THE INTERNET'S WORLD WIDE WEB AND THE SIMULATION COMMUNITY
A SURFING LESSON FOR BEGINNERS

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ABSTRACT

The World Wide Web (WWW or the Web) is the fastest growing service of the Internet. This paper covers a portion of the corresponding conference talk. The talk will provide an overview of the Internet, the World Wide Web, and the College on Simulation of INFORMS Home Page. The talk will either be online or will be the simulation of an online session (surfing) of the Web. It hopefully will provide the background and the incentive to turn the audience into WWW enthusiasts. No knowledge of the Internet or the WWW will be assumed.

1 INTRODUCTION

The College on Simulation of INFORMS (The Institute for Operations Research and the Management Sciences) has a World Wide Web page. The URL (to be defined below) of this page is

http://www.isye.gatech.edu/informs-sim/

In this paper and the corresponding talk we will provide a perspective on the Internet, the World Wide Web, the College page and other pages of the simulation community. We hope that this publicity will contribute to the increased use of the Web by the simulation community and the increased realization of the potential of this medium to enhance the development of simulation methodology and to raise the level of simulation practice.

2 A BRIEF HISTORY OF THE INTERNET AND THE WORLD WIDE WEB

The Internet is a collection of interconnected computer networks operating under a common communications protocol, TCP/IP. The Internet began as ARPANET in 1969. ARPANET was a single 4 node network sponsored by the Advanced Research Projects Agency of the US Department of Defense.

As of this writing the Internet is an interconnection of over 50,000 such networks connecting over 3 million host computers in over 80 countries. More than 150 countries can exchange e-mail. The number of users is estimated at between 20 and 30 million.

The World Wide Web, currently the fastest growing segment of the Internet, is relatively new. We will discuss its structure in some detail in the next section. It was conceived at CERN in 1989 and began its process of explosive growth in 1993 with the introduction of the Mosaic browser. Today it is estimated to have 3 million users. 6 million users are projected in 1996 and 20 million by the year 2000.

3 THE WORLD WIDE WEB

3.1 Basic Structure

The WWW is a collection of electronic documents called pages which reside on computers called WWW servers. These documents contain a combination of text, images, audio and video. At the moment, however, most pages consist of only text and images. The pages on the Internet are public (there are private WWW systems) and anyone can generate a page and put it on a WWW server. The pages and the associated files must meet a standard protocol.

The text portions of the document are written in a markup language called HTML (Hypertext Markup Language). Hypertext is text with links such that the user can follow a non-linear path through a document or set of documents. It is an old idea first expressed by Vannevar Bush in 1945. The term hypertext dates back to 1965. The unique characteristic of WWW hypertext documents (pages) is that the links can point to positions in the same document, positions in other documents on the same server, or to WWW pages on any server anywhere on the Internet. They can also link to images, audio or video. The links are indicated by highlighted text

and the link is established by pointing and clicking on the highlighted text.

A person, group or organization creates a page because they have certain information which they wish to make available to other people. Usually this information is related to and hence references information others have decided to make available. Hence the pages point to one another and, as they multiply, form a web. Thus the WWW is a body and organization of information which has no top down structure but is organized in a completely bottom up fashion by the individuals creating the individual pages.

The addresses of the pages are called URL's (Universal Resource Locators). In the case of Web pages the URL's have the prefix http:// followed by the address of the server, followed by a /, followed (possibly) by path, port and file information. The URL's are case sensitive so care has to be taken to input them exactly as specified.

3.2 HTML

As we mentioned earlier, the language the Web uses in its pages is HTML (Hypertext Markup Language). It is a relatively simple markup language which allows page creators to separate the content of the page from the format in which the content will be presented. HTML files are standard ASCII files with format information included within less than and greater than (<, >) brackets.

The HTML language describes the layout of the page in general semantic terms but does not in any sense completely specify the layout of the page as in traditional document publishing languages. This means that the detailed characteristics of the presentation of the pages are provided by the page presentation programs (the browsers) which display pages to the WWW user. We will discuss these browsers in the next section where we describe the client-server architecture of the Web.

Programs converting standard word processor files to HTML are available as are special editors to assist in the creation of HTML files. The files of the College on Simulation page were created and are maintained using an editor "HTML Assist". Many of these tools are available at no cost off the Internet.

3.3 The Client-Server Architecture of the WWW

The World Wide Web is built on a distributed client-server architecture. As we have described, the

Web pages and their associated files reside on servers. These pages have standard addresses (URL's) and there is a standard communications protocol (HTTP) for requesting and obtaining any public Web page from any public server. The user of the Web operates on a client, a workstation or PC running a Windows, UNIX, Macintosh or OS/2 operating system. The client has software, called a browser, which enables it to request a page from a server and process the HTML file presenting the processed material to the user. In most cases these are interactive-graphical programs which provide a wide range of functionality which we will describe below.

Thus the browser, the software on the client, fetches the page and its supporting files from the appropriate server and displays it to the user. All the server does is respond to the request, i.e. send the files. It does not process the files. This is done on the client, the user's machine, using its processor and its browser software. When the user points and clicks on a second highlighted phrase (can also be an image) which refers to another WWW page the browser repeats this operation.

Now, as we pointed out earlier, the HTML language only gives broad indications of the layout, font size, font choice, etc. of the document. Hence the browser has considerable liberty in interpreting the HTML and creating the displayed page. Furthermore, there are many browsers so what appears on the user's display is browser dependent. Thus if you are creating a WWW page and you are concerned with its appearance, you must view it on as many different browsers as possible (at least as many of the popular ones). This situation of browser dependence is further complicated by the fact that HTML is going through a sequence of upgrades and even the latest versions of some browsers don't handle certain features. Also many users have not upgraded their browsers. As of this writing, the most popular browser is Netscape followed by Mosaic. The three main current online services: America Online, Compuserve and Prodigy, provide WWW browsers. One will also be provided by Microsoft's service when it comes online.

In addition to displaying the text and graphics associated with the particular page being processed, the browser provides a wide range of function including e-mail, caching pages, storing a history of pages referenced, storing a "hotlist" of page URL's specified by the user, providing search capability, providing access to the source HTML file, providing print capability, etc.

4   THE COLLEGE ON SIMULATION HOME PAGE

The main menu of the College on Simulation WWW page is shown below. We will now go through the entries on this menu. This will illustrate the main features of the page and show how they are related to the powerful features of the Web.

The first entry, "Nominations for Outstanding Simulation Publication Award", is an example of an announcement which can be released earlier and with a wider potential audience than would be achieved with a hardcopy release. (Although, for the foreseeable future, it would supplement a hardcopy release.) It also illustrates the "mailto" feature of the Web protocol which is implemented on most browsers. In this case the chairman of the committee, Paul Glasserman, has an e-mail address and this e-mail address is highlighted. If you click on that address, an e-mail form addressed to him from you appears on your browser. You can write a message, click on a send button and that message will be sent to him. Unlike a "FORMS" response, which we will discuss below, this is done on your machine and is exactly the same as if you sent him an e-mail message through your usual mail procedure. This "mailto" feature is implemented on most pages of the College's collection of pages. If a person has an e-mail address, you can send her a note by just clicking on her highlighted address. We have not as yet done this for the Interested Individuals' List (to be discussed below) but it is in our plans and will probably be implemented by the time you read this paper.

The "Conferences and Workshops" entry lists conferences and workshops in chronological order. It gives a simple listing with the dates and locations of the events. However, most of the events have WWW pages. If this is the case, their titles are highlighted and clicking on the highlighted title will take you to their page. If the event is sufficiently far in the future, the page may contain a preliminary announcement and/or a call for papers. This (as all pages) can be printed out on your local printer. If the program for the event is complete and the event is in the near future, the page will typically contain the complete program, registration forms, hotel registration forms, travel information and links to pages giving local tourist information. Thus you see how the Web works. From the College on Simulation page in the US you would go to a EUROSIM Conference page in Vienna, to the page of the City of Vienna, to the page of a Vienna museum or hotel.

The page of this conference, WSC'95, has a separate entry. At this writing it contains the call for papers and links to tourist pages for Washington DC, Virginia, and Maryland. A person planning to come to the conference could go from the Virginia or Maryland page to the page listing all 50 states and plan an itinerary for a pre or post conference trip. When they become available the call for papers will be replaced by the complete conference program, registration forms, tourist and travel information, etc.

The "Newsletter" page is interesting in that, although originally a subpage of the college page located at the same WWW server (www.isye.gatech.edu), it is now located at the Uni-

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Nominations for Outstanding Simulation Publication Award
Conferences and Workshops
Winter Simulation Conference (WSC'95)
Newsletter
Call for Papers, Special Issues
Directory of Interested Individuals
To Request that your name be added to the directory
Other Organizations with Overlapping Interests
Journals Publishing Papers in Simulation
Reference Books
WWW pages of Active Research and Development Projects
To Request that your WWW page be added to active list
Freeware and Shareware
Commercial Products and Services
Awards
Bibliographies
Simulation news groups
Mail to Page Administrator
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Main Menu of College on Simulation WWW Page

versity of Kansas and managed independently by John Charnes. Thus, although the Newsletter is one of the items on the main menu of the College page, because of the architecture of the Web it has a life of its own at a separate location. You see how the Web concept fits so well into the information dispensing needs and geographical dispersion of a professional society.

The "Call for Papers, Special Issues" in some cases points to a subpage of the College page which we created from material provided and in some cases to a Web page created by the person responsible for the special issue. In the future the latter will be more and more the case.

The "Directory of Interested Individuals" is open to anyone desiring to be listed. It contains name, address, phone, fax, and e-mail information. Most browsers have a search capability so that the file can be searched on any character string. We plan to implement the "mailto" feature so that, if an entry has an e-mail address, an e-mail note can be generated by clicking on the address. The "To Request------" entry takes you to a WWW FORM which provides an online form to be filled out with the directory information. When the "Send Form" button is pressed, the contents are sent to us, the Webmasters or Web administrators. We will process the form and update the directory.

The next three entries list related organizations, journals and reference books. For the first two, there is a WWW page referenced in almost all cases. It is interesting to note that there is now an electronic simulation journal, a harbinger of things to come. For the reference books, publishers are beginning to bring up pages. You will be able to click on their name and get detailed information on the book referenced and all their other offerings. Presumably in the future you will be able to order books.

The "WWW Pages of Active Research and Development Projects" is partitioned by subject matter. These pages provide a snapshot of the current activities of the individuals and groups. In some cases technical reports and working papers are available. The WWW offers the potential for the early dissemination of results and the more ready availability of unpublished material. We are hopeful that this will become a very active segment of the College page. The "To Request-----" is a WWW FORM response which sends the information to us.

"Freeware and Shareware" enables you to use the ftp feature of the Internet to download software to your workstation or PC.

The "Commercial Products and Services" gives address, phone, fax and e-mail information for any firm requesting it. It also gives a one paragraph description of their product or service. If they have a WWW page a link is provided to it. We view this as a valuable service to both the seeker and provider of commercial products. One of the major problems with the WWW is the difficulty in finding pages. Hence professional societies can provide a real service by including a high level yellow page function on their WWW pages. Much more information about a firm can be provided in a WWW page than in an advertisement or brochure.

The final four entries follow the basic patterns we have described.

5   SUMMARY

In our view the Internet and the WWW hold tremendous potential for the communication within and the general distribution of information within groups with a common professional interest. This potential is just beginning to be realized. It promises to result in an interconnectivity of effort which will dramatically increase our productivity.

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