



VIRTUAL ASTRONOMICAL OBSERVATORY

AccessData in SIAV2

Doug Tody, NRAO, USVAO



The VAO is operated by the VAO, LLC.



AccessData in SIAV2

- Motivation

- New use-cases
 - Some use cases require repeated direct access to a single dataset
- In particular large data cubes
 - Major issue for radio data; some O/IR cube data as well
- This is a useful capability in any case
 - Alternative to queryData + acref for precision data access

- History

- First introduced in SIAV2 draft two years ago
- Not the same as the original *getData*, which gets whole datasets



SIAV2 AccessData

- Cube access use-case
 - Cubes can be very large
 - A single observation in multiple spectral bands
 - Each may be several hundred GB
- Two approaches to remote access
 - Data access, remote visualization
- Approach
 - Both can be addressed with the same VO interface
 - Remote vis uses VO service running locally



AccessData vs QueryData

- QueryData
 - Not just a simple discovery query
 - Query for virtual data; "ideal image"
 - Server understands the local data, client does not have to
 - This approach required when posting queries to multiple services
- AccessData
 - Client understands data, tells service exactly what it wants back
 - Prior queryData required to get dataset metadata
 - Error if request is invalid
 - Client may repeatedly access the same dataset
 - e.g., successive planes of a cube, cutouts of an image, etc.



AccessData

- AccessData Model/Workflow

- Workflow
 - inputDataset -> [filter] -> [WCS-proj] -> [section] -> [func] -> outputImage
- All stages are optional
- Workflow is logical, does not specify how actual processing is done
 - Trace back from specified output image to determine data contributing to each pixel

- Examples

- dataset(image) -> image (returns whole image)
- dataset(image) -> section -> image (cutout in pixel coords)
- dataset(image) -> WCS-proj -> image (cutout/reproj in WCS coords)
- dataset(visibility) -> WCS -> image (OTF imaging)
- etc.

- For already pixelated data WCS-proj and section are most useful
- More fundamental data (visibility, event) is more interesting



AccessData

- Model/Workflow
 - inputDataset
 - > [filter] -> [WCS-proj] -> [section] -> [func] -> outputImage

- Model Stages
 - Filter
 - Range, range-list: BAND, SIZE, TIME, POL
 - BAND for example could use range-list to include or exclude spectral lines
 - WCS-proj
 - Specify WCS of output image
 - Section
 - Specify pixel space of input image (as in IRAF, cfitsio)
[*,-*], [* ,99:233], etc.
 - Function
 - Standard functions computed over data



Radio Use Case

- Functions
 - Standard computations often performed on cubes
 - May need to be done on visibility data to have full information
 - Will often require async / UWS
- Cube Functions
 - Moments (0,1,2) eg velocity image
 - Spectral index image type of emission indicator
 - Spectral curvature image variation of SI
 - Rotation measure image magnetic field indicator
 - Variability curve time variability within obs
 - Optical depth image eg HI absorption
- <http://www.ivoa.net/internal/IVOA/SiaInterface/Anita-InterferometryVO.pdf>



Applicability To Other Data

- 2D Images
 - full model applies here as well
 - requirement not as strong but still very useful
 - legacy systems have long had this (IRAF image i/o etc.)
- Spectra
 - line cutouts, line removal, dispersion matching
- TimeSeries ?
 - use cases not well understood
 - e.g., time range cutout, function application (periodogram, ?)

