Putting Everyone and Every Course Online:
The Oncourse Environment

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Imagine having in place a web enterprise system that dynamically and automatically creates a web environment for all course sections, students and faculty members in the university. By entering the university computing account, a course environment is accessible to the registered students and instructor. Each course environment contains various communication and collaboration tools such as course mail, message board, chat, online testing, grade book, class roster, syllabus, and a suite of online library resources. When the instructor is ready to put contents on his/her class web site, it is only two clicks away from a web browser to logon and publish on an already created class site. Such an enterprise system offers universities and colleges a totally maintenance-free, cost-effective, and easy-to-use solution for putting everyone and every course section online and on the Web (Jafari, 1998).

This article elaborates the design and development of the Oncourse project at Indiana University Purdue University Indianapolis (IUPUI) and the system wide implementation of the Oncourse at the Indiana University campuses.

In the fall of 1997, the WebLab at IUPUI (now called CyberLab) initiated the Oncourse project in order to introduce a new conceptual and technical framework for supporting the higher education's paradigm shift to distance learning (CyberLab, 1999). Although the initial idea was only to design a simple "cookie making machine" to automatically produce course web sites, what the WebLab research and development group realised was the conceptualization and design of a "big picture" solution for teaching and learning needs in the twenty-first century. The big picture solution evolved into the research and development of a comprehensive teaching and learning enterprise framework that offers a single door "one stop shopping" web solution to all online teaching and learning needs. From the technical perspective, the Oncourse Environment was designed as an "add on" computer program to the university legacy system and/or to the Student Information System (SIS) to dynamically create a personal homepage and a course web site for every individual and every course section in the university. From a business perspective, the Oncourse Environment offers millions of dollars in savings by not creating and maintaining duplicate database systems nor duplicating existing IT services already in a university in addition to savings resulted by automatic Websites creation and maintenance. From a faculty perspective, Oncourse introduces a new and useful technology with a toolbox that can be easily learned and maintained without, for most users, the need to attend workshops or receive technical consultation.

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THE ONCOURSE PROJECT

In early 1997, the WebLab group began trials with off-the-shelf software in order to identify those products that might possibly meet the "big picture" requirements for teaching and learning needs. Although more than a dozen software systems were identified, none could meet all the functional, pedagogical, and technical requirements. Therefore, the WebLab group began the in-house design and development of the Oncourse Environment. All the off-the-shelf software packages were found to have one or more the following limitations:

- The software was designed as a stand-alone system and was not capable of an easy integration with the university legacy system and/or SIS.

- The software was not capable, from both a technical and cost perspective, of handling the large number of courses and student accounts.

Figure 1. Oncourse design architecture

- The software could not leverage the existing IT services on the campus, such as the University's file server and Web server.

- The software could not meet the pedagogical and functional requirements for synchronous and asynchronous instruction.

- The software was not easy to use.

Interestingly, none of the off–the-shelf software could meet the ease of use requirements. It seemed that all the software packages were designed by engineers for engineers with the assumption that the end users (mainly faculty) would spend a day or more in training workshops and consultation to master the environment.

Therefore, the WebLab group began the in-house design and development of the Oncourse Environment (Oncourse, 1998). Within the period of a year, the WebLab group undertook various phases of research and development from the initial stage of conceptual design to the final stages of usability and stress testing, culminating in a campus-wide deployment in January of 1999.

In the conceptual design phase, the Oncourse design team began to brainstorm in an attempt to anticipate and understand the future educational needs for information technology. The conceptual design of Oncourse was based on a series of assumptions about the current and future needs for information technology as it relates to communication, collaboration, pedagogy, online resources, and digital libraries. The Big Picture, described above, evolved as part of this process, in addition to the development of the Oncourse "conceptual story" (Jafari, 1997).

Oncourse system design mainly focused on the technical architecture and technical requirement of a teaching and learning system that could handle a very large number of courses and user accounts(see Figure 1). Other considerations were the creation of an architecture that is fully dynamic, interactive, and Web based. A framework that can interface with Student Information Systems via standard ODBC interface has the potential to grow to include the SIS system.

The Oncourse system architecture was designed with the following functional and technical requirements:

- It is useable. Usability refers to factors such as ease of use, ease of learning, mastering speed, transparency, and the overall system usefulness in teaching and learning applications.

- It is highly integrated into the other institutional systems. Integration refers to the hardware and software characteristics of the system and the degree to which the system can
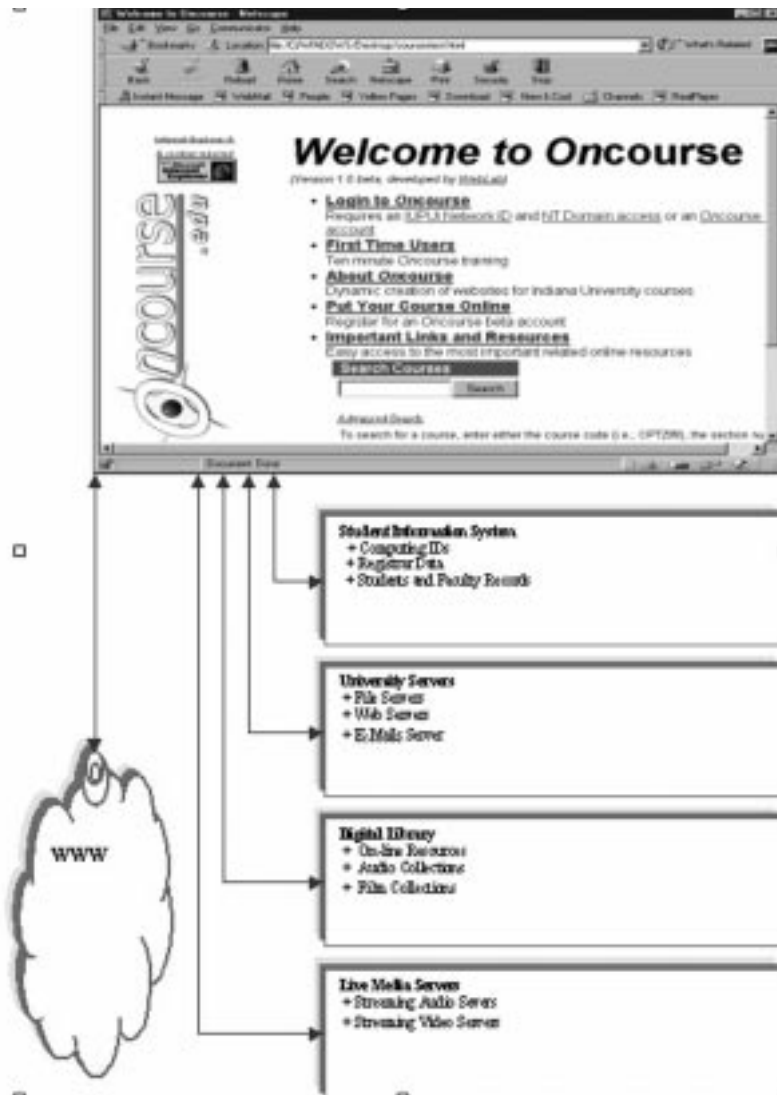
be integrated and interfaced with other information legacy systems and services within an institution. This includes system capabilities to interface with the student information system, registrar database, authentication systems, e-mail and web-server services, digital library collections, etc.

- It is multifunctional. Multifunction refers to the system capabilities that support various in-class and distance education needs including both synchronous and asynchronous teaching and learning functions.
- It uses meta-data. Meta-data, is the use of a standard way of describing data, the educational resources, and their relationship (IMS, 1999).
- It is readily maintainable. Maintainability includes system utilities to support the needs of daily system and application maintenance. This includes software utilities to assist instructors in easily editing and updating class site contents, adding and removing users, creating and archiving contents, etc.
- It is scalable. Scalability refers to hardware and software that supports an easy and cost-effective system expansion to support a larger number of users or to provide additional functions and features.
- It is affordable. Affordability refers to the total hardware and software cost to acquire the system, including the amount of technical support required in operating and maintaining the system.
- It is futuristic. Futuristic includes system capabilities through which it will support future technological advancements and services as they become available in the market.
- It is secure. Security refers to end-user and administrative gatekeeping functions for personal, institutional, and library data and contents.

THE ONCOURSE CONCEPTUAL DESIGN

Every student and faculty member at the university owns an Oncourse Personal Profile, similar to a personal homepage that is dynamically generated for every member of the university. Every member of the university may access his/her profile via a web browser (Netscape or Internet Explorer) by entering their existing university computing ID, normally the same username and password used to check the university e-mail (see Figure 2). For instance, once a student registers for a course, the course hyperlink dynamically appears on the student's Personal Profile page. Similarly, once a department identifies a course offering

for an upcoming semester, the system automatically places a hyperlink on the instructor's Personal Profile page, pointing to that instructor's teaching assignments (see Figure 3). All of this happens automatically based on the data entered and maintained by the university registrar. Every course web site features a course template, which is consistently used for all university courses (see Figure 4). The course templates are preloaded with many communications and collaboration tools including e-mail, chat, threaded message forum, class roster, grade book, and online testing, as well as hundreds of online resources that are available through the University library. The faculty of record, by default, is given authoring privilege and assumes the site administration responsibility. There is no need for a faculty member to know any computing language. Word processing and web surfing experience are sufficient skills to author and maintain a course web site. This fully automatic and dynamic environment runs 24 hours a day with near zero administrative maintenance. For instance, when a student drops a course, the Oncourse system will remove her access to the course and her name from the class roster. This will be done automatically without any maintenance required by either the university technology administrator or the course instructor.

DEFINING THE BIG PICTURE

Defining the big picture not only aids in the understanding of all possible functional

Figure 2. STEP 1: Login to Oncourse: Every student, faculty and staff can access their profile using their university computing ID, the same username and password used to access university email.

requirements, it also assists the system architect in designing a system with a broad enough foundation to support forthcoming technological needs and features.

Dynamic creation of a Personal Profile page for every student, faculty and staff member based on the data contained in the University Information System database offers several opportunities. In addition to the features discussed in the previous section, it also offers the potential to create a "front door" or "one stop shopping" environment for university teaching, learning, and course management needs, including online resources and digital libraries, collaboration, communication, distributed learning tools, news and information services, student commerce, web publishing, administrative functions, and more.

Imagine yourself as a faculty member in this Dynamic Integrated Web Environment. You will need to remember only one URL and one user account. Once you are authenticated, the system will dynamically identify all of your access rights, assigned IT services, your assigned teaching obligations, and more. The tools or the toolboxes you need to maintain your courses are all dynamically hyperlinked on your Personal Profile page. You can access your e-mail, update your web sites, achieve access to online scholarly collections from the library, publish and edit your course contents, provide access to your colleagues to observe or collaborate in your course environment, share access to your digital collection of papers, images, and multimedia. All of this could be done anytime, anywhere via the Internet using a web browser software.

Students in the Oncourse Environment will be able to search, review and select their classes by viewing course syllabi, course contents and faculty portfolios before deciding what course to take in the next semester. Students will also be able to review institutional data regarding departments, courses, and individual faculty. After students are registered for a course, they will be able to fully collaborate with all of their classmates and instructional teams, even to interact with other students taking the same course but in a different section or on a different campus. While logged into this learning environment from anywhere in the world, they can access library resources permitted or licensed for use by students for that specific class. As for some non-academic Oncourse applications, for instance, students can post advertisements to sell an old dormitory refrigerator or to look for a tutor. They can even, if appropriate, place a note at the end of the semester to sell their used textbooks where the note would automatically be posted to the next semester's class, who will need the exact textbook for the very same class. All of these features and more can easily be provided in an Oncourse Environment.

From a university administrator or staff perspective, when a new committee or taskforce is initiated, the chair of the committee can create a committee web site and enter the computing IDs for every member of the committee. The next time the committee members login to their Personal Profile page, they will find a hyperlink pointing to the committee web site. By clicking on the link, a committee member will be able to see the entire committee list, their portfolio, notes and minutes, and fully collaborate and communicate with all other committee members. This provides a more interactive and collaborative environment than the traditional method of using an e-mail listserv - a less unified collaboration technology that nonetheless is frequently used today.

The framework and conceptual system of Oncourse consists of the following layers.

Figure 3. STEP 1: Login to Oncourse: Every student, faculty and staff can access their profile using their university computing ID, the same username and password used to access university email.

Personal Profile is the overall top layer user interface environment that includes one or more "toolboxes," each customized for certain applications. Each toolbox dynamically populates the personal profile according to the status and function of a user. A student, for instance, will receive: the "My Courses" toolbox (if registered for one or more courses), the "My Portfolio" toolbox, the "My Information System" toolbox, etc.

Tool Box 1: My Courses
The My Courses category dynamically appears and lists the courses for a user who is either assigned to teach a course section(s) or enrolled in a university course(s).

Tool Box 2: My Committees
The My Committee category dynamically appears in one's Personal Profile if the individual is either chairing or is a member of a university committee or task force.

Tool Box 3: My Portfolio
My Portfolio appears on every student, faculty and staff's Personal Profile. The portfolio function is very similar to a file server and personal web server account. A faculty member, for instance, by placing his resume in his portfolio, will automatically be given an http address for the resume. My Portfolio provides interfaces and easy-to-use tools to upload and maintain personal documents and multimedia files. The portfolio ownership stays with the members as long as they are associated with the university. A student, for instance, can archive all of the papers and multimedia files that she created during her studentship in the university. A dynamically created "home page" can be provided to each student to list academic work and individual and institutional data as desired by the student.

Personal Profile can include *more toolboxes* as new services and needs are developed. This may include toolboxes such as My Digital Library, My News and Information, etc.

Understanding the "big picture" was critical for the WebLab team to design and develop the Oncourse Project. The Version 1 of Oncourse deployed in the Spring of 1999 at IUPUI did not include every element of the big picture, however the Oncourse system design has been planned for future upgrades and to support changing needs in teaching and learning.

ONCOURSE SYSTEM DESIGN
Microsoft SQL was selected as the database backbone for Oncourse. The system was designed for full compliance with Microsoft Internet Explorer version 4.0, Netscape 4.0, and Java Script 1.2.

ONCOURSE PROTOTYPE TESTING
In the fall semester of 1998, the WebLab began the formal beta testing of the Oncourse Environment by offering a trial opportunity to faculty at IUPUI, other Indiana University campuses, and some other universities, both national and international. A simple web form was provided for requesting a course account. By the end of fall semester, more than 600 course accounts with more that 12,000 student accounts were created. The IUPUI Center for Teaching and Learning (CTL, 1999), the campus faculty support center, offered Oncourse training workshops and walk-in assistance to Oncourse beta testers. Interestingly, only 37 faculty members attended the Oncourse workshops while more than 200 faculty put their courses on Oncourse. This eloquently attests to the ease of use of Oncourse and indicates that 80% of faculty members managed to put their courses onto Oncourse without need of a workshop or technical assistance. During the beta testing period, student and faculty feedback came directly to the Oncourse design group and changes were made, in some cases overnight, to fix a problem or include a new feature. With this massive number of beta testers (over 600 course authors and 12,000 students users), the Oncourse project received the best possible beta testing environment - not only were the bugs identified, but the system also tested well under the stress of operation. Although the beta testers were told not to expect the system to be a "production system," the majority soon became dependent on the

Figure 4. STEP 3: Use a Course Environment: Use the course template to navigate through the Oncourse course environment.

Oncourse environment and expected full operational services from the campus.

During the beta testing period two simultaneous usability studies were conducted at the Indiana University Bloomington Campus and at IUPUI campus. Both used the laboratory model where students and faculty were asked to perform authoring and surfing tasks. The result of the usability studies directly fed the Oncourse design group and recommended changes were included in the Oncourse environment.

ONCOURSE IMPLEMENTATION

In the Spring semester of 1999, the Oncourse went into deployment phase at Indiana University Purdue University Indianapolis, IUPUI. IUPUI offers more than 12,000 course sections annually to more than 28,000 students. The IUPUI Oncourse deployment included the dynamic creation of an Oncourse environment for every course section offered on the campus, for a total of 6,041 fall semester course section. By using the faculty and student data, every student and faculty was given automatic dynamic access to their Oncourse web site by using their university Network ID (the same used to access e-mail accounts). This provided a "two click away" opportunity for every faculty member to add course content in their already existing course environment. Although there were neither public announcements nor any promotional activity, the Oncourse, in a matter of days, received high usage among the students and faculty. On Sunday January 10, a day before first Monday of the new spring semester, more than 150 faculty members logged on into their course web sites and added contents such as greeting messages to students, syllabi, reading assignments, and the like. In the fall of 1999, the Oncourse environment is going into the university-wide implementation phase. In addition to the IUPUI campus, the faculty members of Indiana University Bloomington campus and six other campuses of Indiana university (see Figure 5) will be able to use the Oncourse system supported by the University Information Technology Services (UITS, 1999). All 7,000 course sections of the Indiana University Bloomington campus will be added in the Oncourse database (Oncourse, 1999).

A NEW GLOBAL ENVIRONMENT FOR LEARNING

In spring of 1999, the WebLab group, under their new Laboratory organization named CyberLab, continued their distance learning research initiatives toward the development of A New Global Environment for Learning (ANGEL) project. ANGEL, the next generation of Oncourse will include new conceptual environment and tools using the EDUCAUSE IMS technical specifications. The major features of the ANGEL project include intelligent agents, enterprise framework and distributed authentication. More information about the ANGEL project will be available at CyberLab website at http://CyberLab.iupui.edu/

FINAL WORDS

Year 1999 continues to witness many higher education institutions not yet utilizing the World Wide Web and Internet for teaching, learning, and distance education. Although making web sites for a university and producing web pages for academic departments would provide a virtual image of a campus, universities needs to think more deeply and consider producing a web site or web environment for every course they offer in the university. This initiative not only provides a comprehensive virtual course offering catalog, but also offers an extensive teaching and learning environment that can complement every traditional course while opening new doors and opportunities for the twenty-first century paradigm shift in teaching and learning. The list below offers ten reasons why universities and colleges should offer a web environment for every

Figure 5. The Oncourse implementation in all eight campuses of Indiana University

course in the catalog. The benefits include:

1. Providing a complementary virtual communication and collaboration channel among the students and instructor.
2. Increasing collaboration and communication outside of the classroom.
3. Facilitating and simplifying posting and distribution of information and resources.
4. Reducing, in certain subject fields, classroom contact hours.
5. Providing hyperlink conduits to the massive amount of information and resources available on the Internet and digital libraries.
6. Providing a gradual transition from a traditional in-class curriculum to a hybrid (in-class/distance education) curriculum, and then to a full distance education curriculum.
7. Reducing the number of visits to the campus and library.
8. Producing a comprehensive digital collection of curriculum.
9. Making course selection and "shopping around" for courses and instructors easier and searchable.
10. Offering more effective learning.

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