poly2=wcs.wcs_pix2sky([[0.5+hdr1['NAXIS1'],0.5]],0)
    print poly2
    poly3=wcs.wcs_pix2sky([[0.5+hdr1['NAXIS1'],0.5+hdr1['NAXIS2']]],0)
    print poly3
    poly4=wcs.wcs_pix2sky([[0.5,0.5+hdr1['NAXIS2']]],0)
    print poly4
    poly1="("+str(poly1[0,0])+str(poly1[0,1]))+"d"
    poly2="("+str(poly2[0,0])+str(poly2[0,1]))+"d"
    poly3="("+str(poly3[0,0])+str(poly3[0,1]))+"d"
    poly4="("+str(poly4[0,0])+str(poly4[0,1]))+"d"
    poly="{ "+poly4+", "+poly3+", "+poly2+", "+poly1+"}"
    #poly="("+poly1+", "+poly3+")"
    return poly
```

SIA EuroVO registry

VO Integrated Data Operation Center [IDOC]

[XML | EDIT | CLONE]

IVOA identifier: <ivo://idoc> [Authority]

This naming authority is the root of the naming of the resources from IDOC

Published by: IDOC on the 2013-01-25T09:21:30Z and last updated on the 2013-01-25T10:31:24Z

GINCO: Galaxy, Interstellar matter and Cosmology [GINCO]

[XML | EDIT | CLONE]

IVOA identifier: <ivo://idoc.ginco> [Authority]

GINCO is a center for expertise for several space, balloon and ground mission. It has an important role in data processing, distribution and interpretation, for several astronomy missions at long wavelength. In this matter, GINCO : develops and maintains high level analysis pipelines develops and maintains data archives & access develops, maintains and distribute high level software for data analysis offers scientific expertise for mission using long wavelength detectors plays an important role in education and outreach to the general public

Published by: IDOC on the 2013-01-25T09:21:30Z and last updated on the 2013-01-25T14:21:11Z

HErSchel IdOc Database (HESIOD) [HESIOD]

[XML | EDIT | CLONE]

IVOA identifier: <ivo://idoc.ginco/herschel> [Organisation]

HErSchel IdOc Database (HESIOD)

Published by: IDOC GINCO on the 2013-01-25T11:01:53Z and last updated on the 2013-03-29T10:57:43Z

SIA EuroVO registry

Herschel Idoc Database (HESIOD) SPIRE [HESIOD]

[CHECK | XML | EDIT | CLONE]

IVOA identifier: <ivo://idoc.ginco/herschel/spire> [CatalogService] [SimpleImageAccess]

All data for the Herschel SPIRE guaranteed time program on Interstellar Medium (SAG-4) and other public data processed at IDOC. All data have been reprocessed at IDOC using advanced reprocessing pipeline.

Published by: IDOC GINCO on the 2013-01-25T14:53:47Z and last updated on the 2013-04-03T07:23:07Z

Herschel Idoc Database (HESIOD) PACS [HESIOD]

[CHECK | XML | EDIT | CLONE]

IVOA identifier: <ivo://idoc.ginco/herschel/pacs> [CatalogService] [SimpleImageAccess]

All data for the Herschel SPIRE guaranteed time program on Interstellar Medium (SAG-4) and other public data processed at IDOC. All data have been reprocessed at IDOC using advanced reprocessing pipeline.

Published by: IDOC GINCO on the 2013-04-02T11:59:44Z and last updated on the 2013-04-03T07:23:39Z

<http://idoc-herschel.ias.u-psud.fr/ds/pub/spirephoto12/services/sia?>

Herschel Portal: what's new

- New processing (PACSMAN for spectro, scanamorphos for PACS Photo)
- VO compatible for Simple Image Access Protocol
- Log Stats on downloaded data
- New ergonomoy
- Multidataset search

Herschel Portal: and always...

- Easy search and download
- CutFits available for Level2 Photometry
- Latest and Previous Releases available