Accessing the Virtual Observatory from Python

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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 validator; strict (“pedantic” mode)
    - Integrated with general table capabilities
      - Numpy arrays
      - Row and column-based access
  - PySAMP
    - Recently imported
  - Conesearch
    - First protocol
    - Comes with service validator
      - 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/
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)
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