Learning Centre Prototype Deployment – Using .Net Framework

By

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Abstract The launch of the Microsoft Visual Studio.NET (VS.NET) ushered in a new approach to developing Internet applications by providing broad set of technologies, tools and development environment. The "Learning Centre Prototype Deployment –Using .Net Framework" project was initiated to explore the suitability of Microsoft .NET platform as an application development environment for students who have little or no experience in developing sophisticated Web applications. This project is developed by two first year students for *Internet Application Development* course, a required course for Computer Information Systems Diploma program. The Learning Centre facilities are places where students can find learning assistance, one-to-one and small group tutoring, help with study skills and learning strategies. Using the Learning Centre facilities, students can also access print and electronic resources and other tools to aid them in their studies. The paper provides an overview of the project, discusses the strategies used in integrating the theory with relevant practices utilizing Microsoft .NET framework, outlines the challenges encountered in the application development, and describes the successes that have been achieved.

1. INTRODUCTION

Kwantlen University College is offering the Internet Application Development course to the Computer Information Systems diploma program since spring 2000. The course was initially designed to meet the existing demand in the industry for technical personnel with strong background in WEB application development and techniques. Subsequently the course is updated to include Microsoft .NET platform to distributed applications development. This course is mandatory for all first year Computer Information Systems diploma students. This course provides students with a solid foundation of knowledge on which to build a career in Internet Application development. The curriculum is designed to make academic theory relevant through exercises and projects normally encountered in a real world environment.

2. COURSE OVERVIEW

The Internet Application Development course introduces the students to the fundamental concepts of Web Application Development. Students will learn to build, debug, and deploy Web-based applications using the current development tools and methodologies. They will study the Web-based application development concepts such as: Architecture and Technical Requirements for Web Application Development, Hyper Text Mark-up Language (HTML), JavaScript, ASP.NET, Web Database Development, and Active Data Object .NET (ADO.NET). Upon successful completion of this course, the student will be able to:

- plan the architectural and technical requirements for Internet Application Development;
- use Hyper Text Mark-up Language (HTML) to build client-side Internet applications;
- apply HTML and JavaScript to Web-base problem solving;
- use ASP.NET to build server-side Internet solutions; and
- add database functionality to server-side Internet applications.

3. TEACHING STRATEGY

Classes for the course will consist of a series of lectures, tutorials, in class examples, assignments and project presentations. The lectures will serve to introduce topics. However, there will be a strong focus on reading, appraisal and assimilation of appropriate materials in the textbook to provide further detail and context. Students are advised to read relevant materials, as they will help with the assignments and provide additional information. Students will learn the principles and concepts of programming using ASP.NET through a series of assignments and a major project. For the project, students will work in groups in designing and implementing appropriate applications using ASP.NET. The project will require comprehensive skills in ASP.NET and ADO.NET programming. Students will document the project results, present the results and conduct formal reviews with their peers. The last week of the class will be devoted to the group presentations of the projects.

There is Midterm examination and one Final examination in addition to assignments, quizzes and project work.

The “Learning Centre Prototype Deployment –Using .Net Framework” project described in this paper is undertaken by one group of students to meet the project requirement component of the course.

4. PROJECT DESCRIPTION

The “Learning Centre Prototype Deployment –Using .Net Framework” project is a WEB based application that implements a prototype of Internet-based learning centre system at Kwantlen University College. This facility will provide students of Kwantlen University College with variety of services designed to assist them with their studies.
Learning Centres are facilities where any Kwantlen student can find learning assistance, one-to-one and small group tutoring, and help with study skills and learning strategies.

Access is also available to print and electronic resources to help with the completion of assignments. Available services and resources include [1]:

- one-to-one or small group tutoring in Math, Sciences, English, ESL, reading, writing, study skills, learning strategies, and many other program areas
- forming study groups
- program related reference materials
- study skills and learning strategies materials
- multi station computer labs for preparing assignments
- multimedia computer stations
- video stations
- math review videos
- TOEFL preparation materials
- ESL study and review materials

The .NET implementation of the Learning Centre prototype can be viewed at the web site: http://www10.brinkster.com/kwantlencenter/home.aspx

5. PROJECT TOOLS

The Learning Centre application project is a browser based client-server application that effectively uses various tools of the .NET framework to interface and communicate with an application database. It utilizes two-tier architecture.

The client tier includes the Web browser accessing many Web pages with SSI (server side includes). ASP.NET is one of the key SSI technologies used for producing this Web-based application in the .NET environment.

The server tier consists of ASP.NET Web forms connecting to an Access database. ASP.NET Web forms framework provides programming model that can be used on the server to dynamically generate Web pages. Querying via Structured Query language (SQL) is the method used to access the database. ADO. Net's OLEDB Data Provider is used to provide seamless integration between the application and Access database.

ASP.NET applications can be written in any .NET language including C#, VB.NET, and C++. Although team members had C++ and Java experience, the project team elected to use VB.NET as a programming language, as the team members were skilled in VB. To speed up the development process, many of the ASP.NET features rich controls such as the Data Grid control, Data List Control, Validation Control, and the Calendar control are used extensively. In addition, to enhance code reuses and the robustness of the

application, user-defined controls are applied through out the application to create custom user-interface objects.

The focus of this application is on the design of a rich client interface in a browser based client-server application, and on providing application features that will be beneficial for the students who will be using the system. The focus of this application is not on an architectural or a security template, although every attempt has been made to build this application based on a sound design with good security features. Figure 1 below gives an overview of the project architecture. The following tools are used for the project

- ADO.NET
- ASP.NET
- Visual Studio .NET
- Visual Basic .NET
- Internet Information Services (IIS)
- Windows 2000
- Access Database

The .NET platform has also achieved a high level of sophistication. Because the facilities provided in the .NET platform are easy to use and learn, development cycles are shortened and costs are decreased. The students were able to complete and deploy the prototype within the stated timeframe of about twelve weeks.

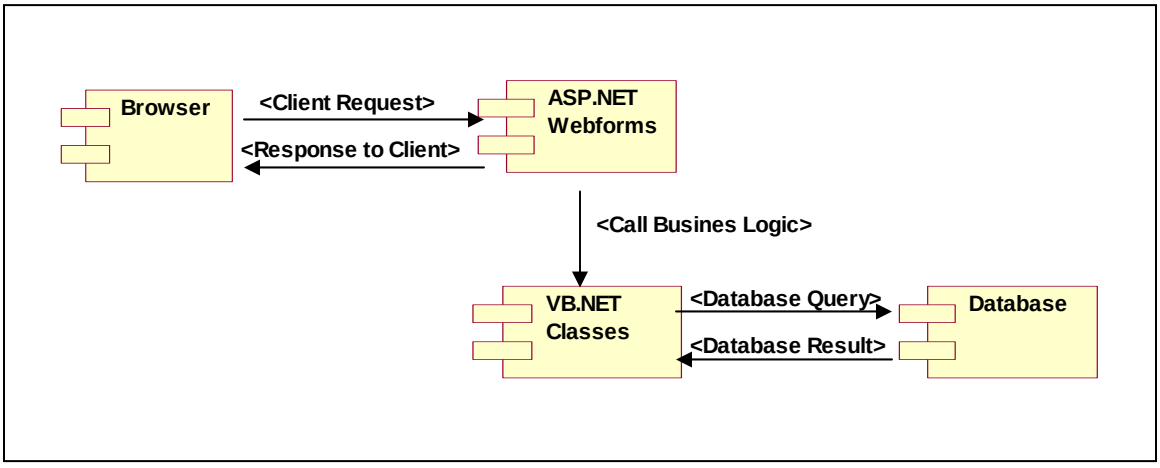

Figure 1: Project Architecture

6. SECURITY

Intrinsic support for security is an important feature of any intranet portal. It is often a requirement that parts of a portal can be accessible only by privileged users or the entire portal is accessible only by authenticated users. The Learning Centre prototype supports role based security which enables or disables different features of the portal depending on the role of the login user. To make the application more robust in term of security, two additional measures can be added with minimum code modifications. If the intranet portal is to be available only to registered users, a forms authentication can be added to the configuration file of the portal. When the forms authentication feature is turned on, all users must login to the application in order to access any feature of the portal. To add extra security measure, user passwords can be encrypted and saved to a password protected database management system. Students in the course have been introduced to both forms authentication and data encryption using features provided by the .NET framework.

7. BENEFITS TO STUDENTS

The development and implementation of the learning centre project provided many benefits to the students as they:

- Gained understanding of .NET architecture and major .NET Web technologies, such as ASP.NET, ADO.NET, and Web Services;
- Appreciated the range of issues one has to deal with in planning the architecture and technical requirements for realistic Web Development application project;
- Became conversant in building interactive client-side solutions using .NET facilities;
- Effectively used ASP.NET to build server-side internet applications;
- Applied database functionality to Web projects using ADO.NET;
- Built a dynamic Web Site with ASP.NET;
- Developed N- tiered .NET applications using ASP.NET, and Visual Basic .NET;
- Were able to set up, configure and maintain a Web Site;
- Acquired skills in .NET tools and technologies that could be used effectively in future to develop distributed applications;
- Obtained knowledge that could enhance their chance for future employability.

8. CHALLENGES

There were many challenges that need to be addressed during the development and implementation of the project:

- Student Learning Curve: As with any new and unfamiliar environment, there are questions about the learning curve and resources and skills required to get students up to speed. Students have to spent considerable time initially to get the skill sets required to develop the project. However because of previous programming background, students became productive within a short period of time, and were able to develop components of project gradually;
- Course expectation: Internet Application Development is not the only focus of study for the students. Students have to spend excessive amount of extra time not only to get themselves familiarize with technology, but also to define the scope of the project in cooperation with the learning centre staff;
- Restricted time frame: The restricted time frame of twelve weeks for completion of the project forced the students to limit the functionalities that could be deployed and delivered ;
- Lack of prior experience: Students did not have experience in working in a project of this magnitude, they lacked confidence, and felt they were inadequately prepared for such a significant undertaking for a course they were learning at the same time;
- Lack of appropriate text book: Students have to refer to additional resource materials to support the lecture topics and obtain specific technical information pertaining to the project from outside sources besides the prescribed text book [2].

9. RECOMMENDATIONS

The Internet Application Development course has proven to be successful. The students who took the course have in general provided positive opinion on the content of the course. The objective of the course was to provide the students acquire sufficient knowledge, and practical skills to enable them in completing real life projects.

However, there are number of issues that must be considered to improve the courseware:

- The students lacked sufficient knowledge of all the available tools of .NET environment. Adequate lecture time needs to be spent in the beginning of the semester to discuss the details of application development environment and scope of the project.

- Students find it challenging to develop a realistic internet application over a 12-week semester. Many of the applicable subject areas are yet to be covered in the lecture by the instructor, when students are designing the system. Project milestones and deliverables must be coordinated, within the limitation of schedule constraints, with class room lectures. Students will then be able to apply the acquired knowledge to the development of the application.

- Although students gain valuable experiences working on real projects with vague and unstable requirements in an unfamiliar development environment, students need specific and detailed guidelines in the beginning of the term

outlining the expectations of the project outcome. As the term progresses, instructors also need to monitor the projects on a more frequent basis.

10. CONCLUSION

The "Learning Centre Prototype Deployment –Using .Net Framework" project gave students valuable exposure to tools and techniques of .NET framework. Although the project has substantial requirements in terms of functionalities, the simplicity with which one can develop client/server applications in .NET framework, enabled the project team to implement the system within stipulated time. There was some steep learning curve in the beginning of the project as members were not familiar with .NET framework's tools and technologies. No substantial difficulties were encountered by the project team after the initial training. The emphasis on developing practical application has positive impact on the students learning experience. With real life examples as the motivating factors, the courseware provides in-depth and meaningful content, and conveys to students the theoretical principles, and its potential practical usage. The students learned about the broad range of capabilities .NET platform offers that would enable them to build wide varieties of distributed applications. Through the deployment of the project, the students gained skills and useful experiences in creating highly scaleable distributed applications.

11. ACKNOWLEDGEMENT

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12. REFERENCES

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http://www.kwantlen.ca/calendar/learning.html

[2] Kathleen Kalata, Introduction to ASP.NET, Thomson Boston: Thomson Course Technology

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