Developing A Multi-Author Web Site
to Support Large ACL Engineering Classes

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Abstract

Instructors increasingly post course information and interact with their students via the Web. However, time to construct and revise a course web site that relies entirely on static HTML coding can be considerable. This paper describes a web application, CENotes, which was designed and implemented around three concepts:
- It must organize material around students needs as expressed by student surveys.
- It must add value to the existing situation and not just rehash existing material.
- It must reduce the HTML maintenance effort as much as possible.

Originally designed for two first-year engineering courses and a junior/senior civil engineering course, the application has grown into a multi-course/instructor Web site, serving some 750 students in 15 graduate and undergraduate classes. It has the following capabilities:
- Instructors are able to incorporate a large volume of evolving material in various formats into the application on a daily basis with no HTML maintenance.
- Students are able to browse and retrieve the material organized by: topic, by function, or by schedule according to their needs. Student surveys indicate that they want the material organized according to their learning styles, background, and personal desires.
- Students are able to retrieve individual grade reports enabling quick feed back on daily work and exam scores.
- Instructors, teaching assistants, and peer teachers are able to communicate with each other and the students through moderated email, notice boards, etc.

This paper will present development strategies, based upon input from student surveys, used to enhance the application.

In The Beginning

CENotes evolved from an over-elaborate Web site that consisted of at least 50 pages coded entirely in HTML. Prior to the summer 2001, the site supported two large classes, CVEN 349 - Construction Project Management (around 100 junior level students) and ENGR111/112 Foundations of Engineering I and II (about 92 freshmen students). The intent was to provide links to lecture notes and other handouts following a 16-week layout for each class. A log-on system was developed in order to restrict access to the notes to enrolled students and a few guests.

Since the site was entirely coded in static HTML, the site had to be recoded every semester as schedule and materials changed. Site maintenance was a major headache. In fact as much time was spent on HTML changes as in editing existing course material. Fortunately, the course

material had been developed by a number of authors over a number of semesters and was generally satisfactory. However, some approach was needed to reduce the time and effort required to maintain the site.

In addition, the Web was rapidly becoming the preferred way to distribute class information. In-class surveys indicated that 80-90% of the students preferred this method and wished that more professors would adapt to the situation. (It is not an exaggeration to state that entering freshmen are significantly ahead of juniors and are far ahead of the faculty in general computer skills.) Moreover, many instructors do not have the resources required to maintain a course web site that would best meet the requirements of their students. If the number of instructors using the Web to distribute course information was to grow, an approach that allowed instructors to easily and quickly post and maintain their course information became necessary.

Summer 2001

During the summer of 2001 a Dynamic Web Application (called ACTfiles) was developed at Texas A&M University (TAMU) to support a research project involving at least six different state departments of transportation. The basic idea was to provide the research team with a central file repository to which data files could be uploaded from a Web browser and from which any file could be processed and the results retrieved using a Web browser anywhere on the Web. This concept quickly evolved into a Dynamic Web application (called CENotes) supporting multiple courses. The application supports the transfer of files in almost any format (document, spreadsheet, presentation, text, program code, ZIP files, etc.) from the instructor's desktop browser to the central Web and File servers and hence to the student's desktop browser. This eliminates the need to recode class material in HTML or HTML compatible format.

During this phase the concept of ClassID and Class Membership evolved from an anonymous logon procedure to a membership persona involving status and category. A specific ClassID identifies each individual course and section. Each user is identified by a specific persona that includes: UserID, password and Student ID# (SID#), membership status (pending, member, or rejected), category (student, guest, peer teacher, teaching assistant, editor, and administrator), and contact information (name and email address). Membership is obtained by filling out a form displayed on a Browser and submitting it over the Web.

Fall 2001

During the spring 2001 semester student and faculty reaction to CENotes indicated that several immediate enhancements were needed. First, since hot-links to the files in the central file server were automatically generated by script from the file-folder\file structure, the link text (what was displayed) for a resource was simply the file name. To overcome the problem of cryptic file names (like **Class16.2-02c**), aliases (like **Friday's Lecture Notes**) were substituted. Aliases, i.e., text to be displayed on the web pages as a link-tag, are entered into a text box, loaded into a database with links to the file, and retrieved by the script. (Please refer to the examples below.) For further clarification, additional file annotation notes provided more descriptive link-tags for the files.

The second enhancement was the organization of the file links. In spring 2001, the version of CENotes displayed the file links in two formats: by week in a 16-week sequence and by topic according to the course. This required uploading the files into two different locations in the central file server. This soon became a major file administration headache as the number of files grew. A mid-semester student survey indicated that 75% of the student preferred the weekly layout to the topic layout. A scripting technique was developed using multiple database entries that enabled generation of hot-links for the same file in multiple locations.

The third required enhancement was caused by the ease with which the new system could be used. Now that files were easy to import into the file structure without the need to code HTML, the volume of class handout material grew dramatically. It became clear that a more workable system was required to handle the large volumes of information being uploaded by instructors.

Spring 2002

The answer to this problem was a system of generic pages where the Instructor (called the Editor in CENotes) has the ability to input the annotation for the header and footer fields of a family of generic pages, mainly home, week, and announcement, and assignment pages. Any file hot-links are automatically generated with full annotation and aliases. The editor has the ability to generate, save, and edit all associated annotation information as required by circumstances. This way each and every page accessed by the user appears to be unique when in fact they are all the same Web application page.

Another enhancement that students requested was a way to track their grades during the semester. By a show of hands during the semester, most students indicated that they would be willing to help develop a grade posting system using the Web application as a base. The strategy would be to email the grades to student's persona email address using the SID# (actually the last 5-digits of the Student ID#) as the access link to the gradebook. The grade request SID# has to match the one in the gradebook and the SID# number used to establish membership in the first place which has to match the one in the official roster provided by the registrar. There are no known subversions of the system. An end of the semester survey of the CVEN 349 students indicated that they approved of the grade information. By the end of the semester usage grew to about 200 logons per week or an average of 2 per student.

Summer 2002

Over the summer several other faculty members asked if they could participate in the project and the ability to accommodate multiple instructors was added. A ClassID was used to access the annotation and membership tables. A redesign of the table access logic reduced the number of actual tables from three per course to four tables in all. This enabled the development of a start-up module that reduced the semester start-up administrative effort by 90-percent.

Fall 2002

The fall semester involved 15 different courses, taught by 12 different instructors with 750 enrolled students. Usage climbed dramatically to an average of 3,000 logons and 4,000 sessions initiated per week. The number of email grade requests grew to 30,000 for the fall semester

alone. In fact a survey of the CVEN 349 and ENGR 111 students at the end of the semester indicated (95%) that the ability to get an updated grade book records on demand was one of the most popular features. Lessons learned indicate that best practice is to provide only individual homework and exam scores and not to include calculated averages. This limits the discussions to issues that can be handled by the course grader and does not require instructor intervention. During the semester one of the peer teachers and the grader asked that they be given greater access to CENotes instructor capabilities in order to better serve the students. Graders were given the ability to upload their grade books and send emails to the class membership list. The peer teacher wanted the ability to send emails to the class membership but indicated that it would be a mistake for him to have access to the grades. There was a very favorable reaction from the students to this enhancement.

The original design concept used the membership persona for administrative purposes only. Anyone with access to the web could establish membership in a class as a student (the default). Several instructors requested the ability to automatically limit membership to students actually enrolled but to be able to handle exceptions on an individual basis. CENotes was modified to enforce three different access rules:
- Anonymously, using the generic UserID\password combination established by the instructor.
- Open Membership, requiring users to register for membership and establishing individual personas.
- Closed Membership, requiring class enrollment as a condition of registration.

CENotes now accepts official class rosters provided by the Registrar's Office and before a student is allowed to become a member of a class they must be on that roster. The system for emailing grades has been upgraded to conform to current University standards by posting a disclaimer and providing the ability to opt-out.

As a final note the fall 2002 survey revealed that students (40% of them mentioned it specifically) objected to the instructor posting all assignments at the start of the semester and then never mentioning them again. The use of CENotes actually encourages this on the part of the instructors. The response has been the development of an Assignments page designed to capture a list of the Weeks assignment blocks.

Current Examples

The two first-year engineering courses at Texas A&M University have about 1,600 students enrolled during both the spring and fall semesters. These courses are taught using an Active Collaborative Learning (ACL) strategy in sections of 100 students that meet twice a week for 2-hours. Course material is distributed to the students and faculty over the Web. Figure 1 below describes the Active Collaborative Learning (ACL) process as used in CVEN 349 – Construction Project Management (around 100 junior and senior level students) and ENGR111/112 Foundations of Engineering I and II (about 92 freshmen students). The major challenge for the instructor is to get a massive amount of material into the hands of the students in a timely and effective manner so that they can study before class. In the case of CVEN 349 this is particularly important because the lecture notes do not follow a particular textbook. The second challenge is to facilitate the interaction between the instruction team and the students. Peer teachers and

teaching assistants must be able to communicate with the students independent of the Lead Instructor or Co-Instructor when appropriate. For large classes with at least 20 homework assignments, 30 pop-quizzes and 30 or more in-class exercises, and three major exams, just keeping an accurate accounting of who has turned in what and received what score has become a major issue.
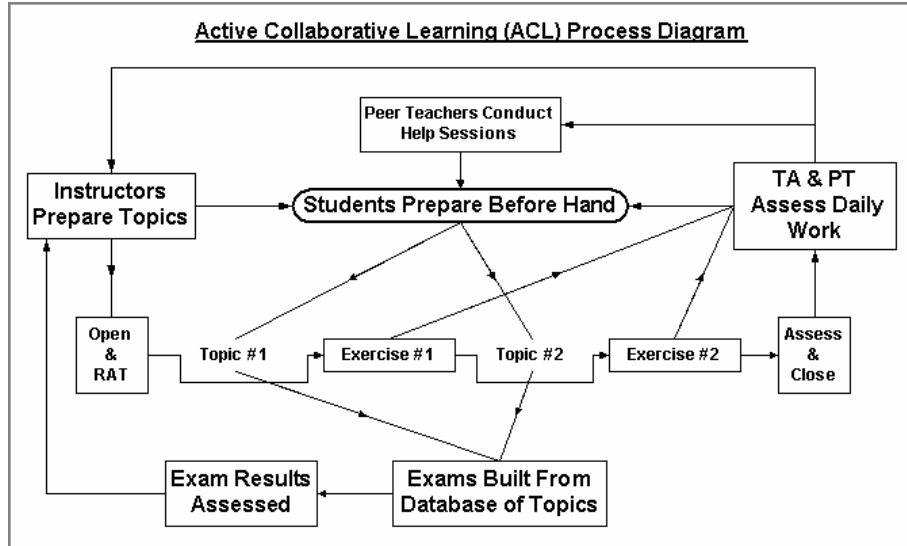

Figure 1. Pattern of Student/Instructor Team Interaction in ENGR111/112 and EVEN349

Spring 2003 and Beyond

There is little doubt that CENotes will continue to evolve. In the past care has been taken to assure that implementation of new ideas on the part of students and faculty members have not violated the following basic rules:

- Continue to organize and add feature around student desires as indicated by surveys.
- New functionality must add value as perceived by the students and\or reduce non-classroom work on the part of the instruction team.
- New functionality and changes must keep the site maintenance effort to as close to zero as possible.

Some research has begun on easily integrated collaboration tools. The idea is to allow to a set fully vetted personas to establish discussion\learning groups that could be moderated by peer teachers. A student survey indicated an almost total lack of interest on their part. To quote, "A thermodynamics chat-room doesn't sound very exciting." However, literature indicates that is a good way to build a learning community.

CENotes Basic Structure and Use

CENotes has a number of basic components, the first of which is the Home Page shown in Figure 2. Left clicking on one of the course links (shown below) establishes the ClassID. The ClassID becomes the pointer that grants access to the files, annotation and membership tables, etc. Functionally, clicking on the link sends you a common frame page with all folder\file directory pointers set.

Figure 2. CE Notes Home Page

The common frame page is in Figure 3. The title at the top identifies it as the course home page with the **ClassID of CVEN349-500**. The left frame (called the contents frame) contains the links to the functional (script) modules. Generally, hot-links are always in blue and turn to red when rolled over. The right frame is the main frame and contains the functional module resulting from clicking on one of the menu links. The area below the second heavy (maroon) line is generated by user input and is unique for every ClassID.

Figure 3. CE Notes Course Home Page

Once a user has established their persona through the login process, they use one of the menu category links in the contents frame to obtain the appropriate module link menu: student, TA & PT, Editor or Admin. Your persona can activate your category link and any one above it on the

page. For example, a student can only open the Student Menu; the administrator can open all menu links. Clicking on the Student Menu and then the Browse Weeks links leads to the page shown below. The schedule detail is generated from text information stored in tables and the handout list is generated from the files posted for Week 1 (see Figure 4).

Figure 4. CE Notes Course Week Schedule

The chart shown in Figure 5 summarizes the operation of the Web application from the student's
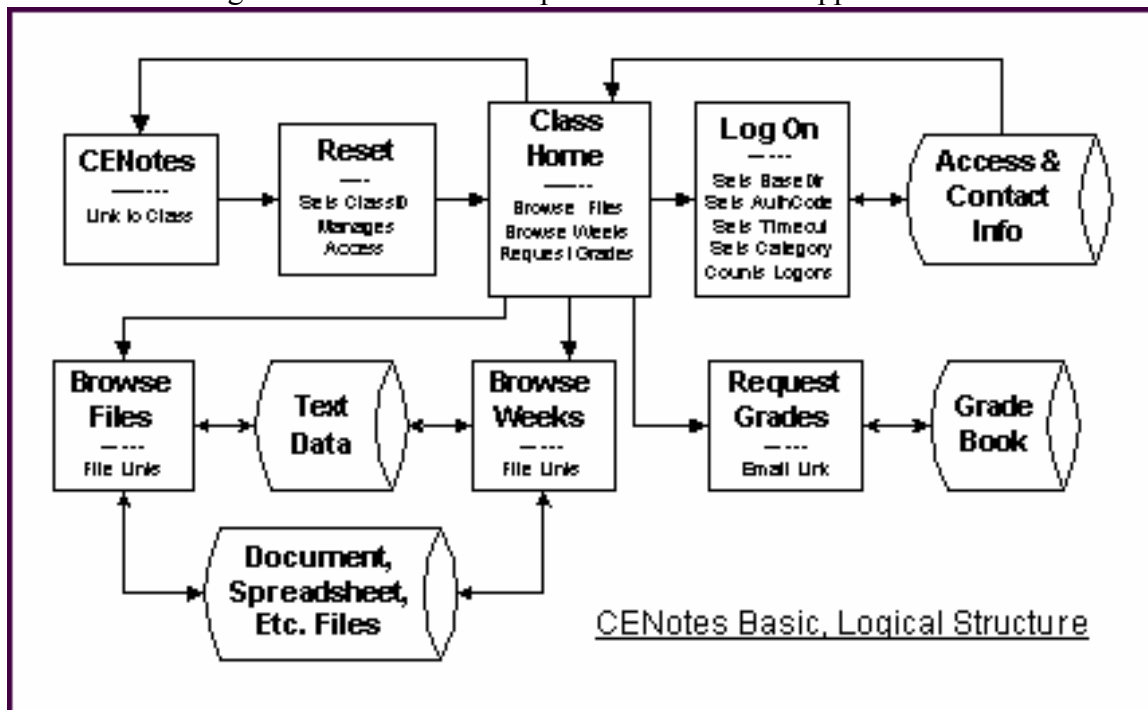

Figure 5. CE Notes Functionality from Student Perspective

point of view. First, upload the CENotes home page to your browser from the server. Then click on the appropriate course link. This causes the reset page to be processed on the server and results in the reset of all pointers appropriate for this course and persona. The student is then redirected to the Class Home Page and clicks the Log-on link. The student enters the appropriate UserID and password information and then clicks the Login button. This causes the student's persona to be set and the view returned to the home page. The student then clicks on the Student Menu to access the Browse Files, Browse Weeks, or Request Grades pages. All annotation, etc is retrieved for the data tables as appropriate.

Results to Date

Different instructors, teaching assistants, and peer teachers use CENotes in different ways. Some instructors generate a large amount of text and files in the conduct of their courses. At the other extreme, some instructors use CENotes solely to distribute grades. One instructor used CENotes to distribute a simulation model executable, the documentation, and related technical articles to a colleague's graduate students at another university and to a researcher at a third. Although, CENotes has proven to be very flexible in its use to conduct a variety of courses, by far the heaviest use has been with the original target courses: CVEN 349 and ENGR111/112. During the fall of 2002 there were a total of 750 personas established. Over the semester there were about 45,000 logins; the Browse Weeks page was hit a total of 120,000 times; and there were 30,000 requests for grades. The number of email messages generated totaled about 120,000. The week just before the midterm exam period CENotes experienced 4,000 logons and reached a maximum of 151 people using the system at the same time.

This version of the system has proven to be easy to maintain. It takes the administrator about 1/2-day, spread over the first two weeks of the semester to establish the required ClassIDs. Questions and problem solving related to site administration totals about 2-days per semester.

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