Virtual Observatory 2.0?

- VO today
- VO tomorrow
The VO vision
The VO vision

- web all docs in the world inside your PC
The VO vision

- web: all docs in the world inside your PC
- VO: all databases in the world inside your PC
The VO vision

• web all docs in the world inside your PC
• VO all databases in the world inside your PC

• Most astronomy data are already on line
• So is that all we need?
Two Problems

• **Tower of Babel**
  – too many different web pages, formats, keywords, table column names, access methods, passwords etc etc
  – standardise !!!!

• **Data Deluge**
  – some modern datasets VAST
  – cannot "download and hack"
  – need online data *search and analysis services*
So ...we need ...

- heads knocked together *international standards*
- *data services* that follow the rules
- *yellow pages* for data (Registry)
- *VO software* that understands this stuff
  - infrastructure
  - tools
  - a software ecosystem not a "one stop shop" portal
Is it ready?
Is it ready?

Nearly ....
What's done?

- Many (but not all) key standards
- Thousands of datasets
- Yellow pages
- Lots of techy stuff
  - Middleware, API, VOSpace, Identity services ...
- Several good interoperating user tools
  - VO Desktop, Aladin, Topcat, VOSpec ..
- Two related popular tools
  - Google Sky and World Wide Telescope
Whats done?

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most of them work...

www.astrogrid.org
Sky Browsing approach
Yellow Pages Approach

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IRAS Point Source Catalog, Version 2.0

Short Name: IRASPSC | VOA-ID:ivo:2:nasa:heasarc:iraspnc
Resource Type: CatalogService | Created: 2008-12-24

Content Type: catalog | Subject: survey | Source: source | Level: research
The IRAS Point Source Catalog, Version 2.0, is a catalog of some 250,000 well-confirmed infrared point sources observed by the Infrared Astronomical Satellite (IRAS), i.e., sources with angular extents less than approximately 0.5, 0.5, 1.0, and 2.0 arcminutes in the in-scan direction at 60, and 100 microns (um), respectively. Positions, flux densities, uncertainties, associations with known astronomical objects and various cautionary flags are given for each object in the catalog. Away from confused regions of the sky, the survey is complete to about 0.4, 0.5, 0.6, and 1.1 Jansky (Jy) at 12, 25, 60, and 100 microns, respectively. Typical position uncertainties are 6 arcseconds in the in-scan direction and about 8 to 16 arcseconds in the cross-scan direction.

Further Information...

Source Reference: 1988IRASPSC......0
Relationships: service-for NASA/GSFC, Exploration of the Universe Division

Waveband Coverage: infrared
Spatial Coverage: All-Sky
Yellow Pages Approach
Search data services

Astroscope - 103 Cat. Object Services

Search for
- Cat. Objects
- Images
- Spectra
- Timed Data

At Position (RA,Dec) or Object Name
19.271249, -73.446993

Search Radius (degs/arcsecs)
5.100000
- Degrees
- Sexagesimal

Navigate
- Search
- Go To Top
- Clear Selection

Process

Actions
- View
- Download
- Multi Query
- Send tables to Aladin
- Send tables to Topcat

About
application/x-votable+xml
### Pipe results to other apps

#### Table Browser for 1: nph-catsearch?CAT=fp_psc&RA=355.0&DEC=0.0&SR=0.1

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TopCat(1): Table Browser
Pipe results to other apps
Pipe results to other apps
Pipe results to other apps

Do Science
#!/usr/bin/python

Sends a query to WFCAM Science Archive; saves result to file on local disk.

Usage: python wsa_gps.py
will write a file named wsa_gps_res_vot to the current directory.

History: 20071212 Written by E. A. Gonzalez-Solares

from time import sleep
from astrogrid import acr, DSA, MySpace

# Uncomment if automatic login is not enabled
acr.login('ukidss')

# Define SQL here
# This query selects for each source, the x and y position in the detector as well as the
# size of the detector in which it was detected and the pixel scale. Only sources which are
# more than 10 arcsec away from the chip edges are returned in a search box
#
# NOTE: If the 'top 100' clause is removed then see below and save the output to a file in MySpace.
sql="""
SELECT top 100
  s.sourceID, s.ra, "dec", s.jmhPnt, s.pStar, s.pGalaxy, s.pNoise, s.pSaturated,
  s.jApMag3, s.jApMag3Err, s.jClass, s.hApMag3, s.hApMag3Err, s.hClass,
  s.k1ApMag3, s.k1ApMag3Err, s.k1Class, d.x, d.y, m.xSize, m.ySize, c.xPixSize,
  c.yPixSize FROM
  gpsSource AS s, gpsDetection AS d, MultiframeDetector AS m, CurrentAstrometry AS c
WHERE
  s.k1ObjID = d.objID AND d.multiframeID = m.multiframeID AND d.extNum = m.extNum AND
d.multiframeID = c.multiframeID AND d.extNum = c.extNum AND
  s.ra between 310.8 AND 313.0 AND s."dec" between 43.14 AND 44.0 AND
d.x*c.xPixSize>10 AND d.y*c.yPixSize>10 AND
  (m.xSize-d.x)*c.xPixSize>10 AND (m.ySize-d.y)*c.yPixSize>10
""

# Define the endpoint service
dsa=DSA('ivo://wfau.roe.ac.uk/ukidssDR2-dsa/ceaApplication')

# Write all the SQL in one line
sql = ' '.join(sql.split())

# Submit
r=dsa.query(sql)

# For large queries better use a file in MySpace
# r = dsa.query(sql, saveAs='#ukidss/wsa_gps_res_vot')

# Wait until query status is completed
while r.status() <> 'COMPLETED':
  sleep(10)

# Save results to file
open('wsa_gps_res_vot','w').write(r.results()[0])

# If the file is saved in MySpace then do
open('wsa_gps_res_vot','w').write(urllib2.urlopen(r.results()[0]).read())
Is this all a bit old fashioned?
The wisdom of the crowd?

• Is this all too rigid?
  – life dominated by big missions and data centres
  – the IVOA dictates and you must obey

• Why can't the VO just *emerge*?
  – all the new postdocs are smarter than the greybeards

• Is there a Web 2.0 style VO?
Web vs Web 2.0

- Web: world becomes transparent
  - but clear divide between creators and readers
  - and between servers and clients

- Web 2.0: users create, adjust, vote
  - blogs, tagging, wiki, Digging etc

- What is the astro equivalent?
• Web : world becomes transparent
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• What is the astro equivalent ?

Note : most "people power" examples actually rely on infrastructure provided by large corporations...
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Likewise: astro-social apps will also need a supporting infrastructure.....
Seven Ideas for VO 2.0
Collaboration Spaces

- Shared filestores
- Arbitrarily defined access lists
- Automated link to appropriate apps
- Editable shared objects - notes, tables, images etc
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- Arbitrarily defined access lists
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This is almost ready ...
Self Publication

• I have 300 FITS files from my VLT run
• How do I put them in the VO?

• Needs publication tools that automate compliance to VO standards...

• ... and probably data centre hosting
Blogs as public notebooks

- Astroblogs so far one of three things:
  - Outreach magazine
  - Political discussion forum
  - Vanity Press

- Scientists in other disciplines are using them as online Lab-books

- Does that make sense for astronomy?
Folksonomies

- Much VO effort on metadata and ontologies
- W2 approach: authors invent their own tags
  - Readers can search on these
  - The most popular tags emerge naturally
- Should data centres decide their own metadata?
- Problems
  - Astro metadata is more structured
  - The metadata is not for people...
  - ...its for applications, so they know what to do with a data object
Annotations

• Users shouldn't *change* public data
• But they can *add* value by annotating it
• Three styles
  – General commentary (cf Google sidewiki)
  – Individual annotations ("this object is a quasar")
  – Mass annotations ("Q13 marks all crossmatches using algorithm-13")

• Annotation service can be detached if contents are standardised
Data model market

- QueryBuilder picks up column names automatically from database
- But user has to look up what they mean
- Can be automated for applications if database follows a known data model

- Current approach is for IVOA to define standard data models
- Alternative is for a free market of data models to emerge and database to point at the one it is using
Community Tool Market

• Useful VO tools written by smart grad students
• Key components already there:
  – protocol for apps to play nice with each other (SAMP)
  – library of pre-packaged VO-service routines (Astro Runtime)
  – VO service call handling middleware (Astro Runtime)

• Needs to be much easier
• Needs a publishing framework
  – cf Mac widgets, Google gadgets