# Automating Image Import for Google Sky Using Virtual Observatory Tools

J. H. Crossley, R. DuPlain, & N. M. Radziwill
National Radio Astronomy Observatory

Summary: We developed a web service that brings Virtual Observatory (VO) image data to the Google Sky desktop client. The service, *KML Now!*, gives the user a simple web-based image search interface that *requires no specialized knowledge* of image conversion, coordinate system conversion, or Google Sky's KML metadata format. *KML Now!* uses VO *Simple Image Access* services to acquire images in the user's search coordinates. Once images are acquired, server-side open-source conversion software generates Sky-compatible image and metadata files. Files are cached on the server, and KML is returned to the user. When opened in Google Sky, all images are automatically downloaded and placed in the desktop client.
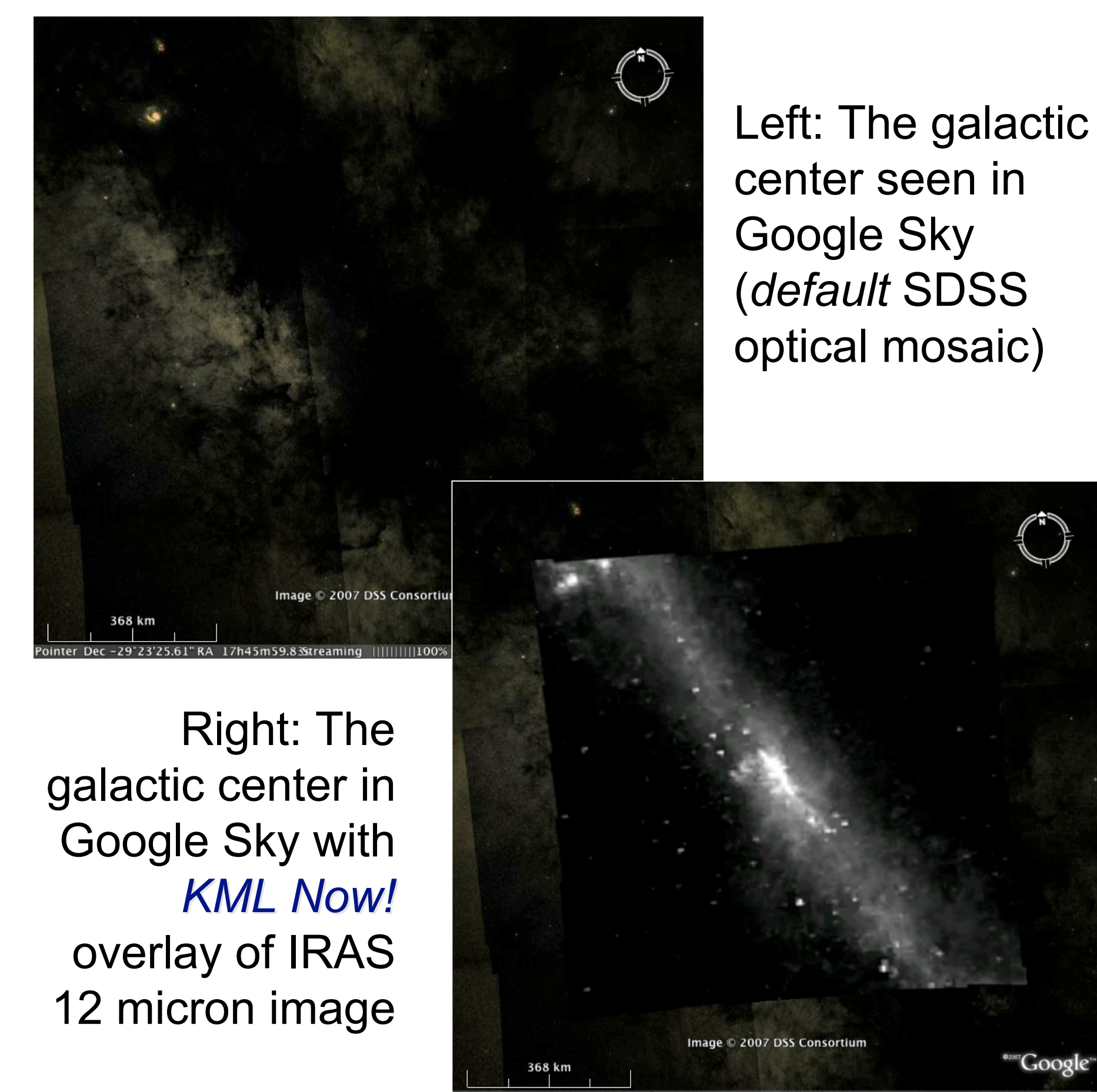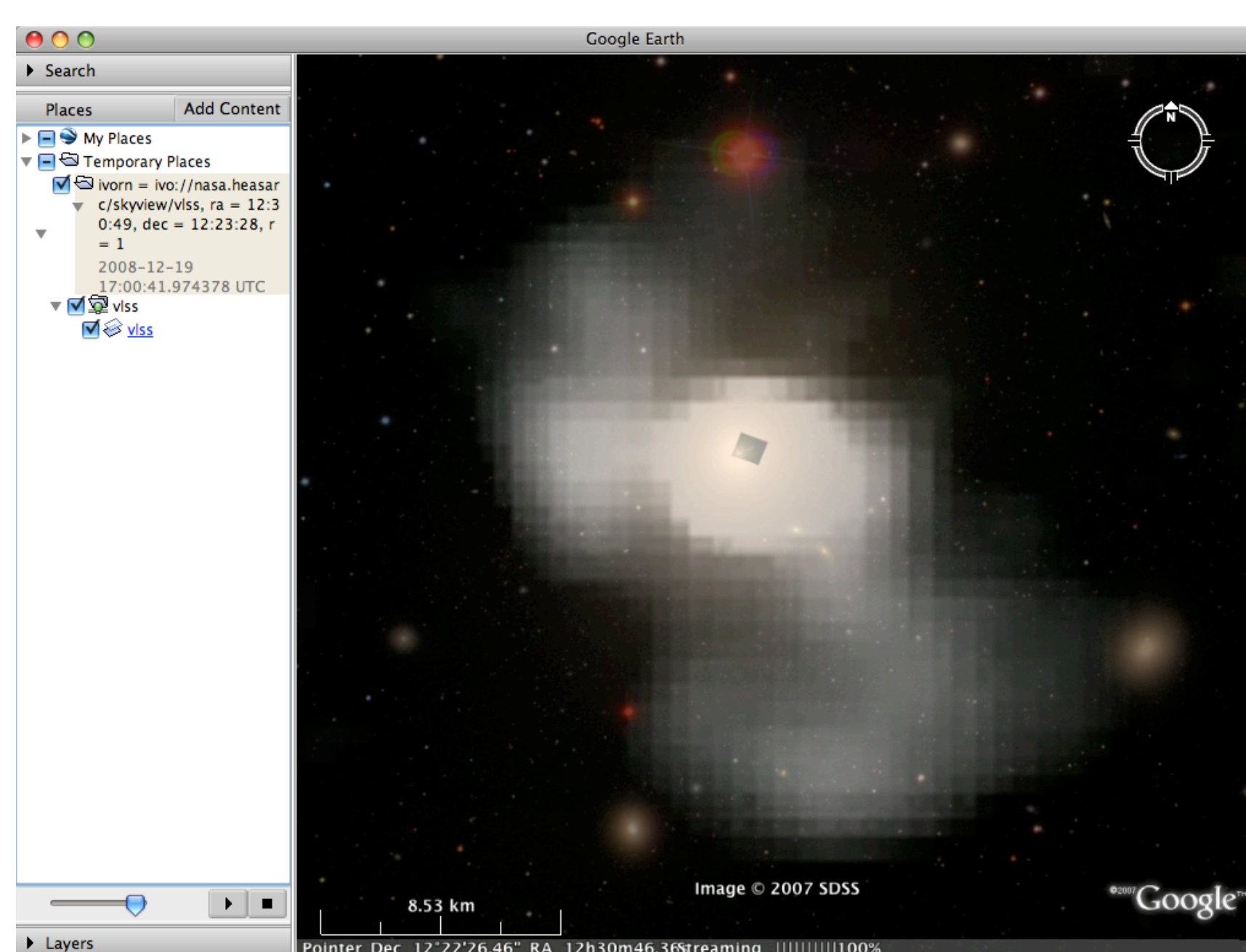
Left: The galactic center seen in Google Sky (*default* SDSS optical mosaic)

Right: The galactic center in Google Sky with *KML Now!* overlay of IRAS 12 micron image

Try it out → `http://go.nrao.edu/kmlnow`

How to use it:

Point your web browser to the URL and use the search form.

1. Enter the search coordinates and select a VO image service. Click "Cone Search".
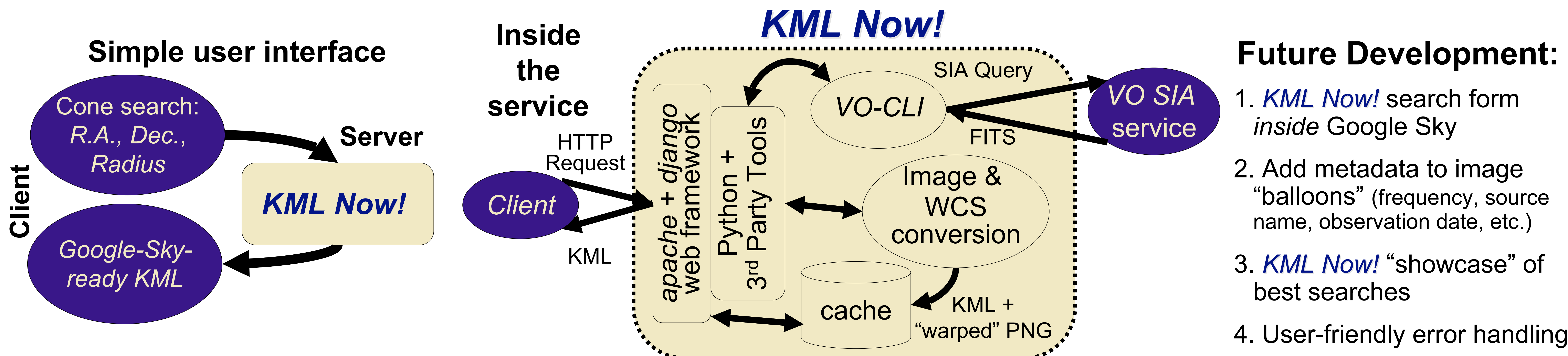
74-MHz image of galaxy M87 from VLA Low Frequency Sky Survey, overlaid on the Google Sky default optical imagery.

2. Open KML document with Google Earth.

3. New images are in "Temporary Places" folder in sidebar.

How it works… What is *KML Now!* doing?

KML Now! uses Python and 3rd-party open-source software to acquire FITS images and make them Google Sky ready. The *apache* & *django* web framework improves code organization, allows for unit testing, provides simple administration via the web, and enables scalability.

1. Query the VO image service. The VO Command Line Interface tool queries the image service, which provides URLs to image data.

2. Download FITS image data to server.

3. FITS → PNG, and FITS WCS → Google Sky KML. STIFF converts FITS to a TIFF image, and ImageMagick converts TIFF to PNG. wcs2kml converts the FITS World Coordinate System to Google-Sky-native KML and warps the PNG for projection on the celestial sphere.

4. Cache KML and PNG on server.

5. Send launcher KML to user. One KML document exists for each image. The user is given a "launcher" that points to all appropriate KML files on the server. Google Sky downloads the server-side KML and PNG images for display on the local desktop using KML NetworkLinks.

Simple user interface

Cone search: *R.A., Dec., Radius*

Server

KML Now!

Google-Sky-ready KML

Client

Inside the service

HTTP Request

Client

KML

KML Now!

apache + django web framework

Python + 3rd Party Tools

SIA Query

VO-CLI

VO SIA service

FITS

Image & WCS conversion

cache

KML + "warped" PNG

Future Development:

1. *KML Now!* search form *inside* Google Sky

2. Add metadata to image "balloons" (frequency, source name, observation date, etc.)

3. *KML Now!* "showcase" of best searches

4. User-friendly error handling