# The Intranet Web: Short on Distance - Long on Education

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## Abstract

The World Wide Web and Electronic Mail List Servers are Internet communications tools available to educators at most colleges and universities. This paper is a case study of one application of these tools to the education process; it represents the first step in the process of learning how to prepare effective, Web compatible multimedia presentations.

## Introduction

The Internet is a global data communications infrastructure. The use of Internet functionality within an organization is referred to as the Intranet. Intranet communications are often selective (i.e., access to information is only granted to those within the organization). The principal goal of this project is communications among class participants; however, no access filter has been applied. The information referenced is globally available and offered as an example to others who may wish to incorporate these techniques into their own classes.

Electronic mail and the World Wide Web are communications tools enabled by Internet - Intranet technology which are available to support the distribution of course materials. The World Wide Web is a platform independent communications system layered on top of the Internet infrastructure. The Web is enabled by the Hyper Text Transfer Protocol (HTTP) and related technologies. Among its notable characteristics is its ability to easily link together several related documents, which may reside at sites that are physically distant. A List Server works in cooperation with an electronic post office. It provides the capability of creating a globally accessible mailing list to which interested parties may subscribe without requiring any action on the part of the list owner. These two tools have been used to enhance the presentation and distribution of the course materials at the University of Pittsburgh at Johnstown.

## Discussion

"Problem Solving in C" is a required course in the Electrical Engineering Technology curriculum at Pitt-Johnstown. It is the current presentation of the generic "Introduction to Computer Programming" course which has been taught for the last twenty-five years. A recent restructuring of this course presented the opportunity to experiment with Intranet communications.

List Server

The use of electronic mail distribution lists to support instructor-student communications is not a new idea. For years, instructors have engaged in the following procedure:

- Gather the e-mail addresses of the students
- Type the addresses into a distribution list file
- Test the list
- Correct errors
- Test the list
- Gather the addresses of the students who were absent when addresses were first solicited
- Edit the distribution list
- Test ...

The process is simple, effective, straightforward, and (instructor) labor intensive. The use of a List Server supplies the same functionality while eliminating the need for faculty management. The new process is:

- Request that the postmaster create the list - a one time process which can be accomplished at Pitt by completing a Web "form".
  (e.g., http://www.pitt.edu/~postman/lists/listform.html)
- Instruct the students to subscribe to the list.

The result is a mailing list which supports both instructor-to-class communications and student-to-student communications (i.e., the students can use the list as a vehicle to support "discussions" about homework problems or programming assignments).

Course Home Page

Pedagogy is a process laden with communications. In addition to oral communications in the classroom, many written documents are distributed to students. Intranet Web technology provides improved methods to distribute this material through the creation of a Home Page for the course.

The Course Home Page is an on-line index to course materials. The home page for "Problem Solving in C" is located at:

http://sandburg.upj.pitt.edu/~gmd/courses/sea/deep.sea.secrets.html.

The home page is drafted along with other course documents as part of the normal course preparation procedure. It contains links to the following resources:

- Course Syllabus
- Programming Assignments - and the Solutions
- Example Programs
- Other Information - handouts
- Quizzes and Exams.

Use of the Course Home Page provides several advantages with respect to distribution of written material. Some are genuine steps forward; others are "free" conveniences which, alone, would not justify use of a home page. Useful features include:

- Example Programs - are commonly used to illuminate new or difficult programming concepts. In addition to viewing and printing the examples, the use of electronic distribution allows the students to download, compile and execute the codes. The instructor need maintain a single copy to support all these functions.
- Programming Assignments - are automatically available to the students the moment that the instructor has completed them. The manual process of print, copy, collate and staple, distribute in class is replaced with a single e-mail message to the List Server. Solutions, which demonstrate proper programming techniques, are made available to the students shortly after the assignments are collected.
- Course Syllabus - contains all the expected information and a link to the instructor's office hours. Each course syllabus maintained by the instructor is linked to the same (single) table of office hours. Maintenance of this single copy is automatically reflected in all syllabi.
- Quizzes and Exams - are maintained electronically. They are protected from public access until they have been administered. Home page access to quizzes and exams, and their solutions, is then enabled. Students view the solutions to "close the loop" on the learning process. As successive offerings of the course occur, the "file" of quizzes and exams grows automatically. It is always available as a study aid for students. The normal logistics involved in collecting a set of quizzes and exams and transporting them to the library are unnecessary.

All of the material distributed via the home page is rather ordinary. The increased functionality is modest. E.g., (1) maintenance of a single table of office hours for all courses (2) example programs and quiz/exam solutions available in ready-to-compile form and (3) the automatic creation of an exam/quiz collection as a study aid for students. It is natural to raise the questions "what are the costs of these benefits?" and "do the benefits justify the costs?"

The Publishing Procedure

The enabling technology for the World Wide Web is the Hyper Text Transfer Protocol (HTTP). Use of HTTP features requires that documents be drafted in Hyper Text Markup Language (HTML). HTML documents may contain links to other documents, single mouse click access to electronic mail, and on-line forms that direct real-time queries to databases. How much effort is involved in authoring a Web-ready document?

In the not too distant past, a web spinner was required to understand the principles of a markup language and master their specific implementation in HTML. This involved the generation of relatively complex HTML "code" which might resemble:

```
<H3>Courses I Teach </H3>
<P>I teach a number of courses within the Electrical Engineering Technology
Program. Click below to learn more:
<UL>
<LI><B><A
HREF="http://sandburg.upj.pitt.edu/~gmd/courses/dsp/DSP.html">Digital
Signal Processing (EET 1176)</A><A
HREF="http://sandburg.upj.pitt.edu/~gmd/courses/dsp/syllabi/syllabus.html">
</B></A>
```

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<LI><B><A
HREF="http://sandburg.upj.pitt.edu/~gmd/courses/sea/deep.sea.secrets.html">
Problem Solving in &quot;C&quot; </B></A>
<LI><B><A
HREF="http://sandburg.upj.pitt.edu/~gmd/courses/logic/syllabi/syllabus.96.h
tml">Digital Systems (EET 1161) </B></A>
</UL>
```

Authoring documents in "raw" markup language is neither efficient nor enjoyable. If all Web documents were created in this fashion, it is unlikely that the Web would have experienced the explosive growth observed in the last few years. Fortunately, in the same fashion that markup text processors (Runoff, Scribe, TeX) have generally given way to what-you-see-is-what-you-get (WYSIWYG) word processors and desktop publishing systems (Word, WordPerfect, PageMaker), Web authoring via "raw" HTML is giving way to a new breed of HTML publishing tools.

A plethora of Web authoring tools has been released in the last eighteen months.[1,2] Silicon Graphics workstations have been shipping with *WebMagic* since 1995. *WebAuthor* (Quarterdeck), *PageMill* (Adobe), and *HotMetal* (SoftQuad) are among the early PC and Macintosh HTML tools. Recently, both *Word* and *WordPerfect* have announced complete HTML compatibility in their products. Simply "Save As ... HTML" and your wordprocessing document is ready to be viewed by Netscape Navigator or Internet Explorer. To create a hyperlink one simply:

- highlights the phrase to be linked
- clicks the "link" button on the tool bar (or picks "link" from the appropriate menu)
- enters the destination URL (or, perhaps, selects the URL from a browsing window of URLs).

The Web authoring process has been significantly simplified and, for simple documents, consists of:

- Create the document in a (near) WYSIWYG HTML editor
- "Publish" the document on the Web (i.e., transfer the HTML file to the Web Server maintained by your college). On many of the HTML tools, "Publish" is an available selection on the "File" menu.

As quickly as advanced features (e.g., the use of Common Gateway Interface (CGI) scripts and the Java programming language) have become available and popular, development tools that support these features have been announced.

What <u>is</u> the cost of Web publishing? The neophyte web spinner must become literate with one of the many HTML authoring tools and learn how to interact with the college's Web server. The first task, HTML authoring, is no more difficult that switching from one word processor to another. Given today's tools, this might be accomplished by simply upgrading to the current version of your favorite wordprocessor. Web server interaction may require a greater investment. Given the wide variety of computing systems and network architectures available, it is difficult to predict the amount of effort involved. However, the staff of the computing center (or the library) can generally teach the basics involved in "publishing" a home page on the server. The actual process, and therefore its complexity, will vary from site to site. It should not, however, be particularly daunting.

Advantages of Web Publishing

What are the advantages of publishing course materials on the Web? Are they sufficient to justify the effort (albeit modest) involved? These are valid questions; it is appropriate to summarize the answers. Web based course material distribution brings with it:

- Efficiency - The standard distribution procedure includes printing, copying, collating, stapling, and distribution in class. All of these steps are eliminated by use of a Course Home Page.
- Additional Functionality - Web presentation of programs (examples and quiz/exam solutions) provides for point-and-click download capability. The multiple steps involved in FTP are eliminated. HTML hyperlinks facilitate the inclusion of additional materials in the course portfolio.
- Student Interest - At this point in time, students' interest is piqued by Web documents. The fascination may not last - but any technique, which improves interest in academic pursuits, is worth investigating.
- Cooperation - The ability to share course materials with colleagues is automatic. This feature is particularly valuable in a team-taught course; it is easy for all instructors to publish under the same home page.
- Enjoyment - Both students and faculty enjoy using the web; it's fun!

The above list includes real benefits. However, each of the individual items is rather unremarkable. Perhaps the greatest benefit of this activity has been not what it is has accomplished, but rather what it has started. It is the first step in the process of learning how to create multi-media presentations for classroom use. This work has barely "scratched the surface" of the potential uses of the Web in education. Capabilities not applied include:

- the use of audio and video clips
- animation
- applications of Java and/or ActiveX to bring greater functionality to the endeavor.

These tools, combined with a laptop PC and projection system, become a multimedia presentation system. The range of effective uses of such a system is not clear to this author at this time. However, the process of creating a Course Home Page has "opened the shoebox" of Web tools. It's now time to "rummage around" in the box and determine which of the tools and techniques are, and are not, useful in engineering education.

**Summary**

This project consists of the distribution of ordinary materials through use of what is rapidly becoming a ubiquitous media. This is rather unremarkable. However the project has gleaned the benefits of efficiency, modest increases in functionality, and increased student interest. More importantly, it has exposed advanced tools and techniques, which are supported by the Web, and which hold the promise of markedly improved classroom presentations. The availability of HTML authoring tools has dramatically reduced the cost of entry into this arena. It's fun ... try it!

## References

1 Gus Venditto, "Dueling Tools," *Internet World*, Vol. 7 No. 4, (April 1996), 36.
2 Ted Stevenson and Gus Venditto, "Under Construction," *Internet World*, Vol. 8 No. 3, (March 1997), 72.

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