Accessing the
Virtual Observatory from Python

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VAO Desktop Development Products

- VOClient
  - Based on C-library implementation
  - Release v1.0: http://dev.usvao.org/voclient
    - Features suite of command-line tools
    - Interactive use and shell script programming
  - Core implementation for binding to other languages
  - Python bindings planned for version 1.0
    - Shares a common API with PyVO
  - Goes beyond PyVO to provide higher level interfaces
    - Managing asynchronous queries across many archives
    - SAMP support
      - drive other desktop apps from a python script
    - Framework for executing legacy/compiled code from Python

VAO Python Products

- PyVO
  - Pure python implementation based on Astropy (astropy.org)
    - "affiliated" package
  - Current focus: data discovery
    - Registry: Search for archives with services
    - Data Access:
      - Query an archive for images, spectra (SIA, SSA)
      - Query object catalogs and observation lists (Conesearch)
      - Query spectral line databases

Astropy and the VO

- **Support in Astropy Core**
  - VOTable support
    - Built in validater; strict ("pedantic" mode)
    - Integrated with general table capabilities
      - Numpy arrays
      - Row and column-based access
  - PySAMP
    - Recently imported
  - Conesearch
    - First protocol
    - Comes with service validater
      - Used to create list of compliant services
      - Transparently accessible from server at STScI
      - Generalized as list of "favorite" services

Astropy and the VO

- PyVO as affiliated package
  - Full integration with core capabilities (tables, coordinates, etc.)
  - Platform for migrating VO capabilities into Astropy core
  - Comprehensive approach to Registry and DAL services
- Astroquery
  - Support for access to non-VO services from many archives
    - E.g.. CDS, NED, 2MASS, …
  - Make interfaces similar on client side

PyVO Audience

- Python tool and library developers
  - Integrate VO capabilities as an added feature

- Astronomy researcher
  - Interactive exploration of available data
  - Automated retrieval and processing of data
  - As part of highly customized processing scripts

Getting PyVO

- Currently available in beta
- Web site: http://dev.usvao.org/pyvo
- In GitHub
  - Can build from source: `python setup.py install`
  - Submit questions, issues. Fork us!
- Releases available from PyPI:
  - `sudo pip install pyvo`
- Read the docs
  - http://pyvo.readthedocs.org/

Demo 1

PyVO Features

- Search the registry to find data archives and catalogs

- Search on-line databases / catalogs:
  - Source and observation catalogs (Simple Cone Search)
  - Spectral line emission data (Simple Line Access)

- Search data archives for datasets
  - Images (Simple Image Access)
  - Spectra (Simple Spectral Access)

Demo 2

Future work

PyVO:

- Add support for additional services (e.g. TAP)
- Improved integration with Astropy, leverage special capabilities for…
  - Coordinates
  - Units
  - Table and array manipulation
  - Source name resolution
- More VO smarts: data model aware
  - Create instances of objects representing astronomical concepts based on standardized data tagging

VOClient:

- Python support follows this Spring