

NVO FRAMEWORK DOCUMENT

ENABLING OUTREACH WITH NVO

RECOMMENDATIONS FROM THE NVO
OUTREACH WORKSHOP HELD
JULY 11-12, 2002



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Synopsis

This document summarizes the recommendations that emerged from the NVO Outreach Workshop held in Baltimore on July 11-12, 2002. The purpose of that workshop was to identify potential capabilities and attributes of NVO that would enable the development of highly effective outreach services and products. The workshop attendees also suggested steps that might be taken to initiate and maintain an active, responsive, and well-informed outreach community for NVO.

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Recommendations

The recommendations described in this document presume that NVO outreach will follow the model of the overall NVO project. We do not anticipate there being a sole portal into the NVO outreach environment. Rather, we envision NVO outreach as a constellation of outreach services accessible through a wide variety of entry points.

Because the potential audiences for NVO outreach are very diverse, ranging from elementary-school students, to amateur astronomers, to artists and science museum professionals, to scientists in other fields, one approach will not suit all visitors. We are therefore seeking partners with expertise in serving particular communities of visitors to cooperate with us in developing and promoting NVO outreach services. Wherever possible, we should use these outreach experts and selected individuals from the communities they serve as consultants to help identify user requirements and to assist in the planning and design of outreach resources.

In order to enable this kind of grass-roots development, the NVO project needs to develop an essential set of software tools and protocols upon which the rest of the NVO outreach services will build. These are listed here as Essential Software Tools.

Next, we describe a set of High Priority Software Tools. These are items that have been repeatedly suggested by other astronomy outreach developers, so we anticipate they will be heavily used. Some of them could be developed outside of the NVO Project.

Following them are some Medium Priority Software Tools. These include interesting ideas that may require substantial effort to create and simple services that perform limited tasks.

Then we describe some Low Priority Software Tools. These are not necessarily unimportant. However, they are lower priority because we do not anticipate that many other outreach services will build upon them.

Lastly, we list some suggestions for developing and funding a thriving NVO outreach community.

Essential Software Tools

Outreach-Related Metadata

Purpose

Outreach-related metadata will serve several crucial purposes:

- Metadata describing astronomical data accessible through NVO will indicate its suitability for non-astronomical audiences
- Metadata associated with individual objects will provide information not normally used by research astronomers (e.g., object type, approximate distance, discoverer, historical or mythological connections)
- Metadata associated with educational resources will describe such things as the type of resource, the appropriate audience, and the type of astronomical content, so that these resources can be easily identified by search tools.

Priority

Essential. Many of the other tools envisioned for NVO outreach will rely on outreach-related metadata.

Anticipated Effort

Substantial. Involves no programming, but care and wisdom will be needed to foresee all the forms of metadata that might be useful. In order to minimize the work involved, we should borrow from many outreach-related metadata sets that have already been developed.

Potential Developers

NVO Project, STSci/OPO, Space Sciences Laboratory, SEGWAY@SSL, Desktop Planetarium Developers

Additional Details

The next step will be to assemble a working group for the development of outreach-related metadata for NVO. This effort should make use of the expertise developed in similar undertakings, such as the Digital Library for Earth Science Education (DLESE; see <http://www.dlese.org>).

Protocol for Outreach Queries

Purpose

To enable a broad variety of outreach services to query NVO in a uniform way.

Priority

Essential. We will be able to serve outreach developers more efficiently and can define outreach metadata more effectively if there is a standard protocol for framing outreach-related queries to NVO.

Anticipated Effort

Modest. Much of what is needed can be adapted from search-engine technology. The bulk of the remaining work will be closely tied to the development of outreach metadata.

Potential Developers

NVO Project, STScI/OPO, Desktop Planetarium Developers

Additional Details

We anticipate that there will be many different entry points into the realm of NVO education and outreach resources. For example, users of a desktop planetarium software package like Starry Night might want to select an object and then access data on it through NVO. In order for the desktop planetarium to retrieve the appropriate data, it will need to know the proper way to query NVO, specifying the outreach-related metadata most likely to identify items of interest to the user. A protocol for outreach-related queries should enable a broad spectrum of educational services to query NVO for appropriate data.

Popularity Index for Astronomical Objects

Purpose

To ensure that NVO directs non-expert users to astronomical objects most likely to be of greatest interest to them.

Priority

Essential. The vast majority of non-expert users will be interested in only a minute fraction of the data accessible through NVO. In order to avoid burying their curiosity under a flood of information, we need to ensure that their queries quickly locate items that will pique their interest.

Anticipated Effort

Modest, if the index is predetermined and hardwired into the system, which can rely on standard object catalogs.

Substantial, if we want the list to update itself based on user response, as on Amazon.com.

Potential Developers

NVO Project, STScI/OPO, SEGWAY@SSL, Desktop Planetarium Developers

Additional Details

Mission-based outreach websites such as HubbleSite generally track hit statistics for their press-release pages. These statistics should be an excellent guide to which objects are most interesting to Internet audiences.

Public-Interest Index for Astronomical Data

Purpose

To ensure that the data sets an NVO search identifies for non-expert users are prioritized so that data requiring the least amount of background to appreciate (i.e., press release images) are listed first and those requiring the most background to understand (i.e., raw telemetry) are listed last.

Priority

Essential. Non-experts generally do not have enough background knowledge to know which data will be most interesting to them.

Anticipated Effort

Modest, as long as the indexing is not fine-grained. The index would probably depend on the data source. Some types of data, like press-release images, will be easy to rank, but there will be gray areas to sort out when it comes to deciding which observatories have more interesting data than others.

Potential Developers

NVO Project, STScI/OPO

Potential Consultants

Amateur astronomers, science museum professionals, artists and graphic designers

Additional Details

User testing with potential audience members will be crucial to the success of this index. Only the non-expert users can tell us whether the results of this kind of sorting are useful to them.

Directory of Educational Resources

Purpose

To make NVO-related educational resources easy to locate.

Priority

Essential. We anticipate that outreach-related services based on NVO will be developed and provided by numerous institutions. A guide to what exists along with a mechanism to find the most suitable resources will be of great use to educators.

Anticipated Effort

Modest to substantial, depending on how readily existing astronomy education directories, such as the Space Science Education Resource Directory (SSERD) at <http://teachspacescience.stsci.edu>, can be adapted to serve NVO's needs.

Potential Developers

NVO Project, SSERD developers

Potential Consultants

Science educators, science museum professionals, artists and graphic designers

Additional Details

Having a thorough evaluation of the SSERD would be very useful in the design and planning of this tool.

High Priority Software Tools

Coordinate Headers for Press-Release Images

Purpose

To ease the process of making multi-wavelength image comparisons and to aid integration of press-release images into large-field images based on sky surveys.

Priority

High. Multi-wavelength data comparisons will be at the heart of much NVO science, and properly registered image overlays currently require a large amount of labor to produce. Coordinate information associated with press-release images would enable this process to be automated.

Anticipated Effort

Substantial, if all the headers are handmade, but much easier if a specialized software tool is developed to match photos with calibrated data. Such a tool could allow an intern to align press release images to FITS images with coordinate and plate-scale information.

Existing press offices should be encouraged to include coordinate and plate-scale information with their images as soon as is feasible.

Potential Developers

Individual missions and observatories should produce their own headers.

Additional Details

The NVO Project or STScI/OPO should look into producing an overlay tool for retrofitting existing press release images with headers.

Amateur Photography Archive

Purpose

To enable amateur astronomers to submit their work to NVO

Priority

High. Today's amateurs create many high-quality images that would be broadly appreciated by the public. Also, the opportunity to submit images would inspire great enthusiasm for NVO in the amateur community.

Anticipated Effort

Substantial.

Potential Developers

A preliminary effort to develop such an archive is being undertaken at Caltech. We have invited Sky & Telescope magazine to partner with us, in order to bring the archive to the attention of the widest possible number of contributors. Preliminary discussions with Sky & Telescope have been very encouraging.

Additional Details

Part of the labor involved with developing this archive will involve resolution of copyright issues and strategies to ensure that all photos and data posted there are appropriate.

Custom Mosaic Service for Public-Quality Images

Purpose

To enable large-format, large-field images to be created for digital planetarium applications.

Priority

High. The use of digital media is rapidly increasing within the planetarium community, creating a need for multiwavelength images covering large areas of the sky.

Anticipated Effort

Modest to moderate. A mosaic service for scientific uses is already under development at IPAC. An alternative interface designed specifically for non-experts would make this tool useful to a much wider audience.

Potential Developers

IPAC

Additional Details

Plans for the *Montage* mosaic service can be found at <http://montage.ipac.caltech.edu>.

Mechanisms for Accessing “Fresh” Data for Formal Education

Purpose

To excite students by giving them access to data taken in the last 24 hours or so.

Priority

High. Educators report that students get more excited about recently taken data than they do about archived data. Fresh data therefore serve as a useful motivator for further investigation of the archives.

Anticipated Effort

Substantial. However, efforts to make telescopes available on line already exist. We need to investigate how to integrate these telescopes into NVO.

Potential Developers

Existing online telescope projects.

Additional Details

User testing with classroom teachers and their students will be essential to the success of this effort.

Medium Priority Software Tools

Internet Sky “Database”

Purpose

To provide users with all the data NVO has to offer on any object they select.

Priority

Medium. Amateur astronomers have responded very positively to this concept.

Anticipated Effort

Substantial. Most of the work would involve interface design and priority schemes for organizing information. This should be considered a second-generation tool, as it would build upon several of the “essential” tools listed earlier in this document.

Potential Developers

Jordan Raddick (SDSS) has expressed interest in further defining this concept.

Additional Details

Existing desktop planetarium software already provides abundant information on many objects of interest. This tool would enable virtually unlimited exploration of an object, beyond what is currently offered by these packages.

According to the NVO model, there would not be one single database containing all the information available through such a service. However, if the interface is sufficiently well designed, the information could be organized to seem as if it were all coming from the same source.

The Internet Movie Database (www.imdb.com) was the inspiration for this idea.

Current-Event Service

Purpose

To notify interested parties of astronomical events that have been observed in the last 24 hours to one week.

Priority

Medium. Press services, museums, and amateur astronomers are interested in knowing what's happening in the sky each day.

Anticipated Effort

Modest to moderate. The American Association of Variable Star Observers (AAVSO) is already forwarding gamma-ray burst notifications to interested members. We need to determine how easy it will be to generalize what they're already doing.

Potential Developers

AAVSO

NVO Object Log

Purpose

To allow visitors to interact with NVO by submitting comments about objects they have “observed” with NVO.

Priority

Medium. This is not an essential part of NVO outreach but could significantly boost user interest and the rate of repeat visits.

Anticipated Effort

Substantial. Not only would we have to provide the service, but we would have to consider moderating or screening the commentary.

Potential Developers

NVO Project

Directory of Artistic Resources Related to Space Science

Purpose

To assist NVO visitors in locating artistic resources related to astronomy and space science.

Priority

Medium.

Anticipated effort

Modest to substantial, depending on the breadth of resources we wish to include.

Potential developers

SEGWAY@SSL

Potential consultants

Artists, graphic designers, science museum professionals, desktop planetarium developers

Additional Details

The SEG-NVO Art & Science Museums Project is in the process of identifying the NVO-related needs of the art and science-museum communities. Once their white paper is complete, we will have a clearer idea of what should be included in this directory.

One example that has been suggested is the Collage Machine at:

<http://mrl.nyu.edu/~andruid/ecology/collageMachine/index.html>

Object-Type Search Capability

Purpose

To allow users to search for NVO data by object type.

Priority

Medium.

Anticipated Effort

Substantial. Much of the effort would involve developing an object classification vocabulary appropriate for non-experts and maintaining lists of objects that fall into each category.

Potential Developers

Desktop planetarium developers.

Additional Details

Existing data archives, such as the Hubble Data Archive, can handle some kinds of object-type searches, based on correlations with standard catalogs. We need to determine whether these searches can be fruitfully adapted for non-expert use.

VOTable-ASCII Conversion Tool

Purpose

To allow non-experts to convert data in VO Tables to text files so they can input those data into familiar software routines.

Priority

Medium. Enabling non-experts, educators in particular, to manipulate data using software with which they are already familiar is likely to be more empowering than teaching them how to use software tools written for astronomers.

Anticipated Effort

Simple.

Potential Developers

NVO Project

Additional Details

The task that this tool performs is very simple. Most of the effort will involve making the interface as easy to use as possible.

FITS-to-TIFF Conversion Tool

Purpose

To allow non-experts to convert FITS images into more conventional image files so that they can manipulate them using widely available image processing software.

Priority

Medium. Enabling non-experts, educators in particular, to manipulate data using software with which they are already familiar is likely to be more empowering than teaching them how to use software tools written for astronomers.

Anticipated Effort

Simple.

Potential Developers

NVO Project

Additional Details

There exist many platform-specific tools that can do this sort of thing (ImageMagick, IDL). However, it would be useful to have a simple, robust web service to which a non-expert could submit a FITS file, without knowing exactly what's inside, and receive a TIFF image (or GIF or JPG) in return. That would enable non-expert users to explore the image using a familiar software package, rather than forcing users to learn some of ours.

A simple interface will be the key to making this tool useful.

Low Priority Software Tools

Quality-Control Metadata

Purpose

To inform non-experts of the reliability of data and other information accessible through NVO.

Priority

Low.

Anticipated Effort

Substantial.

Potential Developers

NVO Project

Additional Details

Museum professionals and members of the press are particularly interested in knowing how far they should trust certain astronomical findings.

This issue is part of the larger picture of data policing. Should NVO be in the business of making “official” value judgements about the trustworthiness of data?

NVO Data Volume Tracker

Purpose

To communicate the volume of data available through NVO in an easily understandable format.

Priority

Low.

Anticipated Effort

Modest. Perhaps the volume of data accessible via NVO can be tracked in some automated way, but this tool would likely require periodic human intervention.

Potential Developers

NVO Project

Community Development

Supporting effective outreach using NVO will require more than just software tools. We will also need to foster communication and collaboration between members of the NVO outreach community. Here are several measures that were suggested for community development.

NVO Outreach Developers' Mailing List

Many people expressed the desire for a mailing list or discussion board for educators and outreach professionals who are developing products and activities based on NVO. We have already assembled a mailing list served by this email address:

epo@us-vo.org

In order to subscribe, send a message to majordomo@us-vo.org with the message body

subscribe epo

Workshops for Outreach Developers

Once we have created a fundamental set of tools, metadata, and protocols for developing outreach products for NVO, we will need to stage a series of workshops for potential outreach developers. Meetings such as the AAS, ASP, and AAPT would be ideal for these workshops.

Recruiting of Amateur Astronomers for NVO Outreach

Amateur astronomers who are familiar with the NVO project tell us that the potential for amateur participation is enormous. Amateurs are tremendously enthusiastic about astronomy, and are likely to be the heaviest non-professional users of NVO. (It would be foolish to call some amateur astronomers non-experts!) Because of their enthusiasm and their knowledge of the subject, amateur astronomers should be recruited as partners in bringing NVO to their local communities, especially their local schools.

Inclusion of Art and Science Museum Professionals

Artists and science museum professionals should be involved in NVO outreach projects, because of their different perspectives on astronomical data and images. Sometimes artistic thinkers see ways to engage the public in astronomy that scientific thinkers do not.

Resolution of Image-Credit Issues

Press officers at astrophysical observatories are concerned about getting proper credit for the science and images that their observatories produce. NASA, in particular, measures the success of a project partly in terms of the positive press coverage that it receives. Because NVO science is likely to involve data from many different observatories, the distribution of credit for NVO discoveries may become quite complex. The NVO project itself might also find that it needs to be recognized in the press in order to merit continued funding. Thus, we would be wise to work out a policy for properly identifying and crediting the institutions and observatories that contribute to pressworthy NVO discoveries.

Funding Sources

Near Term

As of summer 2002, there is no grant program devoted to supporting development of NVO outreach products. However, numerous NSF and NASA grant programs for education and outreach could fund development of outreach products that build upon NVO. In the near term, developers should seek out these existing funding opportunities and tailor their NVO-based outreach programs accordingly. Examples include:

- IDEAS Grant Program, <http://ideas.stsci.edu>
- Hubble Cycle E/PO Program, <http://cycle-epo.stsci.edu>
- Chandra Cycle E/PO Program, <http://cxc.harvard.edu/udocs/A04.epo.prop.html>

Long Term

If NASA elects to fund the NVO project directly, then it will likely require a significant education and outreach component to be a part of the funding proposal. However, the details and scope of such an E/PO program have not yet been defined.