Single Sign-on and the Virtual Observatory as an Operational Facility

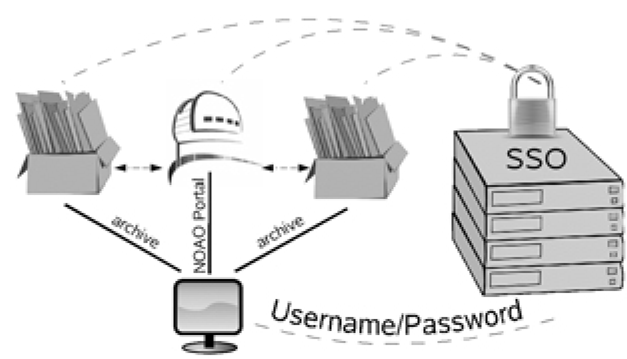
Christopher J. Miller & Irene Barg

The Virtual Observatory (VO) is a distributed system of data, tools, and services—there is no brick and mortar building. By definition, the VO is the integrated whole of a large, heterogeneous and internationally distributed network of facilities. Many astronomers have principal investigator (PI) data taken by NOAO, Space Telescope Science Institute, Spitzer, Chandra, XMM, etc. These data live in secure archives for proprietary periods before going public. The archives act like banks, storing and protecting your valuable data.

One of the goals of the VO is to provide astronomers with highly effective tools and services to discover and access all of their data through portals. A simple (but not ideal) analogy is a financial Web service that provides account aggregation. For example, many online banks will collect user names and passwords to all of your various financial accounts (e.g., credit cards, loans, retirement plans, investment plans, etc.). The service then provides you with a summary of your financial data in one location. The service works by collecting the balances from each separate account.

As users, we often experience "password fatigue" as we try to keep track of different user names and passwords for each account. Arguably, our assets become less secure as notes with account and password information begin to litter our offices.

The solution to this problem is called Single Sign-on (SSO), and it is becoming more popular every day on the World Wide Web. For instance, you can log onto your Google, Blogspot, and YouTube accounts using the same user name and password. At NOAO, the Data Products Program (DPP) has implemented the SSO mechanism into the NOAO VO Portal (*www.nvo.noao.edu*), and we hope that other astronomical archives will follow our lead in the near future.



Single Sign-on (SSO) will enable astronomers to enter their user names and passwords one time and gain access to proprietary data and services across multiple archives and portals. NOAO is now operating a production-quality mirror of the SSO login service to ensure a high quality of service for our users.

As part of the transition from development into an operational US VO facility, DPP operations has been moving toward mirrored services. These will better guarantee availability of services, especially critical services like the VO SSO, which is used by the NOAO VO Portal to grant PIs access to their proprietary data.

In June 2008, the NOAO VO Portal in Tucson and La Serena was deployed into production using a single interface for NVO authentication. To this end, I. Barg, along with C. Miller, N. Saavedra, and M. Fleming (NOAO), and R. Plante and B. Baker (National Center for Supercomputing Applications) have built VMware Linux servers to host an SSO mirror (*nvoauth1.tuc.noao.edu*) and create one of the first production-level, secure, VO login services. Check it out at *sso.us-vo.org*.

The All-Sky Camera Project

David Walker

The All-Sky Camera (ASCA) project started at CTIO in 2002 under the direction of Roger Smith. It later evolved under Hugo Schwarz into a system that has been implemented around the world at 10 different sites.

The ASCA takes images of the entire visible hemisphere every 30 seconds in blue, red, Y, and Z filters, giving enhanced contrast for the detection of clouds, airglow, and the near-infrared. Animation is used to show movement of clouds. An additional narrowband filter is centered on the most prominent sodium line to monitor any human-made light pollution near the site. The camera detects aircraft lights and contrails, satellites, meteors, meteorites, and local light polluters. It can be used for stellar extinction monitoring and for photometry of transient astronomical objects.

The ASCA can also show wandering planets, diurnal rotation of the sky, the zodiacal light, and even the occasional bird. The archival use of the ASCA images will allow us to measure the trends of extinction variations, airglow changes, and long-term light pollution from cities and towns near the observatory.

The project was started as a basic cloud monitor, using only a blue filter, and it was later enhanced with other filters. The final version being used on the Large Synoptic Survey Telescope (LSST) and Thirty

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All-Sky Camera Project continued

Figure 1: All-sky camera at Kitt Peak National Observatory.

Meter Telescope (TMT) campaigns uses a filter wheel with five filters to monitor clouds (blue), airglow (red), the near-infrared (Y, Z) and artificial light pollution (sodium). The ASCA is fully automatic and, apart from periodic maintenance, requires no human intervention.

The ASCA is made up of a CCD camera with a filter wheel and a 180-degree field-of-view fish-eye lens. The equipment is placed in a simple tubular housing on top of a pillar three meters high with a small acrylic dome to protect it from rain, snow, wind, and dust. A ladder provides access, and the whole housing with camera can be removed easily for maintenance. Marked positions assure that the orientation of the ASCA is the same after being removed for maintenance or repair.

From carefully selected locations, the ASCAs can see most of the sky (and at observatories and the site test locations, most of the surrounding domes or telescopes). The cameras have lines of sight to all towns and cities on the horizon to monitor light pollution.

One computer controls the ASCA while another stores and processes the images. The control computer, located in the ASCA housing, demands a location with an Internet connection and power. The processing computer resides at the respective observatory and receives the data by downloading the images from the all-sky control computer over the Internet.

The all-sky systems are deployed to sites in Chile at Cerro Tolar (TMT), Cerro Armazones (TMT), Cerro Tolonchar (TMT), Cerro Las Campanas (Carnegie), Cerro Tololo (CTIO), and Cerro Pachón (SOAR); in Mexico at San Pedro Martir (TMT-LSST); in the US at Hawaii (TMT) and Kitt Peak (KPNO); and, finally, in the Arctic at 83 degrees North (in a partnership with Canada).

TMT and LSST use the ASCAs for evaluating light pollution at their different sites. Each of the five sites in the TMT site-testing program has an ASCA as part of the site testing equipment. All five sites are very dark on average, with the only light pollution coming from nearby communities or work sites. For light pollution to be an issue for TMT, it must extend above the 65-degree zenith angle, which is the lower limit for TMT observations.

The TMT all-sky data has shown that there are great differences in light pollution levels even at the same site. This demonstrates the necessity of examining as many nights as possible from each of the sites. Noticeable changes occur due to instrumentation, light sources

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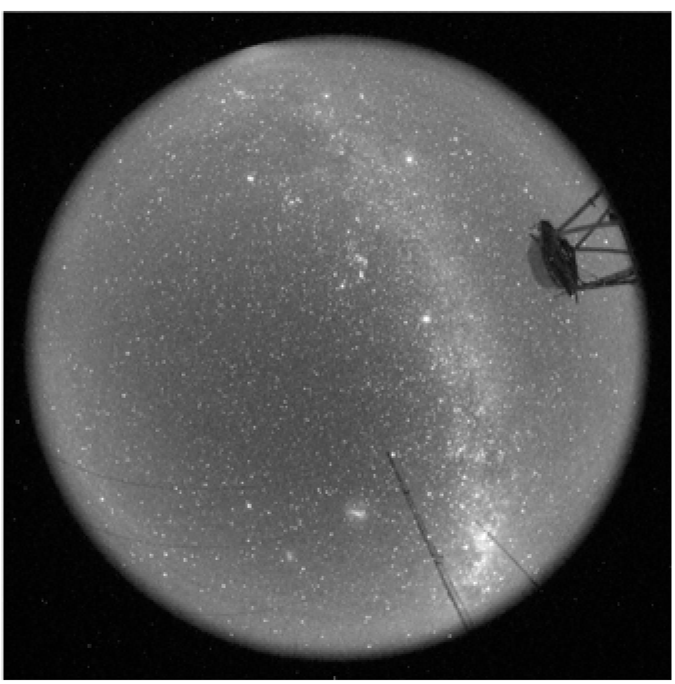

Figure 2: A single all-sky image from Cerro Armazones taken on the night of 8 December 2007.

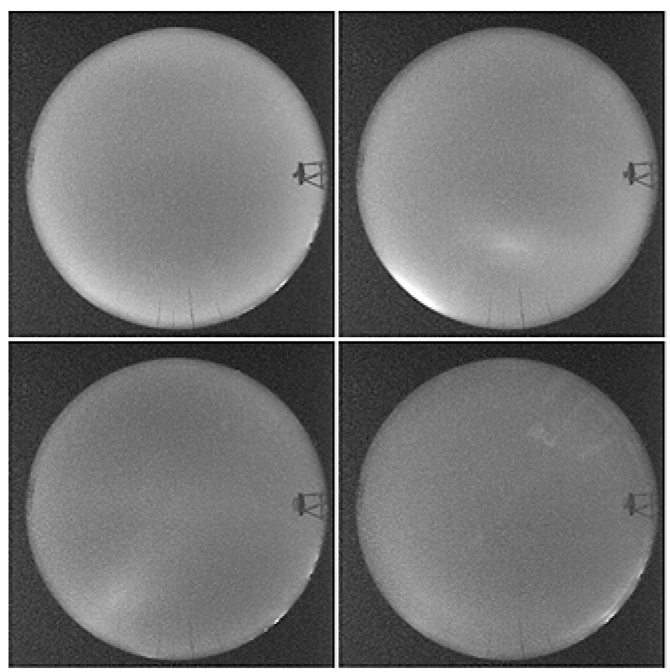

Figure 3: A set of light pollution analysis images from Cerro Tolar, showing the various features that can appear in the data.

All-Sky Camera Project continued

appearing or disappearing over time, patches of clouds near light sources at times, and the appearance of the Milky Way galaxy in the data. It is critically important to examine each light pollution analysis image and, if necessary, raw data to conclude what the different features are in the images, and then combine the analysis of several images to determine the effects of light pollution at the sites.

The data from the ASCAs on NOAO sites also hold the promise of providing better understanding of the scientific data obtained from all of the telescopes on a nightly basis. Now that ASCAs are operating at CTIO, KPNO, and SOAR, we are starting a program to archive the ASCA images together with the scientific data in the NOAO Science Archive. In the future, both principle investigators and archival users will be able to retrieve the ASCA images along with their science data to aid their scientific research. NL

Upcoming Data Products Program Meetings and Events

Christopher J. Miller

The (northern) fall is a busy time of year for the NOAO Data Products Program (DPP) team. Software deliverables are scheduled for release at the National Virtual Observatory Summer School (NVOSS), the Astronomical Data Analysis Software and Systems (ADASS) conference, and the next Americal Astronomical Society meeting in January. All DPP software needs to be operationally deployed and tested prior to these milestones.

Important dates over the next few months:
The fourth NVOSS will be held in Santa Fe, New Mexico from September 2–11. NOAO is sending staff members Dave De Young, Mike Fitzpatrick, and Chris Miller, and many students. The NVOSS is where students learn to use and develop modern astronomical tools and services that are VO-compliant. See *www.us-vo.org*.

The International Virtual Observatory Alliance (IVOA) will hold its semi-annual interoperability meeting in Baltimore at the end of October. The IVOA is the forum where standards are set so that astronomical tools, services, and archives can operate together. See *www.ivoa.net*.

The ADASS annual meeting will be held November 2–5 in Quebec City, Quebec. Themes this year include new algorithms, future large projects, software processes, and Web technologies. See *www.adass.org*.

As always, the NOAO DPP will have a strong presence at each of the events. Our central goal is to promote involvement of the US scientific community in the Virtual Observatory through user support, operational efficiency, and software development.