WWW and the Globewide Network Academy

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Abstract

Incorporated in the state of Texas in November 1993, GNA is the world's first virtual organization. It is affiliated with the Usenet University project. Its long-term goal is to create a fully accredited online university. WWW plays an important role in accessing information on GNA activities: both as a static information source and through various multimedia projects, such as interfacing interactive teaching environments ("MOOs") to WWW, collaborative HyperText textbooks, a meta-library of internet resources, and electronic consulting.

1 Introduction and Overview

The Globewide Network Academy, Inc. [GNA] is a non-profit corporation incorporated in the state of Texas, affiliated with the Usenet University project. Its long-term goal is to create an fully accredited online university. To reach this goal it has short term plans for 1993-94, and its actions are coordinated by a projects web.

As the world's first virtual corporation, GNA serves as a testbed for organizations of the 21st century.

GNA sponsors a large number of projects on the net. It aims at weaving an own web providing a kind of "umbrella" for other, smaller organizations and enterprises as well as real universities who want to get to the net. A number of working groups and many enthusiastic, knowledgeable individuals are doing volunteer work for GNA. In "virtual reality", GNA is collaborating with Diversity University and other MOOs creating virtual classrooms and meeting places.

About This Article

For this article, GNA members have written about a few central pieces of the GNA Web, at URL `http://uu-gna.mit.edu:8001/uu-gna/`. This selection illustrates how important the World-Wide Web server is for all of the work done within the GNA.

To get started, an overview of the GNA Web Tree is given via a commented walk through its home page. Joseph Wang wrote a brief account of the GNA Meta-Library, a flexible, keyword searchable index of internet resources. Colman Reilly explains the basics of links between the Web and MUDs, the virtual environments used for GNA meetings and classes. Carter Butts reports on the architecture and use of the GNA Personnel Tracking System used for member registration and to build up a database of GNA volunteers. Finally, the use of WWW for teaching purposes in GNA prototype courses is outlined by Marcus Speh with an example at hand. At the end of each section, you will find an address to contact for further questions.

How Can I Help?

There are many outlets for those wishing to help the GNA. You can propose a course sponsored by GNA, using our expertise on WWW and MOOs.

In addition, already established projects often need assistance; to volunteer, contact a project leader after consulting the GNA FAQ for addresses (you can also get the FAQ list via anonymous FTP

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to rtfm.mit.edu in directory /pub/usenet/news.answers/ as file globewide-network-academy-faq).

Consultantships are always available, as are memberships on GNA open committees. You can also help simply by becoming a member of the GNA community: by teaching, attending classes, or by contributing to one of our ongoing discussions, you can make a difference. Your first step: Look for the GNA registration forms.

Lest there be any doubt, financial aid is welcome as well. The GNA is currently run on volunteerism, with time and machines donated by individuals and institutions worldwide. Those seeking to make contributions should contact the GNA treasurer, Matt Grover, at <mjg@beach.cis.ufl.edu>. We will appreciate (and make full use of) any donation.

Working with the GNA means helping to further education worldwide, while doing exactly as much as you want, when you want to do it. The GNA has unparalleled flexibility as well as unequaled opportunities.

Email Discussion List: <gna-talk@mcmuse.maricopa.edu>
Usenet News Group: alt.uu.future

The purpose of the **GNA World-Wide Web Tree** is to provide a maximum of transparency of the organization through a central, complete repository. In this brief section, the present documents which can be accessed from the home page are referenced and commented.

2 GNA's World-Wide Web Tree

Quick Info: at the top of the tree, a "What's New" file informs frequent users about the everyday changes on the server. The all-embracing, notoriously outdated GNA FAQ can be accessed from here, too: since Internet Email access should be the minimum requirement to use GNA services, this document contains information on alternative access methods to WWW documents.

About GNA: The GNA long term development plan attempts to outline GNA's future until the beginning of the 21st century.

Projects Web GNA's mechanism to keep track of the wealth of projects under the GNA umbrella - this is the place to hook into for volunteers. The projects Web is combined with the WAIS server and automagically incorporates discussion threads for single projects in HTML format. See section 5.

Administration: Documents from the GNA incorporation - GNA is the world's first purely virtual corporation. This link also contains many ideas on virtual management for similar future enterprises.

Consultants: A keyword searchable index of people willing to answer questions via Email, ordered by topics.

Courses: A draft catalog of online courses, taught under the GNA Umbrella, see section 6.

Meta-Library: see section 3.

GNA Library: The GNA Virtual Library provides globewide librarian services and supports GNA online classes.

Technical Guide: The entry point to the lot of technology-related projects undertaken by GNA, many of which are directly related to WWW.

Collaborative Textbooks: Hypertextbooks used stand-alone or in connection with GNA online courses. See also section 6.

Virtual Campus: GNA is the first educational organization to build its teaching around a virtual campus using a distributed net of MOOs. See section 4.

GNA Umbrella: miscellaneous information related to distance education, truly Web-based GNA projects (like the GNA Logo Contest), strategic papers, general information on how to communicate via Email and MOO and a transitional page to the Diversity University initiative.

Bookkeeping and Usage

People who want to do volunteer work for GNA can obtain an account at `uu-gna.mit.edu` which enables them to modify the GNA Web tree directly. To keep track of the changes and for bookkeeping, the GNA uses RCS, the revision control system, but may switch to the CVS front end to RCS, better suited for a team of developers. Besides the conventional gna-webmaster, there is a list of people known to have mingled with HTML trying to keep each other up to date on changes to this tree of many hundred of documents.

Technical information on the GNA Web is collected on an own page. For new information providers, a set of Building rules has been formulated.

In the future, advanced WWW statistics and bookkeeping scripts shall be used to ensure continuity since the GNA management is not bound to certain people for a longer time.

At present an average of 2500 people attach to the GNA Web Tree daily. Through its mailing lists, and Web pages of related organizations, such as Diversity University, who have profited from the expertise collected by GNA on WWW, feedback is guaranteed and the pages are continously improved.

Contact: `<gna-webmaster@tsun.desy.de>`

The purpose of the **GNA meta-library** is to create an easily accessible database of information on the internet. The purpose of the GNA meta-library development group is to maintain this database and to develop tools to make this database more accessible.

3 Basic Information About the Meta-Library

The meta-library consists of a postgres database connected to a plexus WWW server. The WWW server receives requests for searches from the outside world and converts them into database commands for the database. Each database entry contains a topic code and a coverage code.

Coverage codes

One problem faced by the GNA library which is not faced by conventional libraries is the problem of coverage. In a conventional library, a document search returns a reference to a book. In the meta library the document returned could be a volume, but it could also be a library index or a reference to an article or paragraph in another work.

To deal with this problem, the following coverage code is assigned to each document to describe the coverage of the document returned by a hypertext search. The items returned by a search of the library will be sorted from broadest to narrowest.

010 - Collection of collections - This codes index that attempt to index all the documents in a particular area of the internet. Examples: the WAIS directory of servers, the worldwide list of gopher sites, the list of anonymous ftp sites.

020 - General collection - A general collection can be thought of as the hypertext equivalent to a library. Examples: Campuswide information servers, general library indexes, an index of all FAQ lists

030 - Specific collection - A specific collection is a group of documents in a specific field. Examples: An information server that specializes in astronomy

040 - Volume Set - A set of related volumes. Examples: All the issues of a magazine

050 - Volume - A document that corresponds to a book.

060 - Article - A short free standing document. Examples: A FAQ list

Meta-library problems

There are two problems with the meta-library. One is that the software used is rather unreliable and prone to breakage. The other is that the assignment of coverage and topic codes requires manual intervention. Because of this, and the lack of manpower within a volunteer organizations such as GNA, the entries in the meta-library tend to be out of date.

The meta-library project is currently dormant due to lack of manpower. What is needed to reactivate the project is some means of distributing the work of indexing (perhaps via scripts similar to ALIWEB), a method of automating indexing, or funding to pay indexers and professional librarians.

Contact: `<gna-meta-library-admin@mcmuse.mc.maricopa.edu>`

An important tool of GNA education are the so-called "MUDs" (for "Multi-User Dungeon") or their Object-oriented programmable variants, the "MOOs". While at present GNA is relying heavily on WWW for its documentation, we aim at **combining Email, MOO and WWW** for maximum education with minimum effort. The work done to link MUDs and WWW is in this spirit.

If possible, attendants of the T & L workshop at the conference will be taken on a tour around DivU MOO.

4 Links between MUDs and W3.

We can link the Web and our virtual campus in three ways:

- We can implement W3 clients within the campus, creating objects that allow access to the Web by interacting with objects within the MUD.
- We can use the MUD as a HTTP server to allow people get information from the MUD without having to connect to it directly.
- We can use HTTP and HTML to give intuitive access to multi-media resources for users of the MUD.

W3 access from within the MUD

It may seem redundant to use a system like a MUD as a W3 browser, but this is something that is being implemented in several places.

It provides people that do not have access to a local client with a way of reaching the Web and it allows collaborative inspection of information: a number of people can gather in a room and inspect a document while discussing it.

The basic interface is similar to the line-mode browser from CERN: you use a command like choose 1 on www and the document will be displayed to you, with links numbered. You then choose another number to follow the appropriate link.

A command like

```
display HTTP://www.maths.tcd.ie/ on www
```

would display the appropriate document.

It can also provide an intuitive interface to resources: a book in a library can point to a text document available on the Web somewhere, without the information being built into the MUD and without the user being aware that it is being retrieved from a remote location. This can be important, as one of the things that MUDs are not very good at is holding large amounts of textual information on-line.

An example implementation will be available by the time this is published: you should examine the electronic form of this paper for a pointer to it.

Using the MUD as a HTTP server

There is certain information that can be provided from the MUD to people on the outside: the most obvious is information about who is connected, but there are other uses.

There are several ways available of doing this. A simple way is to write a gateway on an existing server that connects to the MUD and extracts the appropriate information. A planned release of the MOO server includes a facility to allow the MOO to act directly as a HTTP server, which will make providing information like this much easier.

An example implementation will be pointed to in the electronic form of this paper.

Using W3 to extend the capabilities of MUDs

The second way of linking the Web is to use it as a way of providing access to "static" multi-media resources. One of the things that people would like to do is link graphics or sound to locations in the MUD.

For instance I might want to create an art gallery. At the moment the best I can do is put in a description of the picture I wish to discuss. Using a "smart" client, I can use out-of-band information to tell my client that it should find a picture of the appropriate piece of art in a certain location. This has already been done in AstroVR where they use a specialised emacs-based client and ftp to transfer information.

Using HTTP and html gives us several advantages:

- It is technically easy to use, as all that is required is a way of controlling a W3 client from our MUD client. Using Mosaic this is easy, and in the case of tkWWW it would be simple to add a MUD client into the package so that two appear as one application.
- It is easy to provide information this way, as there are well supported W3 clients available for most platforms.
- We can provide more than one interface to information. For instance the same pictures could be used for a gallery in a MUD and for a normal W3 page.

Ok, this is a cute idea, but why would the GNA want to do it?

The first reason is that it would allow us to provide multi-media information in a simple and intuitive way. If I wish to put together an exhibit on (say) Castles in Ireland, I can create a virtual keep in a MUD complete with stone staircases, great halls and wolf-hounds. As the learner wanders around the exhibit she can pick up items and interact with them; she can see the normal descriptions she would see in the MUD and she can also view pictures or videos of similar items or constructions. When the exhibit is of musical instruments she can hear them being played.

And she is there: a well described room in a MUD can give a good feel for a place, far more so than a picture, but it is very hard to include the level of detail that a drawing can convey.

Another possibility is use during "lectures". If a teacher feels that the best way of giving a certain course is to use the classical lecture idiom, they could use URLs to point to slides to be displayed to students.

The other uses are left as an exercise for the reader: they seem to be limited only by the imagination of the person building the information sources.

Technically, it is easy to do this sort of thing in a way suitable for prototyping but not suitable for production use: at the moment the standard implementation is to hack on your favourite client until it can control Mosaic. Obviously this is not very satisfactory, particularly for those people who do not use systems where this is easy to implement. A much more elegant solution would be to build a MUD client into W3 clients, but of course this introduces what is probably unnecessary complication into W3 clients.

The solution that seems best to us is to follow up the idea of accessories that has been discussed on the www-talk mailing list.

The idea is that there would be a standard way of invoking external programs, from the client, which would have a two-way communications channel with the client, allowing output from the accessories to be displayed by the client and perhaps allowing control of the client from the accessory. Certainly one of the authors intends to write an add-on for tkWWW to allow it to easily communicate with MUDs.

There are dangers associated with using advanced technology: one of our aims is to allow access to everyone, and some people feel that in order to do this we must use only lowest common denominator technology.

The fear is that if we use more than just telnet and E-mail we will be excluding people who have on these resources available to them, especially in the less-developed countries. The other objection that has been raised is that by using graphical or audio information we are excluding the deaf and/or the blind, who can use text based information.

On the other hand other people feel that, while these fears are valid and we must be careful to provide alternative forms of information we also need to cater to those people that do have access to the leading edge technology or we will be ignored by them.

Future Directions

The future of W3-MUD connections is not very clear, but I can suggest one possibility: a MUD who's native language is HTML. Users would connect using an integrated W3/MUD client and all descriptions etc would be presented in marked-up text. This would allow for in-line images etc to be presented in an entirely transparent way. We understand that work towards this is already being done on Jays-House MOO, which is an experimental site playing with this sort of thing.

Conclusions

Linking the Web and MUDs is a promising and useful technology that we think will enhance our capabilities to provide interesting and useful course material.

Contact: Colman Reilly `<creilly@maths.tcd.ie>`

The **GNA Personnel Tracking System** is a first attempt at combining the power of WWW as a static, networked documentation system with a WAIS engine in order to automate keeping track of the lot of GNA members, associates and staff. At present, this model is being tested for registration of online courses and general GNA projects.

5 The GNA Personnel Tracking System

Early in the development of the Globewide Network Academy it became apparent that a means of keeping track of GNA volunteers would be a necessary element of the project. This realization grew out of observations of other virtual organizations, such as the Usenet University project, as well as real-world experience; it was observed by many that once an organization such as ours got started, the number of people involved skyrocketed, generating great problems in coordination and communication. In the GNA, this would be compounded by a decentralized authority structure and a diverse volunteer base: if a means was not found of keeping track of who the Academy's volunteers were, as well as basic facts about them, the GNA was unlikely to be a viable institution.

Of particular concern in formulating a solution were the unique challenges posed by the Academy's environment and resource structure. The two great strengths of the GNA's virtual environment were ease of automation and of information transfer; the organization's weakness was volunteer labor, which was both scarce and difficult to coordinate. Other significant environmental factors included a wide but shallow potential labor base (many volunteers could ultimately be expected, but the time/resource commitment from each was expected to be small), a high rate of both endogenous and exogenous change, and a diverse target audience. These elements defined the nature of the volunteer tracking solution: it needed to be as automated as possible, easy maintainable by almost anyone, and able to serve information quickly and easily for a variety of purposes to remote sites.

With these constraints in mind, a personnel tracking system was proposed with three basic elements: a form to be filled out by volunteers indicating pertinent information (including name, email address, interests, resources, etc.); a forms handler to accept, process, and archive forms; and an information server to distribute the archived information. The medium chosen for transmission of the forms was internet email. The choice was a natural one both for its wide familiarity and availability and because it made the second element of the system easier to implement. The processing of the forms was to be implemented via a script or executable binary activated by a mail server. For the final stage, the distribution of the processed information, a WAIS server was chosen as the most reliable means of allowing remote users to browse, search, and retrieve personnel data.

The actual implementation went forward as follows: the personnel form was created by a volunteer, subjected to public scrutiny via a mailing list, and finalized; a site (`uu-gna.mit.edu`) was chosen to house the archive and the Wais server. a program was written by a volunteer to accept incoming forms, remove comments from them, and place them in the archive; an alias was established to serve as a destination for the forms and the form processing system activated; a WAIS server was established to allow remote search and retrieval of the processed forms. The entire process took several months to complete, due to the time needed to flesh out the plan and allow for public response, to the time required for researching the various implementation options, and to the time required for implementing and testing the system's various parts; this was longer than was originally anticipated, not an uncommon phenomenon for an organization such as the early GNA.

The system as currently implemented:

Elements

1. GNA Personnel Form: An ASCII form containing questions asked of GNA volunteers and instructions for filling out and submitting the form. Instructions and other comments are

designated with a "#" at the beginning of the line, and are removed by the form handler. The form also contains a header which is used by the form handler to seperate forms from other mail.

2. SMTP server: uu-gna's mail server, which accepts incoming mail and sends it to the appropriate recipient; in this case, and alias has been established such that mail addressed to gna-personnel is sent to the form handler.

3. Form handling program: This program, written in the C programming language, takes as input a stream of text from the SMTP server and saves it to a temporary file. This file is then searched for a header indicating that the file is a newly submitted form. If the header is found, the program strips all comments form the form and saves it under a unique name in a special directory reserved for received forms; the name is an 8 character string, chosen sequentially from "aaaaaaaa" to "zzzzzzzz". If the file is found not to contain the header, it is placed as-is in a directory reserved for "other" mail; its name is determined by the date and time of its' processing. After taking one of these actions, the form handler deletes the temporary file and awaits the next form.

4. WAIS server: The WAIS server being used is the freeWAIS alpha 2 server created by CNIDR. This server uses the Z39.50 protocol to allow clients to conduct keyword searches of indexed text material; in this case, the material consists of the processed forms, indexed utilizing a utility included in the release. In addition to simple searching, the server allows for sources to be retrieved by the client program, thus allowing interested parties to peruse the entire list of GNA volunteers in order to find those likely to be interested in some project, class, or other endeavor. More information on WAIS can be found at CNIDR's WWW site, http://cnidr.org/.

Procedures

1. Form submission: form is filled out and mailed to the alias gna-personnel@uu-gna.mit.edu. Upon receipt the form is processed and archived by the form handling program.

2. Data retrieval: A WAIS client is used to connect to the GNA WAIS server at uu-gna.mit.edu (port 2010) and to search the personnel database. Forms are indexed periodically (this is still manual at the time of this writing) to allow keyword searches. Forms can be retrieved via the WAIS client.

3. Contingency handling: Questions and comments can be sent to the gna-personnel mail alias, and are seperated from personnel forms by the form handler. These may be checked by any GNA volunteer with an account on the uu-gna site. This was not a feature of the original implementation, but was added later due to a percieved need via a rewrite of the forms handler.

It is anticipated that the personnel tracking system will be used primarily for those seeking to find volunteers with particular interests or resources; this is not the only use for the system, however. As the system contains a wealth of information regarding GNA volunteers it is of statistical value as well. Those who are interested in studying the GNA are provided with a wonderful source of information about our volunteers, information which can likewise be useful for predicting the size of a potential course's target audience. Many of the uses which may emerge for the personnel tracking system in the future cannot be guessed at now; it is still early in the GNA's history. All the same, the GNA's effort provides an example of how network resources may be used to address an organizational problem.

Contact: Carter Butts <eagle@acpub.duke.edu>

GNA has a strong commitment to deliver high quality **educational services via the Internet**. The World-Wide Web is considered a resource of central importance to this endeavour.

An extended version of this section will be expanded to a contribution to the T & L workshop at the conference.

6 Teaching & Learning with WWW

Since spring 1994, two prototype courses attempt to combine the power of the Web with a virtual teaching environment: a course "Introduction to the Internet", and a C++ programming course. In this section, the second course will be discussed in detail. The global structure of both GNA courses is somewhat alike.

The link between MOOs and W3 is subject of section 4.

Programming Courses

The course "Introduction to OOP Using C++" is a prototype programming course. Its format is self-paced, based on a fully hypertextified C++ Tutorial. In addition, a classroom on the GNA virtual campus is staffed with an online consultant at certain hours, to answer student questions and help with the exercises. The course also provides a bootstrapping document which is sent to registered students to help them getting to the Web and the virtual classroom. The GNA personnel tracking system is used for registration.

Organization

A bootstrapping document for this course is made available and sent to registered students in ASCII format via Email. Both through the GNA WAIS server and in the course material, a list of students, consultants and contributing volunteers is accessible (with their hyplans if available). Also, Email lists for discussion among the consultants and students are active for the duration of the course.

The GNA Virtual Library supports GNA courses providing general library services (books, online librarians) and a special course locker for each GNA course. In this way, the course home pages can be saved from being overloaded with secondary information resources.

During course preparation and registration, a separate "what's new" page informs the participants about the progress made. Volunteers are directed towards a help-wanted list.

Online Consultants

At a minimum, the team of online consultants provides answers to questions of students after these have worked through the text of a particular course unit and tried to solve the exercises. In addition, "Nintendo-game" hours are planned to further motivate the students.

In the future, the link between W3 and the virtual classroom shall be used more: at present, virtual teaching is limited to simple line-mode interaction.

To help the students to get comfortable in the virtual environment, a lot of information on MOOs, a repository of clients, a direct link to the MOO and a guide for first-timers, has been added to the course material.

In the aftermath, transcripts taken during online sessions will be analyzed and shall enrich the courseware for following GNA programming courses.

The Hypertext Book

The C++ tutorial comes with a wealth of sample programs. Here, the advantage of Web access to course material is obvious: programs can be accessed directly from within the text page and formatted as fancy as one wants, e.g. to mark language keywords, statements and user-defined variables. Alternatively, the student can cut and paste the ASCII source text, or look up language specifications in a searchable glossary of C++ terms.

Within the course, an alternative approach using automated hypertextification of a full C++ class library is tested. The presentation of C++ source code on the Web is an interesting topic by itself: an example is the GISMO development version by Tony Burnett.

Editing collaborative hypertextbooks is a GNA initiative of its own (see section 2).

Outlook

The first ideas on combining WWW and online methods to create a better Internet curriculum were laid down in the GNA curriculum draft, subject to discussion in the GNA curriculum working group. In the meanwhile, with many more teachers and students getting interested in multimedia, a GNA course review committee has formed. Its work will directly profit from the recent experiences using WWW and MOOs for teaching and head towards formal accreditation.

A draft catalog for future GNA courses exists with proposed classes on topics like “Renaissance Culture”, “Environmental Microbiology” or “Creative Writing”, as well as other programming courses.

In the near future, GNA hopes to offer a package to people willing to teach under its umbrella. It shall help them to make use of the advanced technology GNA is currently developing for educational purposes.

Email Discussion List: `<gna-curriculum@moose.uvm.edu>`