



Workshop Report: Hot-Wiring the Transient Universe

Rob Seaman

The NOAO Data Products Program hosted more than 60 astronomers and software engineers in Tucson at the conference “Hot-Wiring the Transient Universe” from 4-7 June 2007. This meeting served as a joint workshop between the International Virtual Observatory Alliance’s VOEvent working group (voevent.org) and the Heterogeneous Telescope Networks (HTN) consortium (www.telescope-networks.org).

In addition to NOAO, co-sponsoring institutions included the Large Synoptic Survey Telescope (LSST), the National Virtual Observatory (NVO), the Thinking Telescope project at Los Alamos National Laboratory, and the eSTAR project in the United Kingdom.

VOEvent is the standard format for representing reports of transient celestial events within the Virtual Observatory. It is broadly applicable to the description of time-varying astronomical phenomena of all types, from supernovae and gamma-ray bursts to the light curves of variable stars, from events on the solar disk to the orbits of solar system objects.

The fifteen sessions at the workshop ranged widely over topics such as *The Science from Rapid Response*, *A Long Range Vision for Transient Astronomy*, *Event Classification*, *Web Services for Real Time Data Reduction and Analysis*, *Distributed Scheduling*, and *Grid Markets*.

NOAO presentations highlighted our recent efforts toward VOEvent activities such as a case study of how Target-of-Opportunity observations can be managed using a VOEvent-mediated process, some new tools, and an infrastructure for deploying VOEvent services. For those interested in learning more about these technologies, NOAO’s VOEvent software can be downloaded from voevent.noao.edu.

No discussion of transient alert reporting and follow-up response would be complete without mentioning the digital tsunamis of alerts soon to arrive from Pan-STARRS, the Dark Energy Survey and LSST. Tens to hundreds of thousands of discoveries per night will be reported from these facilities, making it critical that a mature VOEvent infrastructure be in place before they are commissioned. VOEvent will provide the critical network link between publishers of transient alerts and their subscribers.

Presentations from the conference are available at www.cacr.caltech.edu/hotwired/program. The conference proceedings will be published in 2008 as a special issue of *Astronomische Nachrichten*. The organizers acknowledge a great debt to Barbara Fraps for unending logistical support, to Pete Marenfeld for the eye-popping workshop poster, and to Sarah Emery Bunn of the NVO for attentive Web support.



Accessing the Virtual Observatory from Within Your Favorite Programming Environment

Christopher J. Miller, David Gasson, & Exequiel Fuentes

The Virtual Observatory (VO) has made significant progress over the last few years in defining standards, providing methods for data discovery, and providing means to access and analyze data. As part of its evolution, there is a growing glossary of terms that VO users should be familiar with.

- VOTables– These are XML files that are in the standard format for dealing with data and metadata in the VO.
- Cone services– These are URLs that, when accessed, return a VOTable containing catalog data within a user-specified search radius on the sky.
- Simple Image Access Protocol (SIAP) services– These are URLs that, when accessed, return a VOTable containing image metadata within a user-specified region on the sky. Included in the metadata is a URL link to the actual image.
- The NVO Registry– This is a service that allows users to query for NVO resources (e.g., data archives, SIAP servers, cone servers, analysis services, etc.)
- The Open SkyQuery Portal– This service allows users to send an SQL-like query, and retrieve object catalog data in VOTable format.
- Name Resolvers– These services allow users to specify a position on the sky and retrieve the names of astronomical objects at that location.

There are Web-based tools available at us-vo.org to help users with these services. In addition, NOAO Data Products Program staff members have been creating libraries to utilize the VO resources. These libraries are available at www.nvo.noao.edu.

The Interactive Data Language (IDL) was created by David Stern for use with NASA's Mars Mariner 7 and 9 missions. In 1981, IDL was rewritten into FORTRAN 77, which is a familiar programming language to many astronomers. The spread of the use of IDL in astronomy can be attributed to both the FORTRAN legacy as well as the wealth of publicly available libraries (idlastro.gsfc.nasa.gov/).

IDL's VOLib is a set of IDL procedures (IDL 6.+) which allow users to discover and access data in the Virtual Observatory, typically with a single command-line call. This means that users can pull in data from the VO to use with their own IDL science and visualization codes.

As an example, a user can call the Far Ultraviolet Spectroscopic Explorer (FUSE) and fill the IDL data structure called "fuse_data" with objects observed by FUSE within 10 degrees of the position RA=180 and DEC=1:

```
IDL> fuse_url = 'http://archive.stsci.edu/fuse/search.php?'
IDL> conecall,str=fuse_data, url = fuse_url, 180,1,10
```

VOLib is available at www.ctio.noao.edu/~chrism/VOLib. If you have questions or need help, please contact Chris Miller (cmiller@noao.edu).

Ruby (www.ruby-lang.org/) is an object-oriented scripting language with a focus on simplicity and productivity. It was first released by the author (Yukihiro "Matz" Matsumoto) in 1995 and has enjoyed gradual growth ever since.

Lately, Ruby has experienced a surge of activity due to Ruby on Rails (www.rubyonrails.org), a popular Web application-building framework that has emerged as its "killer app." Many people now come to Ruby through Rails, and it is a very powerful general-purpose programming language with full and elegant support for objects, closures, iterators, and other denizens of the programming landscape.

VORuby began as a set of Ruby classes for parsing VOTables and has grown from there. Originally conceived as part of the infrastructure for the NOAO NVO Portal, it is now a standalone set of modules available to anyone in the community from RubyForge (rubyforge.net/projects/voruby/) under the terms of the GNU General Public License version 2 (GPLv2).

As an example, a user can obtain the coordinates of Messier 1 via this simple line:

```
coords = @sesame.query_position('m1')
```

A user might take these coordinates and make a *Cone* service call to FUSE, as shown above, to create an object with the positions of spectroscopic objects observed around M1.

If you would like help or more information on using VORuby for your scientific needs, please contact David Gasson (dgasson@noao.edu).

Python is a programming environment that many astronomers use in their daily research. S. Kwok (Keck Observatory) has provided Python libraries that offer similar access to the IDL and Ruby libraries described above.

For instance, the following line will quickly download an image from the GALEX mission using Python:

```
python SIAPEx.py siapImages 'http://galex.stsci.edu/gxWS/SIAP/gx-SIAP.aspx?' 180 0 1
```

Users can obtain these Python VO libraries at:

viewcvs.cacr.caltech.edu/us-vo/viewcvs.cgi/contrib/summerschool/python/.

IRAF 2.14

Chris Smith & Mike Fitzpatrick

We are pleased to announce the new release of the beta version of IRAF 2.14 in September/October 2007. This is an official release of IRAF from NOAO, to be followed by a final 2.14 release within a few months.

Due to resource limitations and higher-priority demands, NOAO dedicated little effort to the maintenance of IRAF in 2005 and 2006. However, the community effort led by Mike Fitzpatrick and Frank Valdes (above and beyond NOAO's commitment) made significant improvements to the core IRAF code base. These improvements included numerous bug fixes and, most significantly, ports to the Mac/Intel and Cygwin platforms (IRAF 2.13 beta). The official NOAO release of IRAF 2.14 is built upon those improvements and incorporates several bug fixes and changes not previously released.

NOAO anticipates a significant investment in IRAF development over the next year, leading to at least one additional release of the core and the release of several external packages. Announcement of all official releases will be made through the official IRAF Web site (iraf.noao.edu), the *NOAO/NSO Newsletter*, and via postings to iraf.net. NOAO will also work with the Space Telescope Science Institute to ensure

that PyRAF and the associated Python environment continues to provide the important services it is bringing to the astronomical community.



Specific help questions about the newly released packages should be sent to the email addresses specified in the documentation associated with the packages. This will allow NOAO to provide direct support of these new packages, which are relevant to new NOAO instruments and other development efforts such as the National Virtual Observatory. Nevertheless, NOAO staff will monitor iraf.net to provide appropriate support for the new releases.

The iraf.net Web site has grown into an active and important community forum for discussion of IRAF questions and general IRAF support. NOAO hopes that it will continue to grow, with even more community participation in answering posted queries. NOAO staff participation in this principal IRAF community forum will also provide a method for gathering community input into the next generation of data reduction and analysis environments, thereby helping us plan NOAO's role in developing and supporting one or more of those future environments.