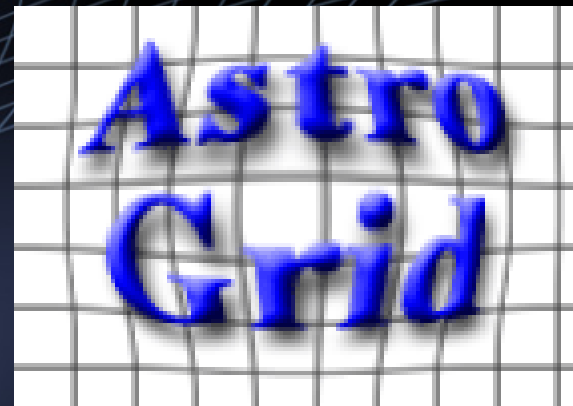# Usage of the Astro Runtime
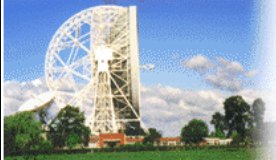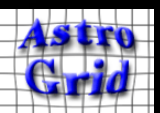
Noel Winstanley
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AstroGrid, Jodrell Bank, UK

Jodrell Bank
Observatory

AstroGrid Workbench
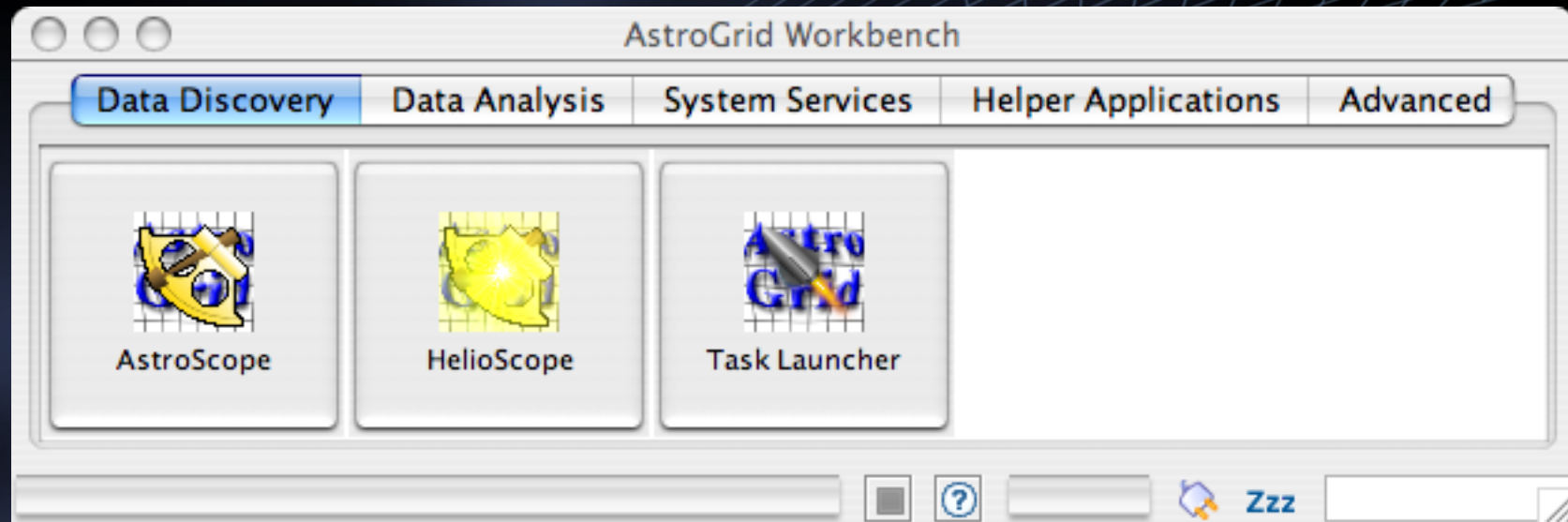
- A Rich GUI Client for the VO
- http://www.astrogrid.org/desktop

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Workbench - User's Perspective

- Workbench – GUI Application
  - Java WebStart / Installer / osx DMG
  - Rich user applications
    - Data discovery – Astroscope & Helioscope
    - Task Launcher – run a single task (e.g. SIAP query, remote applications, ADQL queries)
    - Workflow Builder – combine CEA applications
    - Lookout – Task Monitor and Results Access
    - Myspace browser
    - Registry Browser
  - PLASTIC – exchange data with Topcat, Aladin, Vospec, Visivo, Gaia, Specview, VOSpec,
    - Workbench does no analysis or visualization itself.
  - Scripting access to VO services (Python, Perl..)

Astroscope

- Searches all registered Cone, SIAP and SSAP services.

- Displays a concept-graph of results

- Organized by Service; offset from search position; position

- PLASTIC integrated.

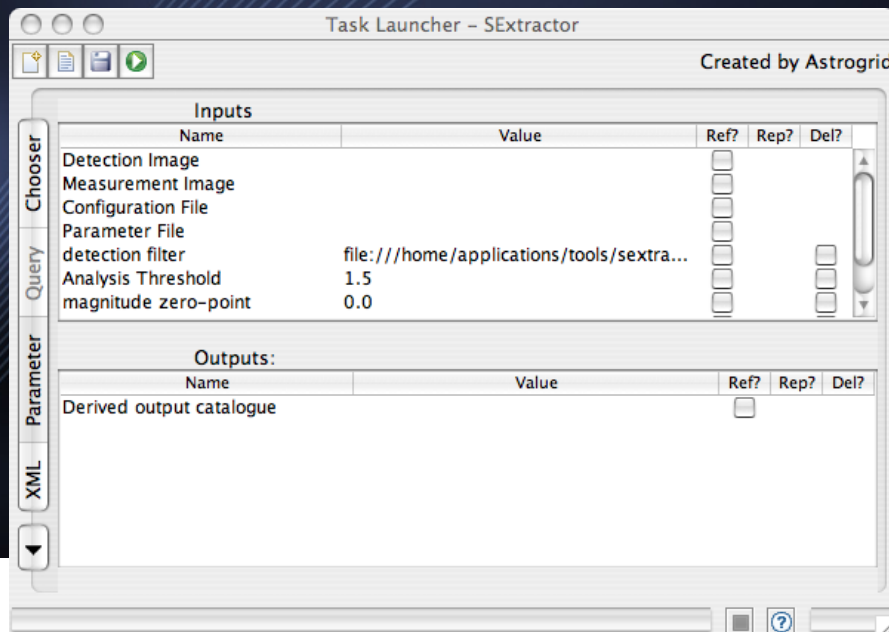- Demonstration

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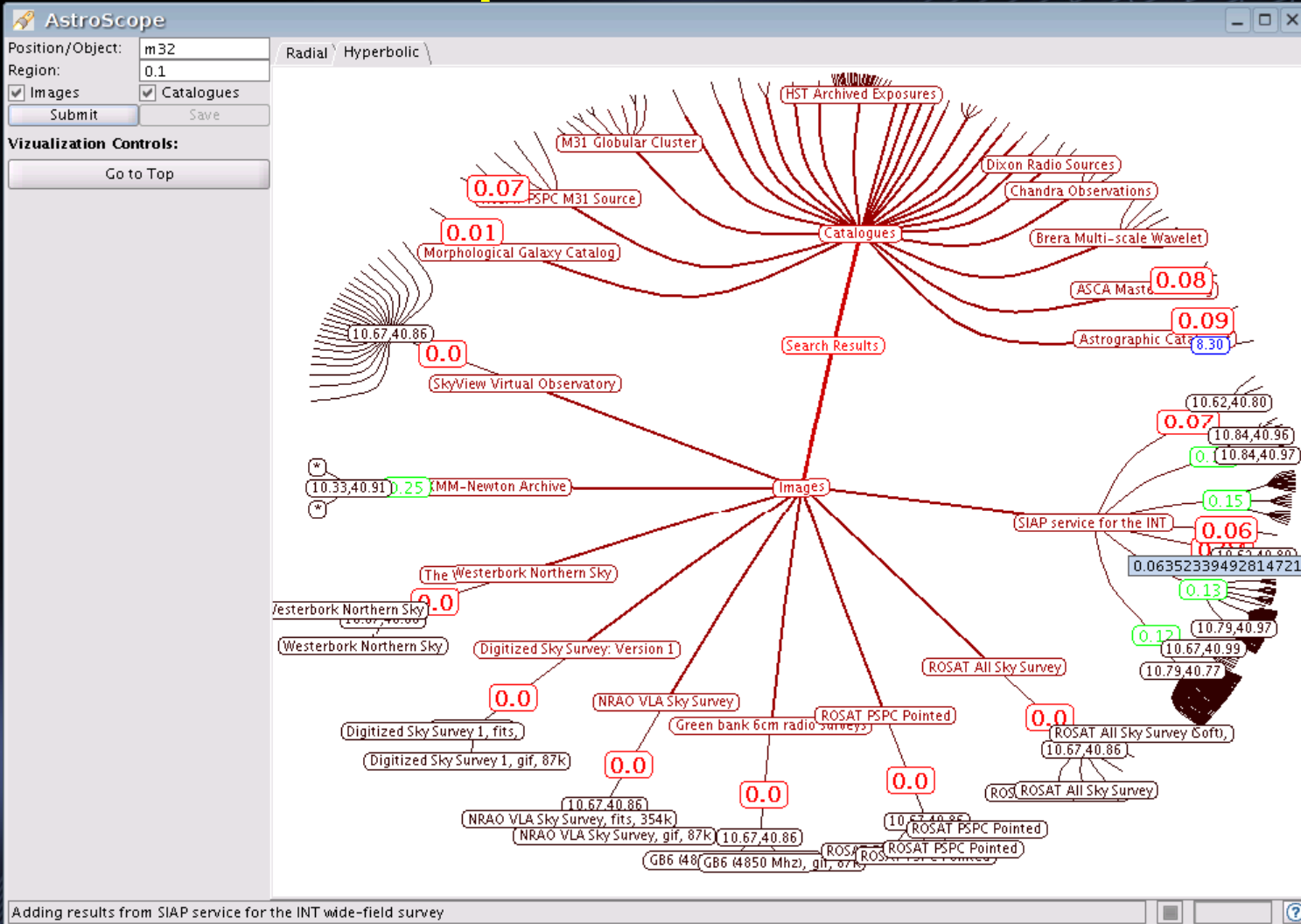
Registry Browser
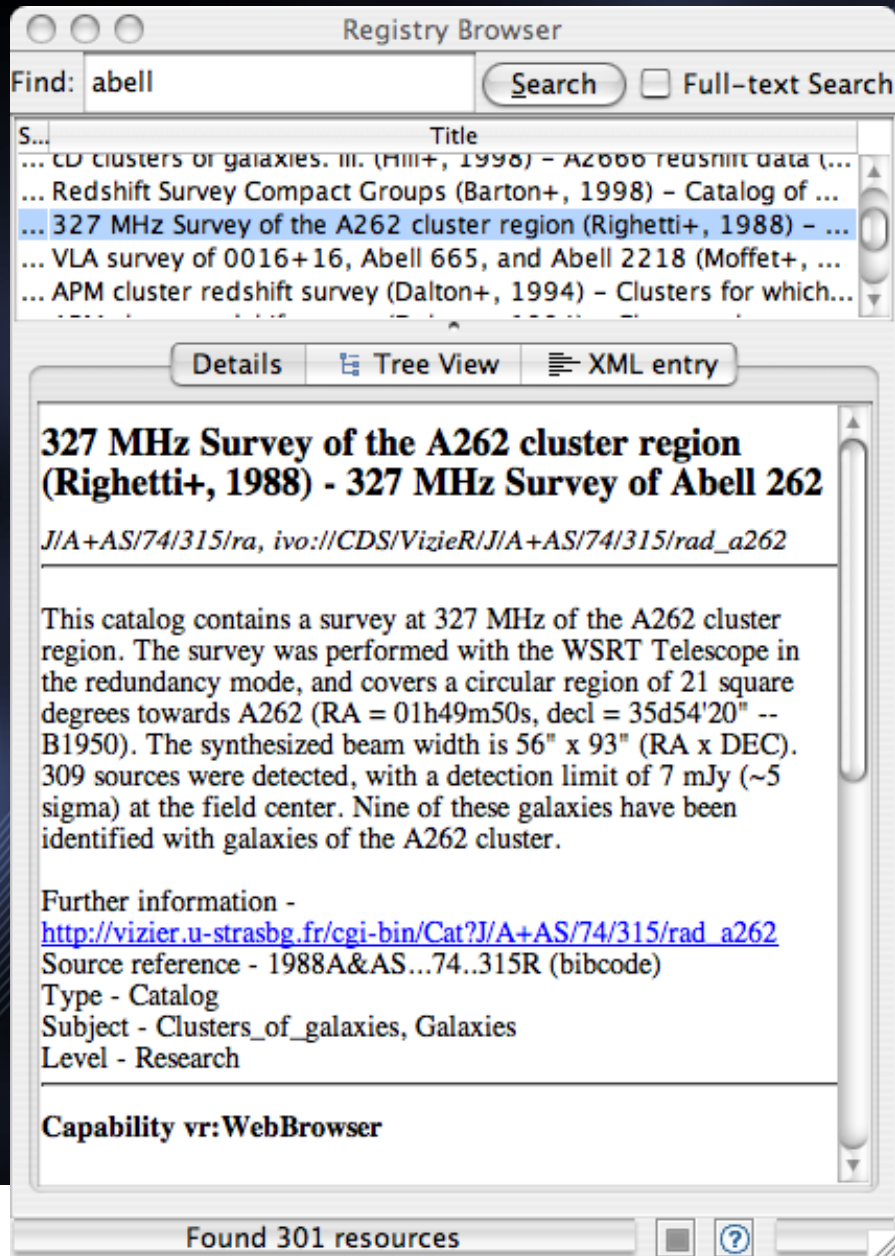
- Google-style keyword querying

- AND, OR, NOT

- Caches Results.

- Hyperlinks to related resources and webpages

- Demonstration

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Remote Applications

- Common Execution Architecture – CEA
  - Described by an IVOA Note.
  - Working system, with an installed base
- Uniform method of describing, deploying, and providing access to remote applications; such as:
  - dataset access - Querying a catalogue database or image collection
  - data processing - X-matching, source extraction, simulation
- CEA applications can be invoked from client scripts, UI, and server-side workflows
  - Asynchronous – invoke, notify, control.
  - Staged results – to myspace, ftp server, ..
- Standardized as IVOA 'Universal Worker Service'

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Task Launcher
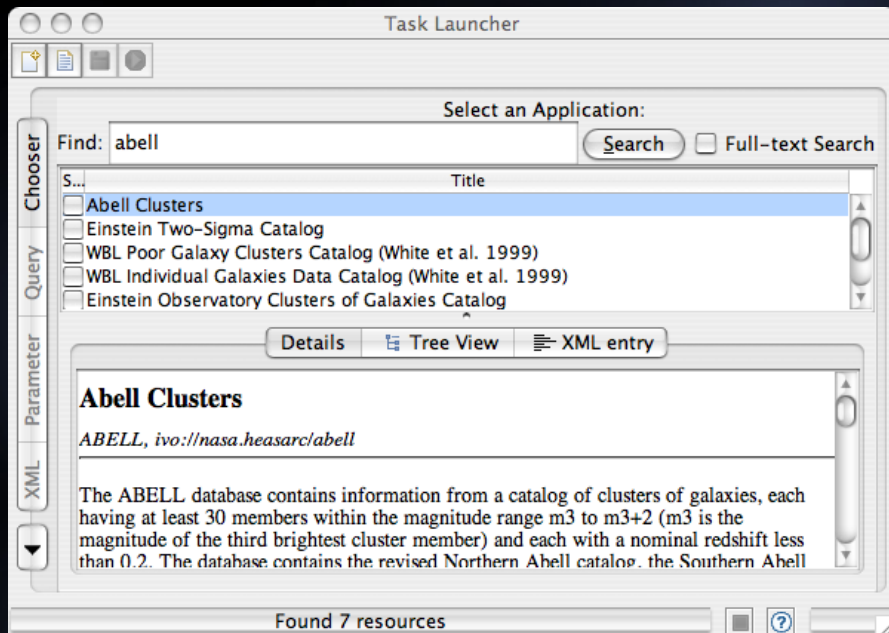
- Uniform form-driven interface to services
  - Cone
  - SIAP
  - SSAP
  - CEA (ADQL and others)
- Includes an ADQL builder
- Shields users from details and differences between protocols
  - adds functionality lacking in particular protocols.
- Demonstration
- Plan to add SLAP, latest SSAP changes, Skynode.

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Lookout
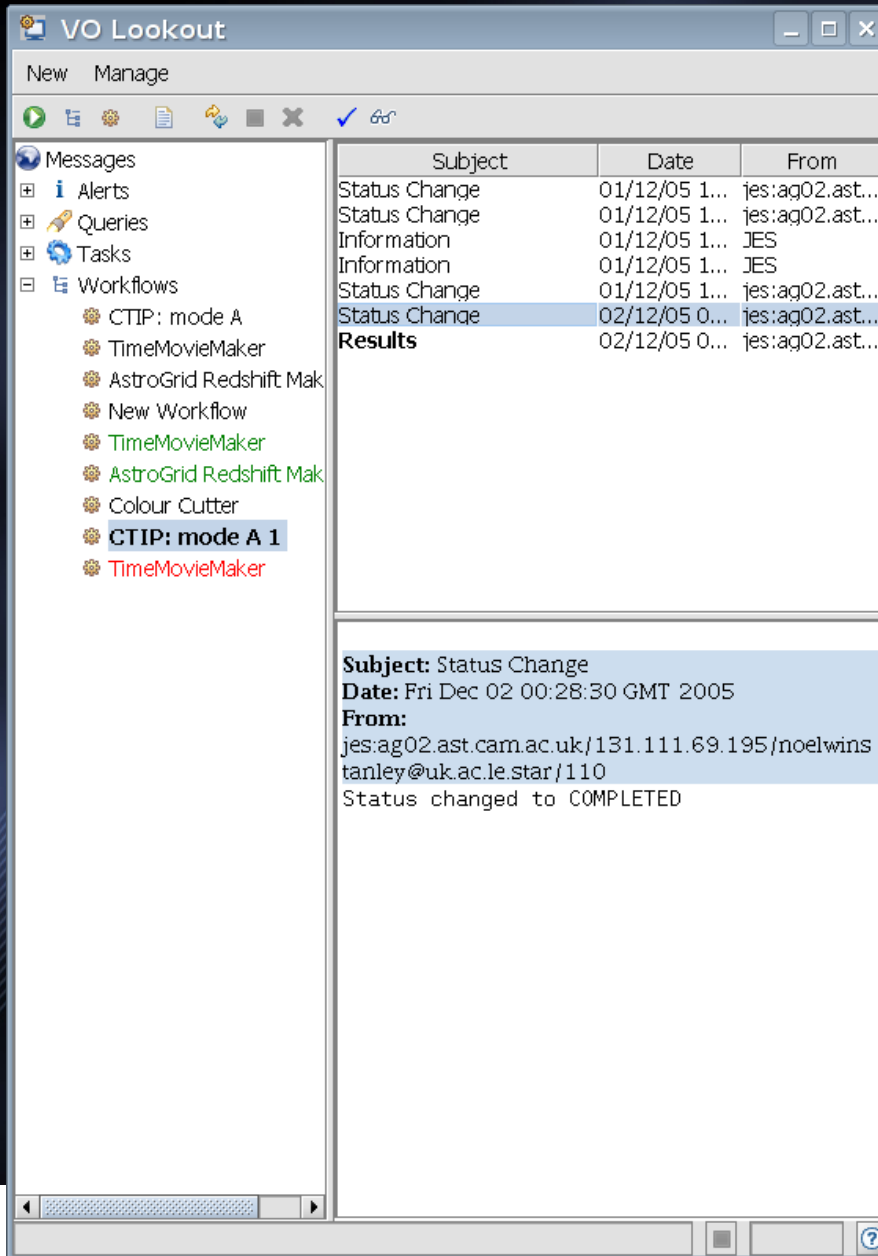
- Displays execution progress and results from
  - Task Launcher tasks
  - Workflows
- Single place to look for progress information, execution transcripts, results.
- PLASTIC integrated – local and staged results can be passed to applications.
- Demonstration

Myspace Browser
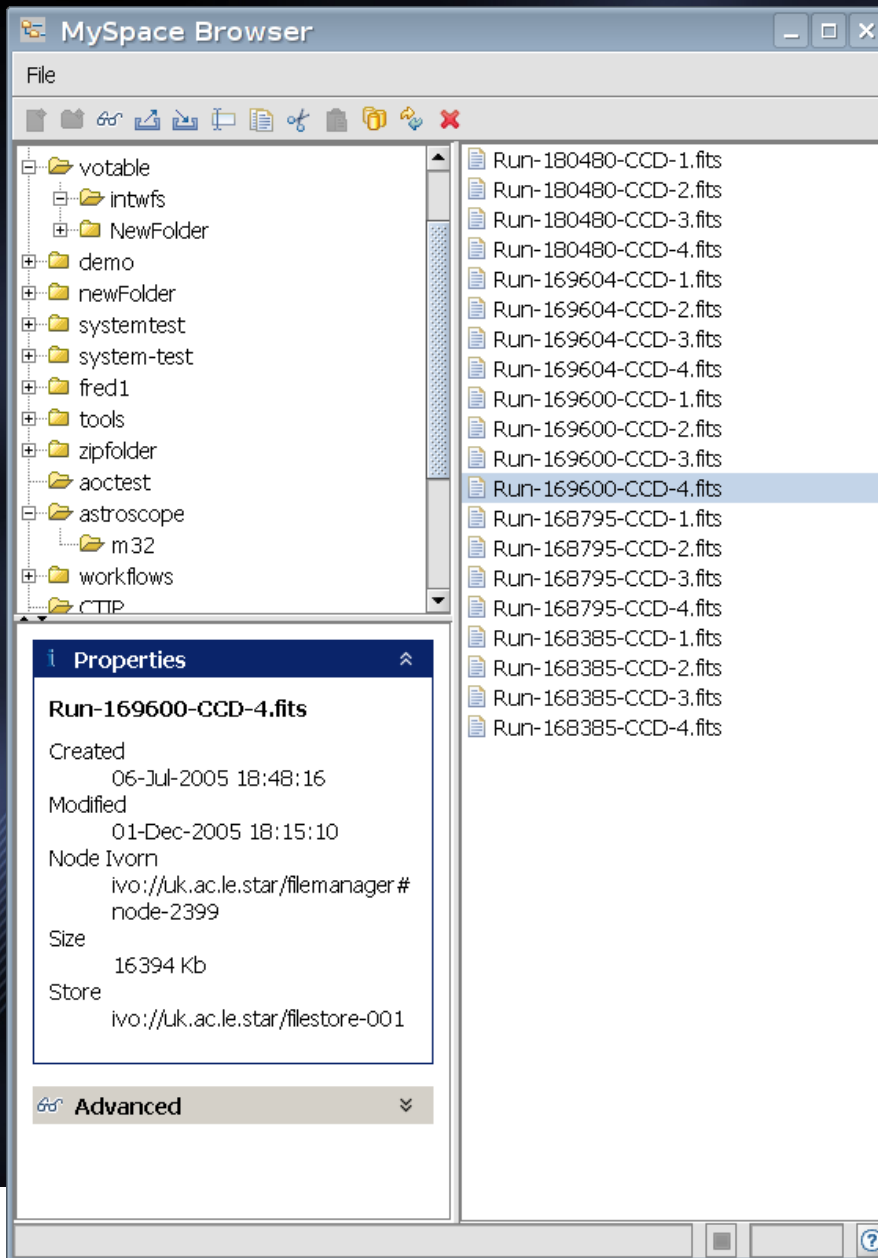
- Manage, upload, download, relocate files
- PLASTIC – load files in selected viewer
- Demonstration

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Astro Runtime – In one Slide

- A library of virtual-observatory functions and clients.
  - scope: integrate all VO standards, popular ad-hoc services, suitable helper functions
- Library is exposed as a desktop service
  - accessible from almost all programming languages
    - XMLRPC, HTTP, RMI
  - trivial to install: Java WebStart; standalone; embedded.
  - minimal setup – no compilation or native libraries
- Library design uses consistent abstractions and types
  - cleaner API, fewer special cases, shallow learning curve, procedural / object based design.
  - Insulates clients from change and detail.
- Shared component
  - single signon, single configuration.
  - cached registry queries, other data.

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Astro Runtime - Variants

All variants are available webstartable (except ASR), and as installers, and as embeddable libraries

Variant	Size	Plastic Hub	Access to VO services AG,CDS,NVO,IVOA	Dialogs myspace browser...	Apps AstroScope...
Workbench	18M	🟩	🟩	🟩	🟩
ACR	16M	🟩	🟩	🟩	
ASR	12M	🟩	🟩		
Plastic Hub	3M	🟩			

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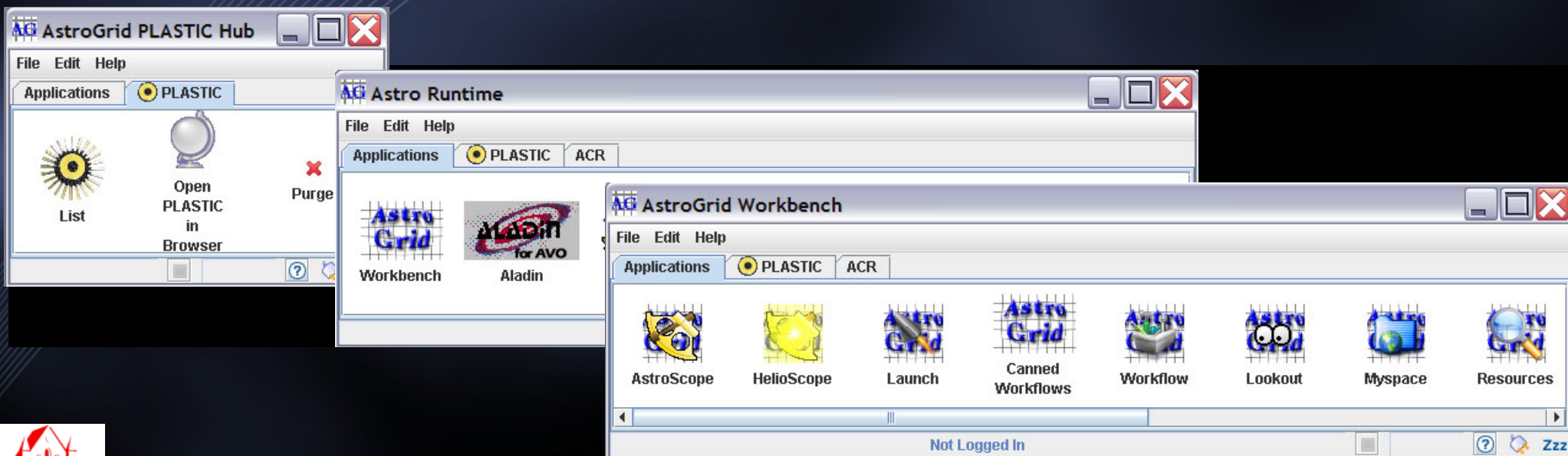
What can it do?

- IVOA
    - Registry v1.0, - query, xquery, resolve.
    - Cone, SIAP, SSAP
    - ADQL Translator
    - SkyNode (almost)
- AstroGrid
    - CEA & Workflow: query, build, execute, monitor
    - MySpace: read, write, list, create, delete
- CDS – Simbad, Vizier, coordinates, UCD.
- PLASTIC Hub - client-side application messaging
- UI - control workbench user interface, display dialogues to prompt for input

How it all fits together...
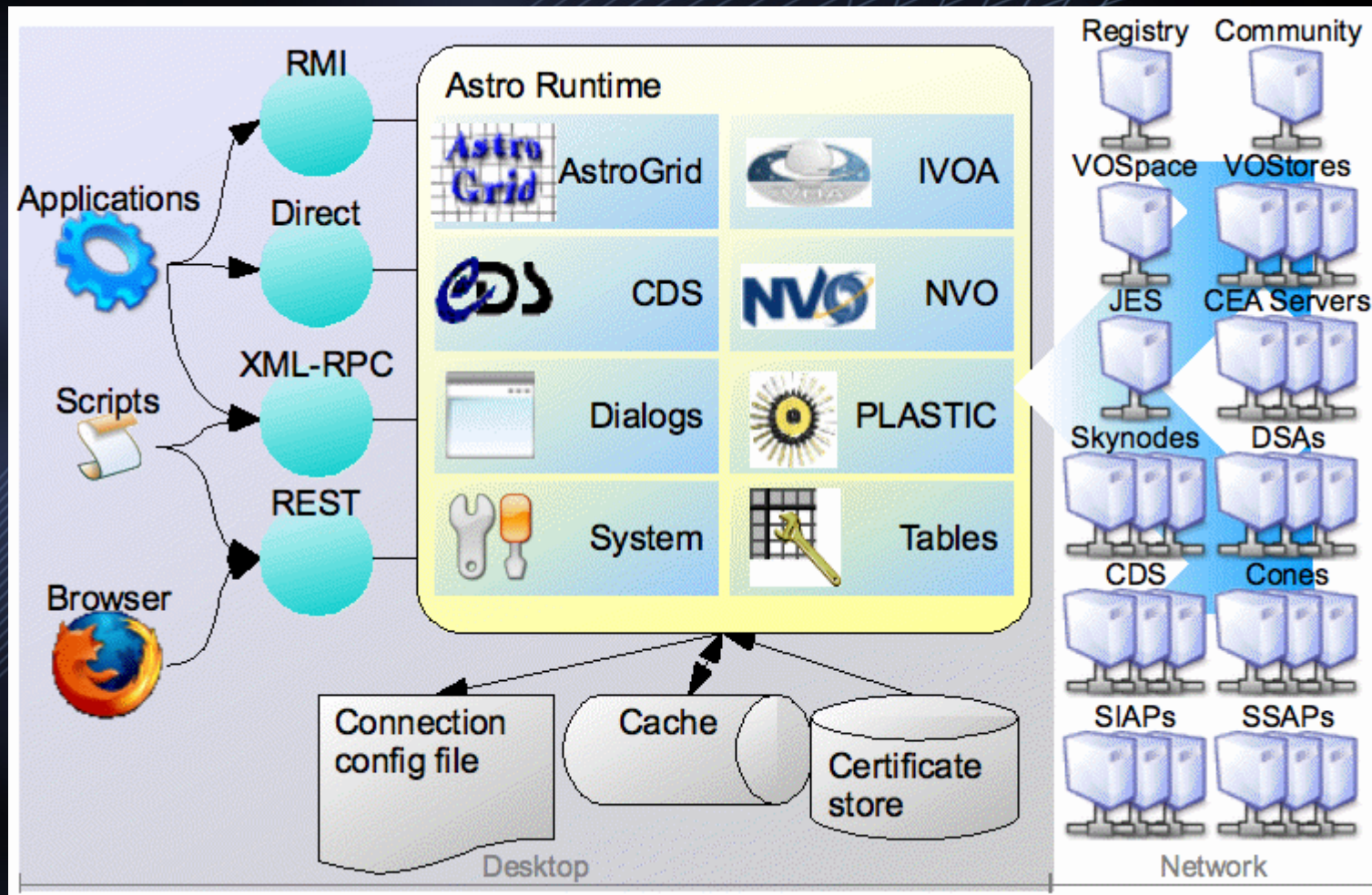
Python: XML-RPC

Import xmlrpc library

Read AR configuration file

Construct xmlrpc endpoint

Create client

Get reference to service

Call service function

```python
#!/usr/bin/env python
# Noel Winstanley, Astrogrid, 2005
# minimal example of connecting to acr and calling a service.
import xmlrpclib
import sys
import os


#parse the configuration file.
prefix = file(os.path.expanduser("~/.astrogrid-desktop")).next().rstrip()
endpoint = prefix + "xmlrpc"
print "Endpoint to connect to is", endpoint

#connect to the acr
acr = xmlrpclib.Server(endpoint)

#get a reference to the registry service from the acr.
registry = acr.astrogrid.registry

#call a method
print registry.getResourceInformation('ivo://org.astrogrid/Pegase')
        # returns a struct of data

print registry.getRecord('ivo://org.astrogrid/Pegase')
        # return the xml of a registry entry (string)

print registry.resolveIdentifier('ivo://uk.ac.le.star/filemanager')
```

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Astro Runtime – Improvements

- Debugged and Tested
- Registry Client Improvements
  - Supports new Registry Schema (v1.0)
  - Streaming
  - Caching
  - Xquery based
- Polished up PLASTIC Hub implementation
- VOTable Manipulation (STIL)
- ADQL Query Builder Dialog
- Split workbench into family of variants
  - Hub, ASR, ACR, Workbench
  - Reduced download size
  - installer, library, OSX .app and webstart packagings

Applications using the Astro Runtime

Searches the registry
Queries SIAP services
Saves to MySpace

Launches CEA apps
on HPC resources

VAST

VisIVO
Visualisation Interface
to the
Virtual Observatory

Browses
MySpace

Lots!. e.g. AstroScope:
Searches registry
Queries SIAP, Cone,
SSAP services

Topcat

ALADIN

Astro
Grid

Workbench

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Scripted uses of AR

- VO Commandline
  - unix-ey small composable commandline programs.
  - `vols, voget, voput, reg-query, ls-jobs` ...
  - implemented as Python scripts calling the ACR
- Python workflows (Eduardo Gonzalez)
  - script contains control flow
  - performs work by querying DSA servers, SIAP services, and running CEA applications via AR
  - more interactive development than batch JES workflows
  - Integrate existing non-VO programs into the workflow
  - same could be done in Perl / IDL / ...
  - Quite advanced for the average astronomer.

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AR - Future

- Maintain backwards compatibility
- Documentation, examples, recipes
- Grow & support the user / developer community
- Myspace Performance, Migrate to VOSpace when ready
- Add
  - missing service type – CDS, SLAP, SkyNode
  - other useful astronomy webservices – NED, etc.
  - Expose the Astroscope engine – bulk query.
- Contributions
  - VOEvent Module – Alasdair Allen.
  - Publish DALClient ?
- Track developing standards (VOStore, SSO, TAP)
- Refine & extend workbench UI (RegistryScope...)

AR - Issues

- Some open questions – similar to those of PLASTIC
  - Unsurprising, as built on same technology
  - Hope to come up with consistent solutions.
- Asynchronous event notification (XMLRPC clients)
  - Assume they're PLASTIC registered
  - Define a new plastic message for callbacks
- Security & Access Control to Hub / AR
  - Decide the appropriate place on the Security Spectrum
  - Prefer to keep things simple.
    - Existing solutions – Firewalls, Java Permissioning.

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Contacts and References

- Noel Winstanley - nw@jb.man.ac.uk
- John Taylor - jdt@roe.ac.uk
- Workbench - http://www.astrogrid.org/desktop
- Astro Runtime - http://www.astrogrid.org/desktop/astro-runtime
- Plastic - http://plastic.sourceforge.net