IU-EVAL

Implementing an Open-Source Electronic Course Evaluation System

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ABSTRACT

In the Department of Computer and Information Sciences at Indiana University, course evaluations are used as an important instrument for assessing teaching effectiveness and maintaining the quality of our academic programs. At the end of each semester students are given the opportunity to evaluate their courses and the results are collected and analyzed by the corresponding academic units. A significant amount of secretarial time is spent on conducting effective and confidential end-of-semester evaluations.

In order to improve the speed and effectiveness of teacher evaluations, and minimize the level of manual processing, the authors have developed an open-source, web-based, electronic course evaluation system called IU-EVAL[4]. The system was tested by approximately 4500 students between August 1, 2004, and July 30,2005. In this paper we describe some of the design principles and strategies behind the development of IU-EVAL as an open-source software.

INTRODUCTION

Course evaluations are an important component of our department's commitment to quality teaching. An effective evaluation and feedback mechanism aids our overall mission to assess student learning and helps guide our faculty to improve teaching materials, styles, and practices. Each department in our university generally uses its own customized evaluation form. A typical form consists of both multiple choice as well as essay questions (See Appendix A for sample forms). At the termination of each course, evaluations are completed by students and returned to the department secretary. To preserve anonymity, the department secretary types all the written comments, scans the multiple choice responses, and prepares a report for each section. This process usually takes about two to three weeks of secretarial work for each department.

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Table 1 and 2 below provides an approximate annual cost for conducting manual evaluations vs. conducing electronic evaluations for our campus.

Table 1 - Estimated Annual Cost of Paper Evaluation at IU South Bend				
Number of sections offered per year	**Average number of students per section**	**Cost of evaluation per student**	**Cost of preparing an evaluation per section**	**Total Cost to Campus Per Semester**
2800	21	$0.32 to $0.42	$9.60 to 12.60	$18,816 to $24,696

Table 2 - Estimated Annual Cost of Electronic Evaluation at IU South Bend				
Number of sections offered per year	**Average number of students per section**	**Cost of evaluation per student**	**Cost of preparing an evaluation per section**	**Total Cost to Campus Per Semester**
2800	21	$0.00	$0.80	$2,240.00

MOTIVATION

The present student enrollment at IU South Bend is approximately 7400 per semester. Furthermore, the campus projects enrollment growth for the next few years. At the same time, academic units have been facing cuts to their operational budget. The cost of conducting paper evaluations continues to burden our academic units, and more importantly, the amount of time it takes to manually transcribe the evaluation data simply overwhelms our secretarial staff at peek periods. It is expected that as the campus enrollment increases this problem will worsen. It seems logical that a more scalable and automated system would be desirable. Our motivation to develop an open-source electronic evaluation system has been the following:

- to reduce the manual data entry and secretarial time needed to process the evaluations
- to reduce the cost of conducting student evaluation for the academic units and the campus
- to improve student experience and enable them to provide detailed, thoughtful and anonymous responses in their course evaluations
- to eliminate the creation, printing, distribution, maintenance and archival of thousands of paper evaluations
- to improve the speed and user satisfaction of conducting evaluations
- to develop an open-source, web based course evaluation system for the academic community

IU-EVAL DESIGN

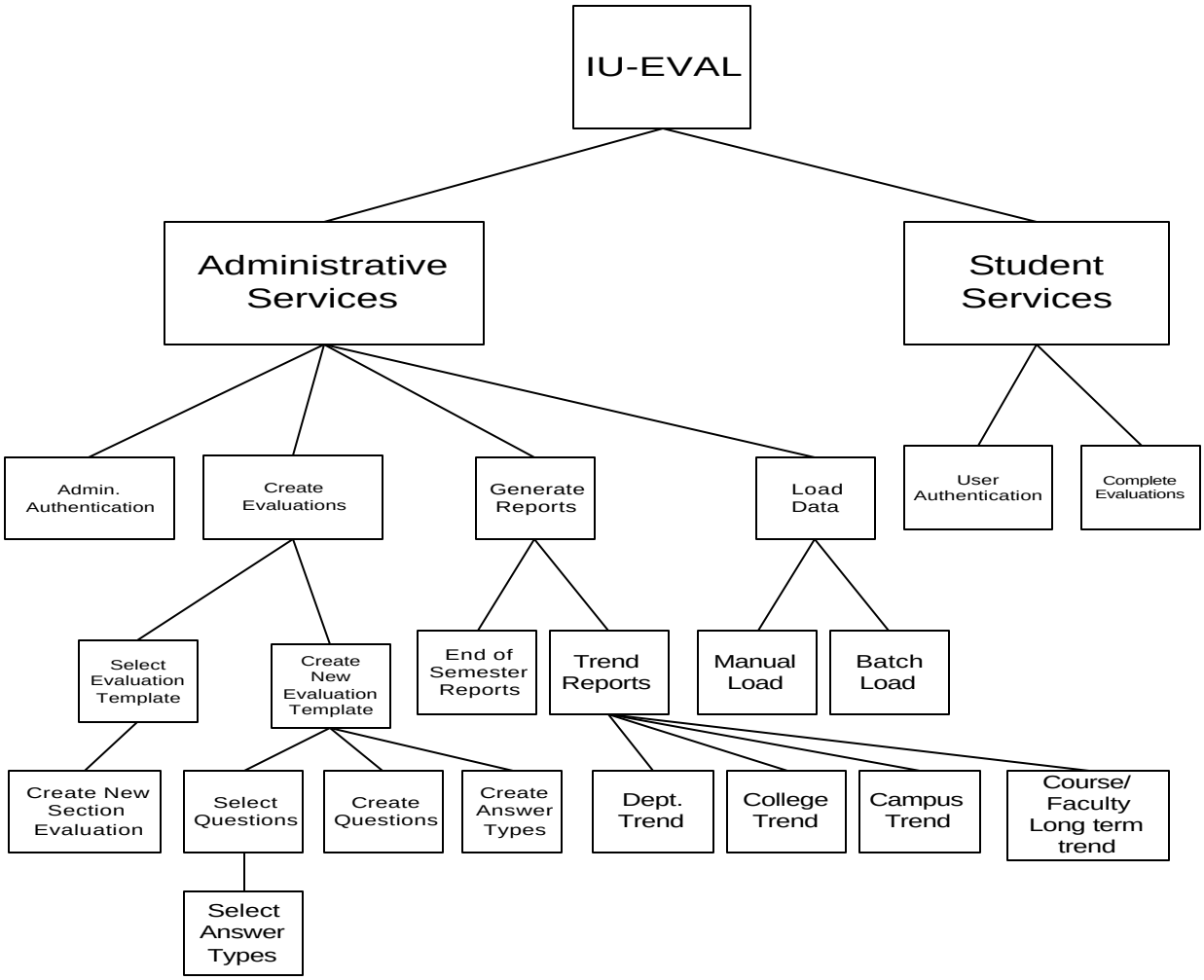
During spring 2003, we embarked upon the initial analysis of a potential electronic evaluation system. Later during the spring 2004 semester, we began to further analyze and design a prototype system in our Systems Analysis and Design Course[5]. Following that semester, we developed a design team composed of students and faculty members and embarked upon developing a more robust and production quality system. The system was beta tested during the fall 2004, spring 2005, and summer 2005 semesters. It is currently being used by several departments and schools at IU South Bend.

From the inception, our goal was to develop a generic, customizable, and scalable electronic course evaluation system. We sought to be fully cognizant of the university's organizational model and its unique needs and requirements for conducting course evaluations. We also tried to be sensitive to both student and faculty need for anonymity and privacy. Our team of students and faculty members spent approximately 2 months interviewing various stakeholders, analyzing the requirements, and refining the design of the system prior to implementing a single line of code. As the result, our data and process models have proven to be quite robust and can easily accommodate new and unanticipated features. In addition, our decision to use open-source development tools has contributed to the system's flexibility and portability.

[5] System Analysis and Design is a sophomore/junior level course in the computer science program at IU South Bend.

The IU-EVAL Decomposition Diagram demonstrates the abstract functional areas within the IU-EVAL system. Each box in the diagram is further defined as a Data flow diagram.

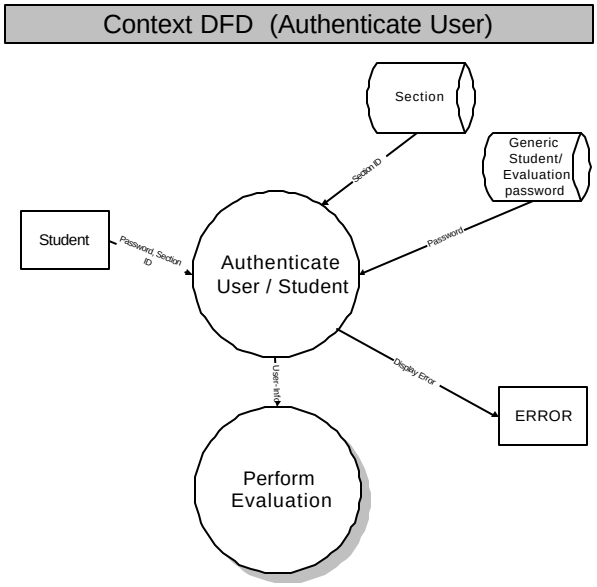
IU-Eval Decomposition Diagram



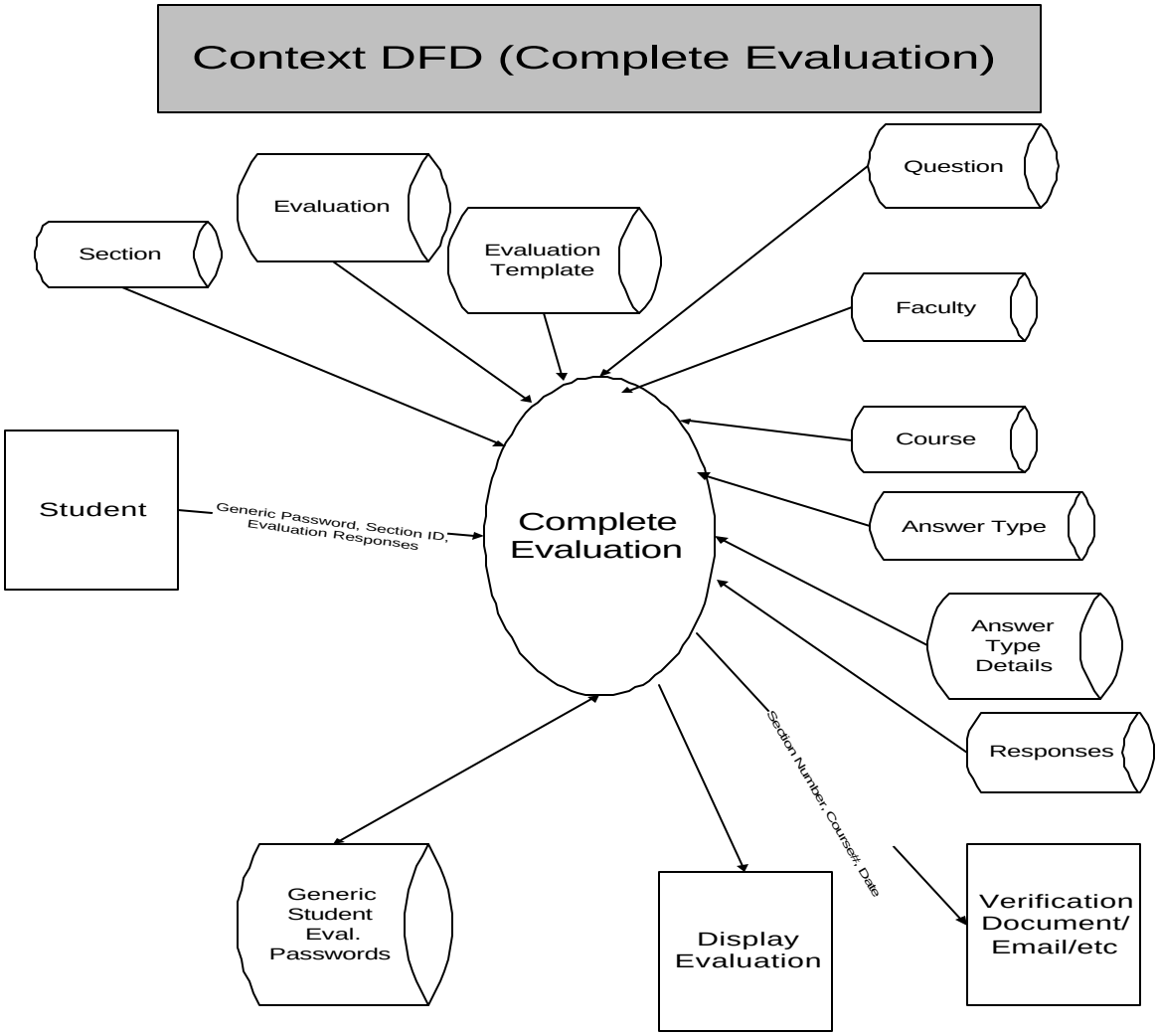
IU-EVAL DATA FLOW DIAGRAMS:

The STUDENT SERVICES sub-system is quite simple and intuitive. Each student is provided with a randomly generated password for each course they enroll in. The IU-EVAL system will be able to identify the course, section, instructor, semester, and other pertinent information from this single password. Furthermore, the student him or herself will remain completely anonymous. The IU-EVAL system does not maintain any identifying information about the students.

Once the password is entered, IU-EVAL will display the corresponding evaluation form for the course. It should be noted that at IU South Bend, each academic unit is free to use its own evaluation instrument. Therefore, students, taking multiple courses, are likely to complete different evaluation forms for each of their courses. Once the evaluation is completed, the student responses are recorded in the IU-EVAL database.



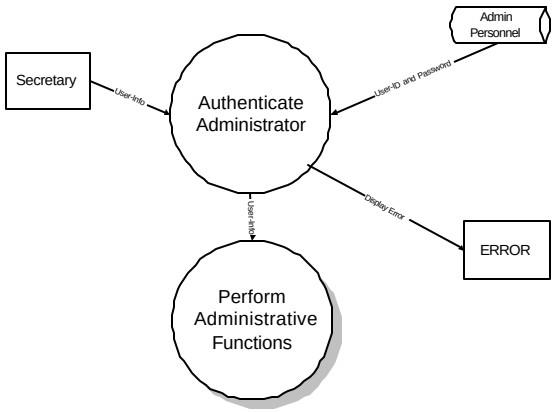
The diagram below represent the data flow diagram (DFD) used by the students to complete a course evaluation.



The ADMINISTRATIVE SERVICES sub-system is a little more complex. There are primarily two types of administrators. First the department administrative staff who are in charge of creating the evaluation forms used by their departments, ensuring that all the faculty, courses, sections are correct and available in the IU-EVAL system, generating random passwords for each section and distributing those passwords to their corresponding instructors. The secretaries are also in charge of printing the final evaluation report and distributing those to faculty.

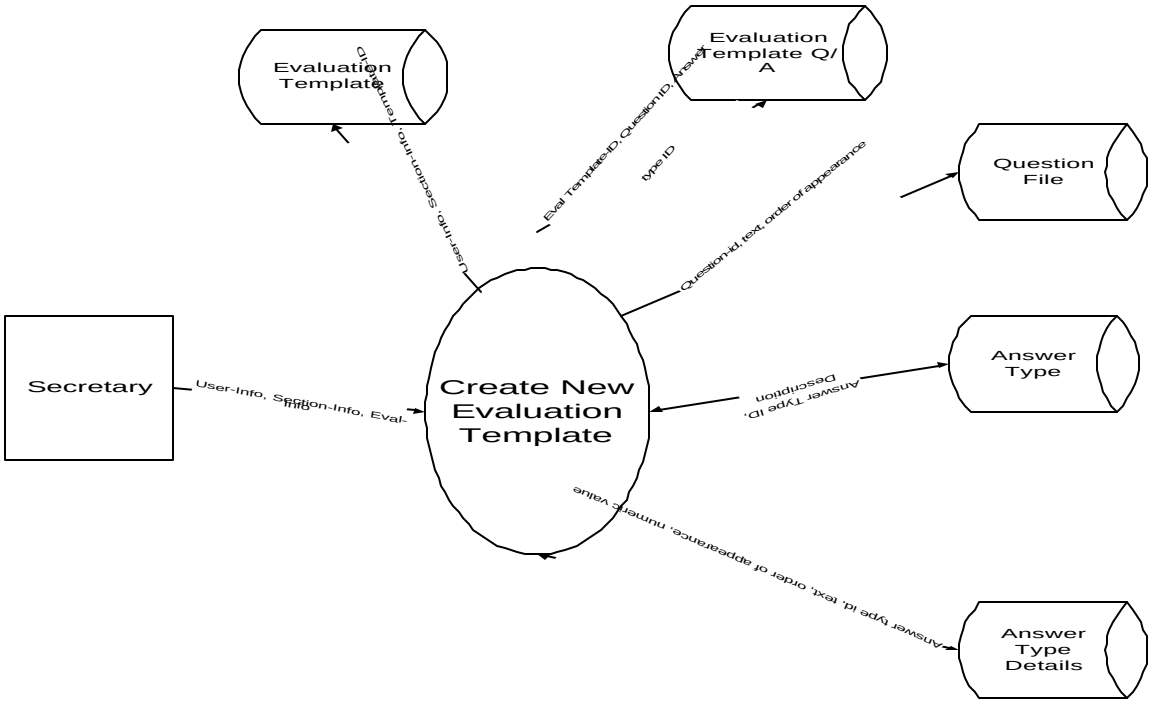
The second type of administrator is the superuser. The superuser will serve as the IU-EVAL system administrator as well as the database administrator. The superuser's primary responsibility is to load the initial data for faculty, courses, and sections for all the sections taught during a given semester. Additionally, the superuser will support the departmental administrators when questions or problems arise.

Context DFD (Authenticate Administrator)



The first task that a department administrator must perform is to created one or more evaluation template for their department. Figure below examines the process by which new evaluation forms (Templates) are created by the administrative staff (secretaries). Typically, this process requires the creation of one or more questions and answer-types. An evaluation template is simply the mapping of questions and their corresponding answer-types.

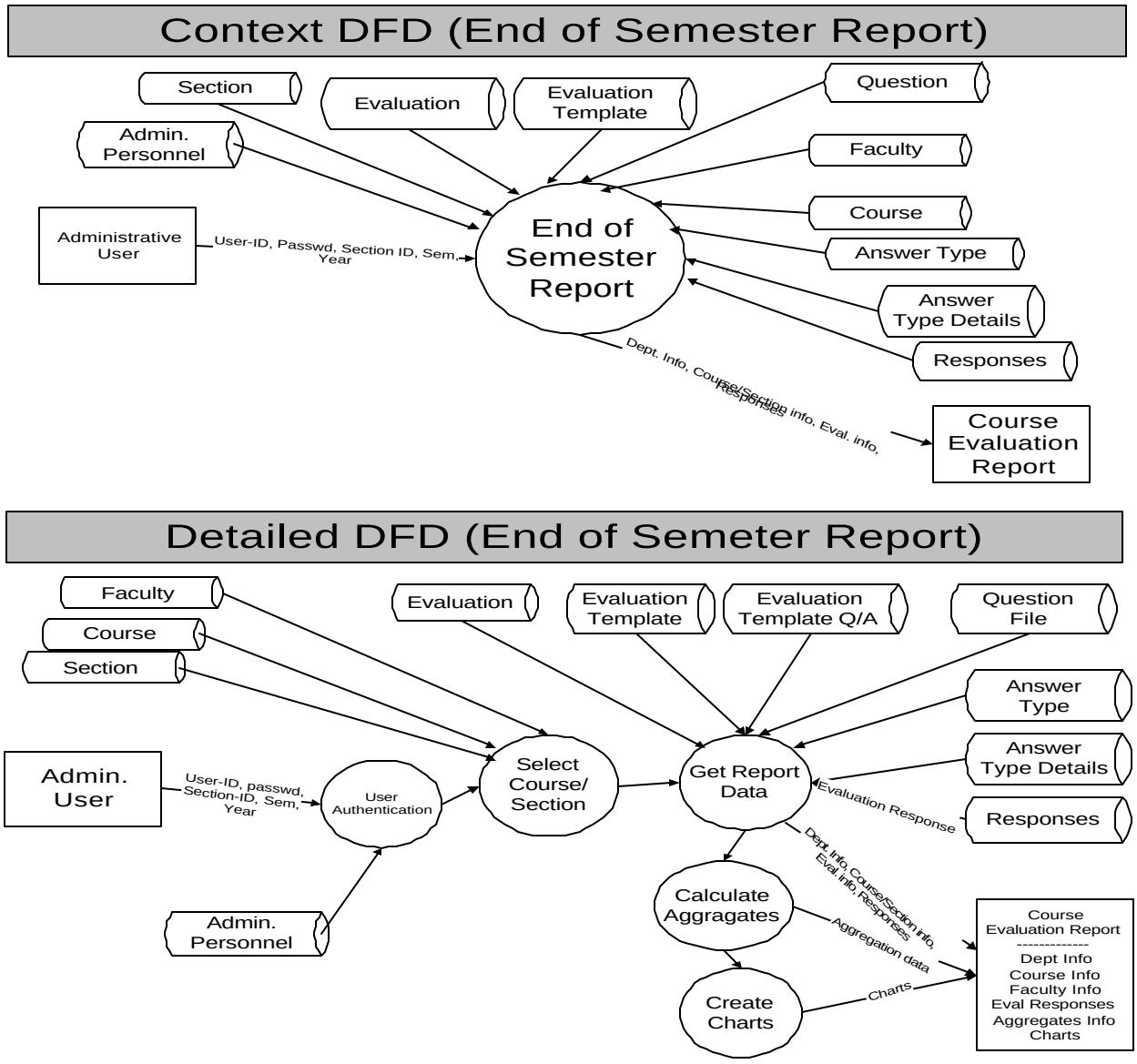
DRAFT DFD (Create New Evaluation Template)



Once the evaluation template is created the department administrator, will simply assign the template to the sections that are offered during a given semester. The system will automatically generate random passwords for each assigned section.

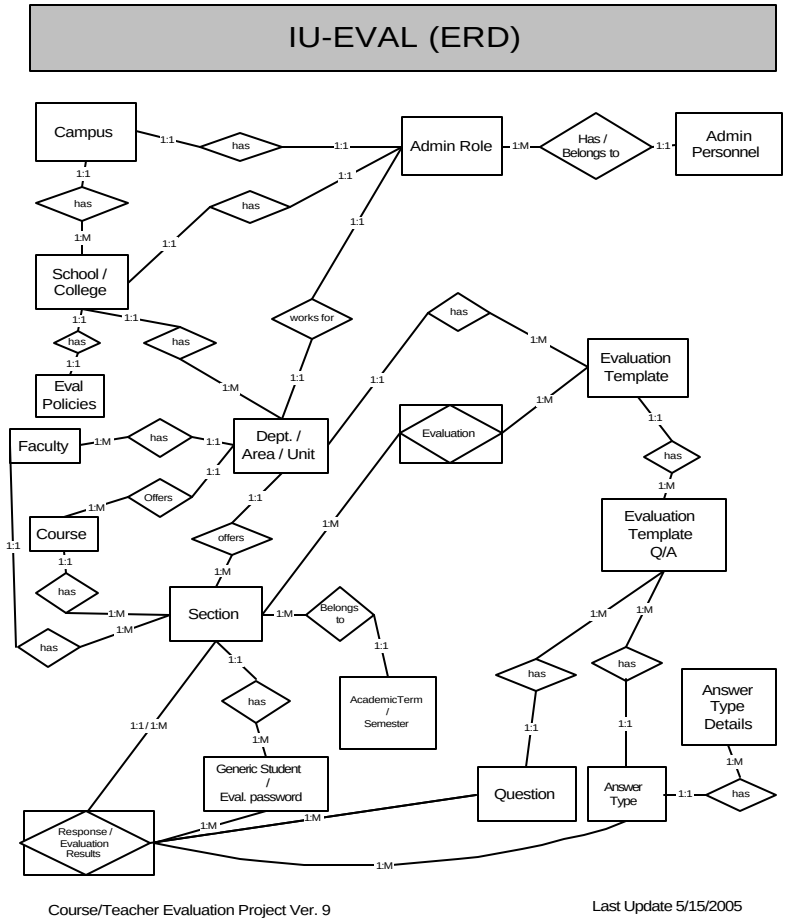
Finally, after the semester is over, the department administrator will print the course evaluation results for each professor.

Figure below examines the process by which end of semester reports (faculty evaluations) are created and printed by the administrative staff (secretaries).



IU-EVAL DATA MODEL

At the heart of our system is the Entity Relation Diagram (ERD), which provides the road map for the creation of the IU-EVAL database. Our ERD is designed to accommodate a multi-campus academic institution such as Indiana University. Naturally, it can also be used by smaller organizations. The data model allows the university to capture information about one or more campuses, colleges, departments, faculty, courses, and sections. In addition, our ERD captures an entity known as 'generic students'. The notion of a *generic student* is used to provide anonymity to our students. IU-EVAL does not keep any identifiable student data.



IU-EVAL allows each academic unit to create one or more evaluation templates (forms) and associate each template to one or more sections. For example a department can use one evaluation form for lecture classes and another for laboratory classes. If a course has both lecture and lab, one can seamlessly combine the two forms into one evaluation form.

SIMPLICITY

One of the advantages of IU-EVAL is its ease of use. Each semester the designated campus administrator (Super User) will simply update the IU-EVAL database with a list of new faculty, courses, and sections being offered that semester. Next, approximately one month prior to the end of the semester, department secretaries will perform the following four steps:

1) Create one or more **evaluation forms** for their academic unit[6]. (See appendix A for sample departmental evaluation form)

2) **Associate each evaluation form to one or more sections** offered this semester. (If the department only uses one form, all sections are associated to the same form.)

3) **Generate and print the passwords** for each class. (The passwords are randomly generated to assure complete anonymity to our students.)

   Once the passwords are distributed to the students in each section, the secretaries simply waits until the end of the semester (typically right before the finals week).

4) **Print a report for each section and provide it to its corresponding faculty** member. (This is done after the faculty has already turned in her grades to the registrars office.)

According to feedback from our college secretarial staff, IU-EVAL has significantly reduced the time needed to

[6] Note: Step 1, does not have to be repeated if the department's evaluation form remains static.

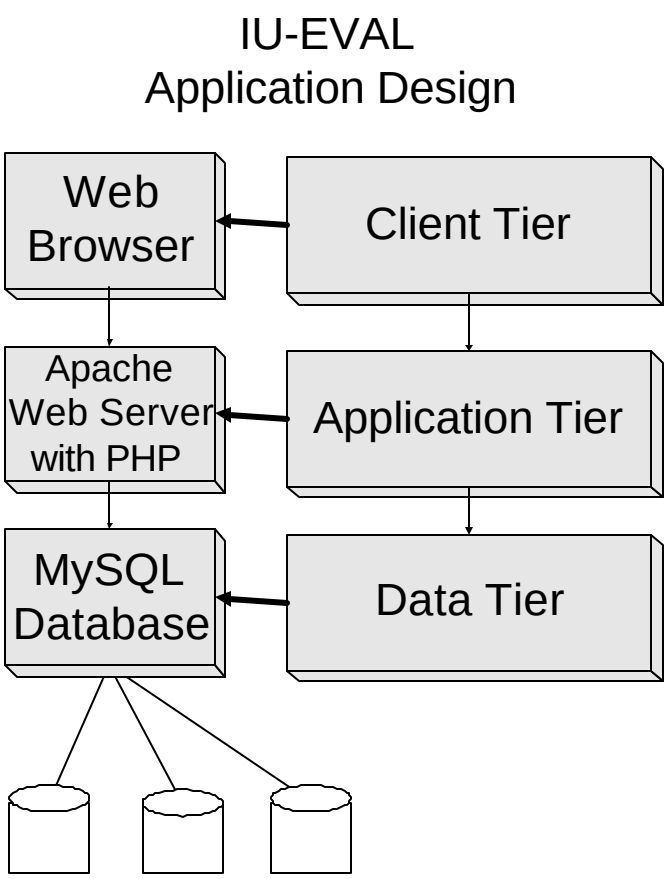
prepare and distribute, collect and analyze the evaluations from *weeks* to *days* and in some cases to *hours*. When asked if they would be prefer to use the paper evaluation systems vs. IU-EVAL, as expected the answer was unanimously in favor of IU-EVAL.

Our development team has tried hard to make the system simple and intuitive for all levels of users, specially for students. The overwhelming majority of students who used IU-EVAL to submit their evaluation indicated that they prefer the electronic evaluation over the traditional paper system.

OPEN SYSTEM IMPLEMENTATION TOOLS

An '**open system**' is a system that employs modular design principles, it employs widely supported standards and relies on community consensus. By its nature, 'open systems' ensure quality control, as each module is openly scrutinized, tested and validated.

One of the goals of the IU-EVAL system has been to make the final system freely available to the larger academic community through the World Wide Web. In order to easily achieve this goal, we decided to select a set of mature development tools that already exist in the public domain. After some research, our team chose the combination of MySQL [7] (open source database), PHP [8] (scripting language for building web pages with an excellent interface for interacting with a number of databases including MySQL), and finally the Apache web server [9] (a popular and open source Web server).



The combination of MySQL, PHP and Apache have been successfully utilized by a great number of developers to implement powerful three-tier web based applications. Currently, IU-EVAL runs on a Linux platform however, due to portability of our development tools, IU-EVAL is completely portable and has been tested on the Windows Server environment as well.

CURRENT AND FUTURE CHALLENGES

The process of developing IU-EVAL has been quite illuminating. For the most part, we have followed a textbook approach of system development. By that we mean, a great emphasis on analysis and design at the early stages, developing good team dynamics, paying attention to software testing and quality control, setting realistic and achievable goals, keeping the user community involved in all aspect of the analysis, design, testing, proper training of personnel, and deliberately refraining from non-essential feature creep.

These principles, have resulted in the creation of an amazingly robust system. During major testing in spring 2005, our main system failure was actually caused by one of our team members accidentally disabling a major subsystem, which caused an approximate 30 minute down time. By far the most important issues that we have encountered have been non-technical.

As for technical issues, we continue to receive great feedback from the user community as to how the system should be improved. Some of these suggestions, are being incorporated in the new version of IU-EVAL. Yet many other

suggestions appear to be too specialized to be incorporated. At this point the decisions to accept or reject new features are made by the authors. However, as the system becomes available as open-source, we foresee a more distributed decision making process.

CONCLUSION

IU-EVAL is an open-source, web based course evaluation system developed at IU South Bend. The open-source movement has brought a number of extremely useful software products and tools to the user community. For the most part, open source products and tools have stood the test of time. At IU South Bend, our goal has been to develop a generic, customizable and scalable electronic evaluation system which understands the unique needs of an academic institution. Furthermore, we sought to make the system freely available to the larger academic community through the World Wide Web.

To date, we have been able to make significant progress toward our goal. IU-EVAL is currently being used by five departments, and two schools. In addition, the University Center for Excellence in Teaching has adopted IU-EVAL as the tool that it uses to conduct its faculty surveys. So far, we have received excellent feedback from the user community. During major testing in Spring 2005, we had no significant errors or failures. The new version of the IU-EVAL is currently being worked on and we hope to be able to put it in production by Spring 2006, in which time we will be seeking a number of academic institutions to serve as beta testing sites. After extended testing, we hope to make IU-EVAL available via our departmental web site.

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[7] MySQL database server is one of the most popular open source database management system available at http://www.mysql.com/

[8] PHP is a widely used open-source scripting language for Web development tool available at http://www.php.net/

[9] Apache is a widely used and powerful open-source web sever available at http://www.apache.org/

[10] Ali, D.L. & Sell, Y. (1998) Issues Regarding the Reliability, Validity and Utility of Student Ratings of Instruction: A Survey of Research Findings. Retrieved May 19, 2000 from the World Wide Web: http://www.ucalgary.ca/UofC/departments/VPA/usri/appendix4.html

Appendix A
Sample Evaluation Forms

Department of Computer & Information Sciences
Indiana University South Bend

Course/Instructor Evaluation

Instructor:	Course/Section No.:
Semester/Year:	Days/Times:

Instructions:

For each of the following statements or questions, please select the response that most closely represents your thoughts/feelings.

Note: *Your instructor will not have access to these forms until after grades have been reported.*

1) Instructor: (Providing explanations and examples; ability to kindle interest; handling of questions, being prepared for class; office hours; examinations; grading; fairness; etc.)

2) Course: (Adequacy of prerequisite courses; opportunity to acquire new skills and understanding; pace of the course; appropriateness of laboratory work (if applicable); etc.)

3) Instructional Support Materials: (Comment on any of the following that apply: textbook, handouts, computer software/hardware, graphing calculators, etc.)

Using a pencil, darken the letter that best describes your opinion.

WHAT SORT OF JOB HAS THE INSTRUCTOR DONE IN:	**Very Poor**	**Poor**	**Satisfactory**	**Good**	**Excellent**
1) providing examples and explanations that helped you learn the material?					
2) creating a class atmosphere in which you could learn effectively?					
3) answering questions raised in class?					
4) assigning homework that helps you to understand the material?					
5) providing feedback on returned course work?					
6) using instructional aids, such as the blackboard, overhead projector, etc.?					
OVERALL					
7) How would you rate the course?					
8) How would you rate the instructor?					