Proceedings

The Fourth Workshop on Information and Computer Science

17-18 March, 2002 (3-4 Muharram, 1423)

Internet Computing

Information and Computer Science Department

King Fahd University of Petroleum & Minerals

In Cooperation With

IEEE Computer Society Chapter, Saudi Arabia

STUDENTS INFORMATION SYSTEMS: REMOVING COBWEBS WITH WEB

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ABSTRACT

High performance legacy database application systems are still widely deployed. The use of these systems requires properly trained professionals. Therefore, data can not be directly accessed or modified by all of the user community. With the start of new millennium and emergence of new easy to use Web technologies, IT departments all over the globe are under immense pressure to change millions of instructions of legacy code of their administrative applications to cope with this changing situation. This can empower the user to view and modify data by themselves. This paper sheds light on how KFUPM moved one of the mission critical application (Student Information Systems) SIS Plus to Web based user interface, with out wasting investment on these applications. Technology and architecture of a 4-Tiered Web based application, its 4-levl security mechanism and its strengths are discussed in brief.

9960-07-187-1

At present more than 15 registrar office employees are working round the year to cater needs of the KFUPM student community. To facilitate registration process, Information Technology Center (ITC) has to deploy 40 extra terminals (dumb terminals and PC's with emulation software) and 12 printers in 3 buildings. More than 30 part time students are hired every semester for the registration activity. This activity involves more than 50,000 Add/Drop transactions.

An in-house developed Web application was used for early registration. That application was not capable of processing information in real time. As a result, data collected through this Web application was uploaded to mainframe and was processed in batches. Students or advisors were not able to know the status of different sections, resulting in un-even registration in different sections.

Grade rosters were printed in batches by registrar officials near end of every semester. These were provided to faculty for grade reporting. Faculty was supposed to bubble the grades on rosters, get it signed by their respective chairman and hand these over to the Registrar office. Registrar office was responsible of verifying the legitimacy of bubbles and reading grade rosters by optical mark recognition (OMR) machine. Finally, grades were updated in batches and the class lists with grades were produced and sent to respective faculty to verify the grades and to report the mistakes (if any) to the Registrar office.

Students had no access to their personal, registration and grades record. They were continuously bugging the registrar officials with different types of queries. As a result there was heavy need of staff to perform these activities.

3. ALTERNATIVE SOLUTIONS

With the emergence of the new technologies like World Wide Web, expectations of faculty and staff increased tremendously. KFUPM being leader in the region for adoption of innovative technologies was always in view to facilitate its students and academic community with intuitive, easy to use technology with minimal learning curve.

To provide Web solution to the community there were several alternatives:

1 Design and develop a Web application interfacing present data by using offline method like present Web system by the registrar. In this approach, data could be downloaded from Plus2000 database and can be loaded to a PC- based DBMS to be used by the Web application.

2. Link the SIS Plus2000 database using gateway software and develop new business logic using new application platform/development tools.

3. Develop or obtain/customize a Multi-Tier Web interface using gateway software and reusing existing business logic with the legacy system, to inquire and update data.

4. Design and develop a brand new Web based Student Information System application software from scratch to fulfill the need of the students, faculty and administration.

4. THE SOLUTION: WEB FOR STUDENTS

Information Systems professionals are always being told to do more with less. Deliver high-quality student services without increasing staff. Keeping this in mind, KFUPM adopted the 3rd alternative by implementing Web for Students, Faculty and Advisors.

Web for Students and Faculty is designed with Web page features. Technology for the application is discussed in the following sections. Web pages show a subset of what displays on the host screens. Hypertext links are provided to link associated pages. Instead of using one-to-one screen philosophy, a Web page correlation is used.

The application reuses the same business logic used in the legacy system. Therefore it can be deployed and customized with little impact to the base product. Cascading Style Sheets (CSS) files have been used to apply style modification throughout the application.

4.1 The Technology: 4-Tier Architecture

Web for Students and faculty supports a four tier, Client Server configuration and uses the same database access as the SIS Plus 2000 online programs. Figure 2 illustrates the four-tier configuration that supports Plus 2000 Web for Students and Faculty application

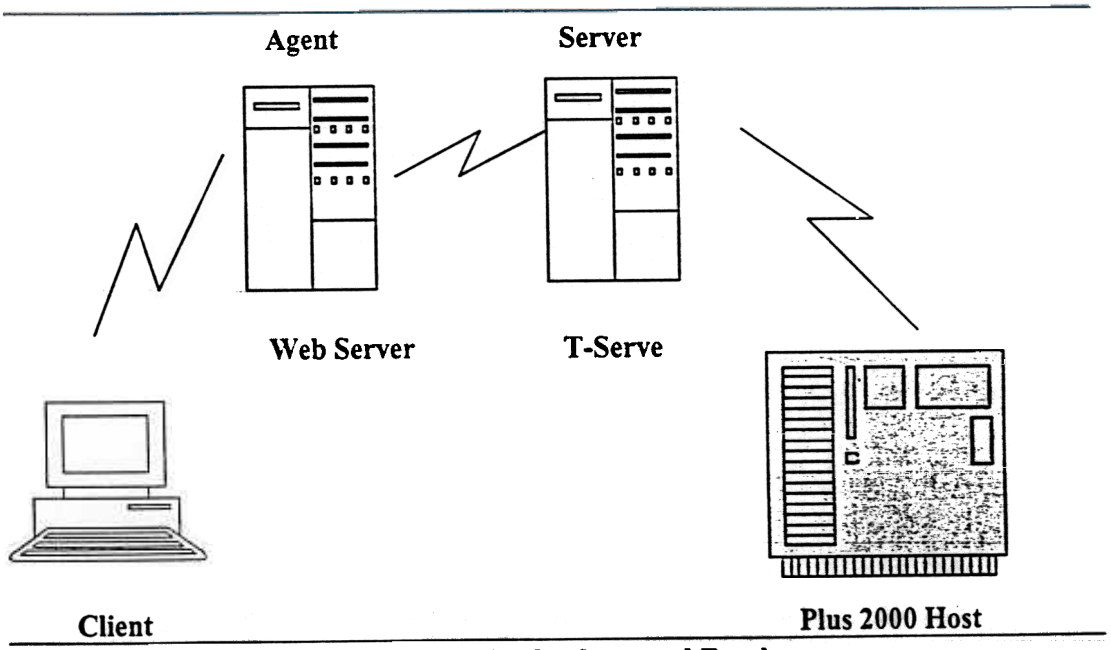

Figure 2: 4-Tier Architecture of Web for Students and Faculty

In the 4-Tier architecture, the steps in exchanging information between Web client and Plus 200 host are:

1 The Web client browser software accesses a web page or completes a HTML form that is sent to the Web server.

2. Web server software interprets the URL (Uniform Resource Locator) and identifies it as either a CGI-compliant (Common Gateway Interface-compliant) or as a procedure to access a static HTML page. The common Gateway Interface (CGI) defines how scripts communicate with Web servers [2]. If the program is identified as CGI-compliant, the Web server software invokes the T-serve web agent and passes the form contents to the agent.

3. The T-Serve Web Agent software reads and decodes the passed data contents to T-Serve server via TCP/IP and executes a transaction request to the Plus2000 host. The host S/390 holds system specification tables and parameters along with SIS Plus database.

4. The COBOL program executes and retrieves or updates the requested information on host that will be passed back to the T-Serve Web Agent. T-Serve holds system tables, parameters and variables.

5. The T-Serve Web agent merges the host information with the appropriate HTML and passes the data back to Web server software that communicates with the Web client.

Figure 4 shows the main programs used on the different tiers.

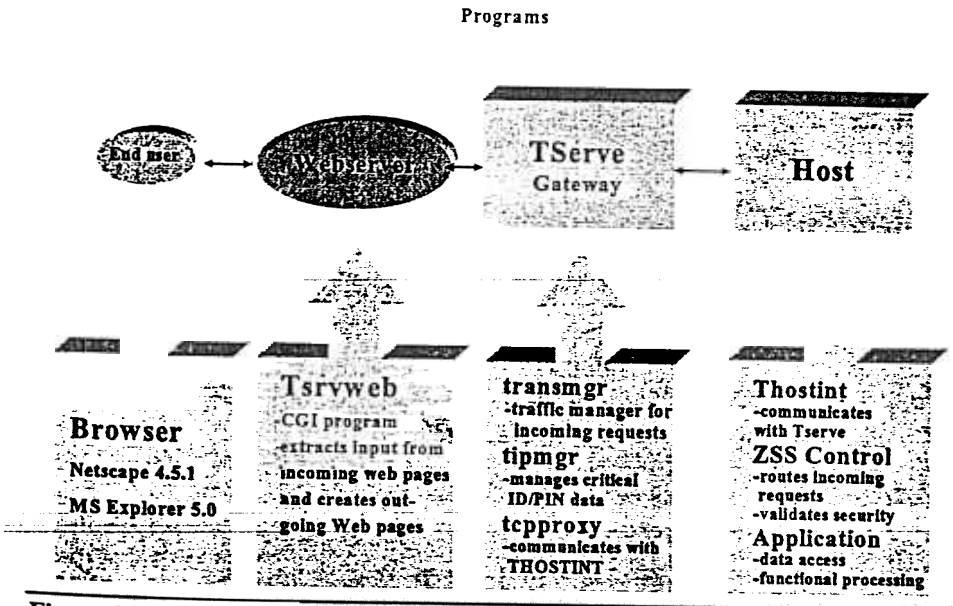

Figure 3: Programs on Multi-Tiers of 4-Tier Web for Students model

4.2 T-Serve

TouchNet T-Serve Universal Gateway includes both the transaction manager and a suite of intelligent gateway options for fast, secure, real-time host connectivity. T-Serve can integrate entire campus information system by enabling Universal Access with interactive voice

response (IVR) from touch-tone phones, touch screen Kiosks, Internet and Intranet Web browsers [3].

4.3 Security

Web for students perform four security levels as shown in Figure 4.

1. **Data encryption between the Web client and Web Server**
   Unencrypted plain text passed between the client and the Web server can be read by network "*sniffers*", that is software and hardware that monitor and display data transmitted across a network. To avoid this situation Secure Socket Layer (SSL) or SHHTP is used to encrypt data between the client and the Web server.

2. **Data encryption between the Web Server and the T-Serve host**
   The web server and T-Serve processes have data encryption routines. These routines protect the data as it passes between the Web server and the T-Serve.

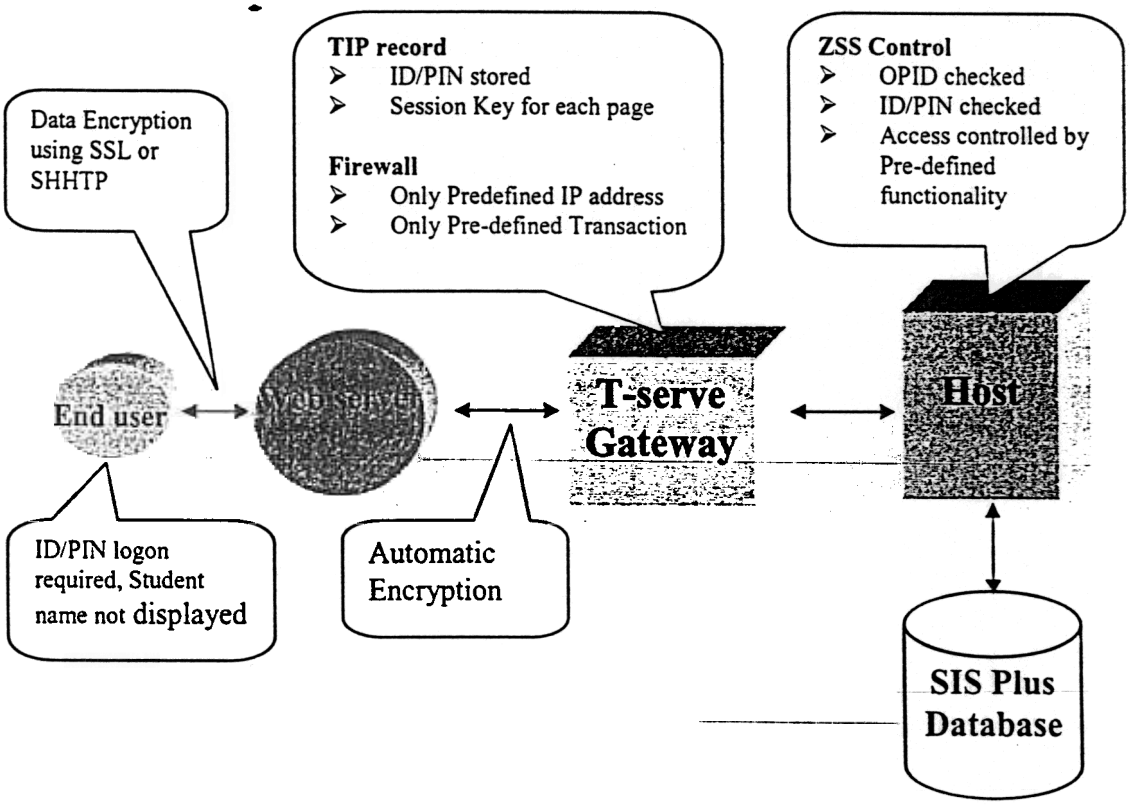

Figure 4: 4-Level Security provided for SIS Web

3. **Transaction in Progress (TIP)**
   TIP processing assigns new session ID to each request from the client browser. The session ID is associated with the student ID and PIN. The student ID and PIN cross the network between the client browser and the Web server only when the student logs in. Once the student is validated, only session ID's cross the public networks between the client browser and the web Server.

4. **Application Level Security**
Two level of security at this level is applied. The first level is provided by the Web server, which can either protect access to HTML pages via specific IP domains or require valid user name and password. This prevents unauthorized Web clients from accessing the page that connects to the T-Serve and Pluss2000 host.

The other level of security is provided at the application level in the Plus2000 Web for Students, which requires a valid student ID and PIN to gain access to the application. The student ID and PIN are stored in Pluss2000 SIS database and are used to authenticate the logon information against Plus2000 SIS database prior to gaining access to the Web application.

4.4. Main Features of the System

- Worldwide access to data through Internet and a web browser
- Self service model - minimizing calls to administrative offices
- Stateless environment - end user is never directly connected to the host
- Security is designed into the product
- All data is accessed and/or updated in real time

4.5. The Benefits

Web for Students provides KFUPM students with secure World Wide Web access to information in a familiar, enjoyable-to-use format. Students can apply for admissions. They can register for classes on their own schedules, without extending registrar office's. It won't compromise system security or institutional policies.

With Web for Faculty & Advisors, KFUPM can turn a challenging situation into a competitive advantage. This self-service solution provides academic staff with secure access on campus or at home to the information they need to manage course information and advise students. They can grade and advise on their own schedules – anytime, any place, on any net, with any browser.

Web for Faculty & Advisors provides an interactive interface to the administrative database for grading and academic advising. And, it does so without compromising system security or institutional policies.

In result the system provides:

- Better service for students
- Less registrar's office traffic
  More productive faculty and advisors
  Reduced costs

5. FUTURE DIRECTIONS

With TouchNet T-Serve gateway, it is possible to deploy IVR, GUI and Kiosk interface to further facilitate Campus community [4]. Figure 5 elaborates the model.

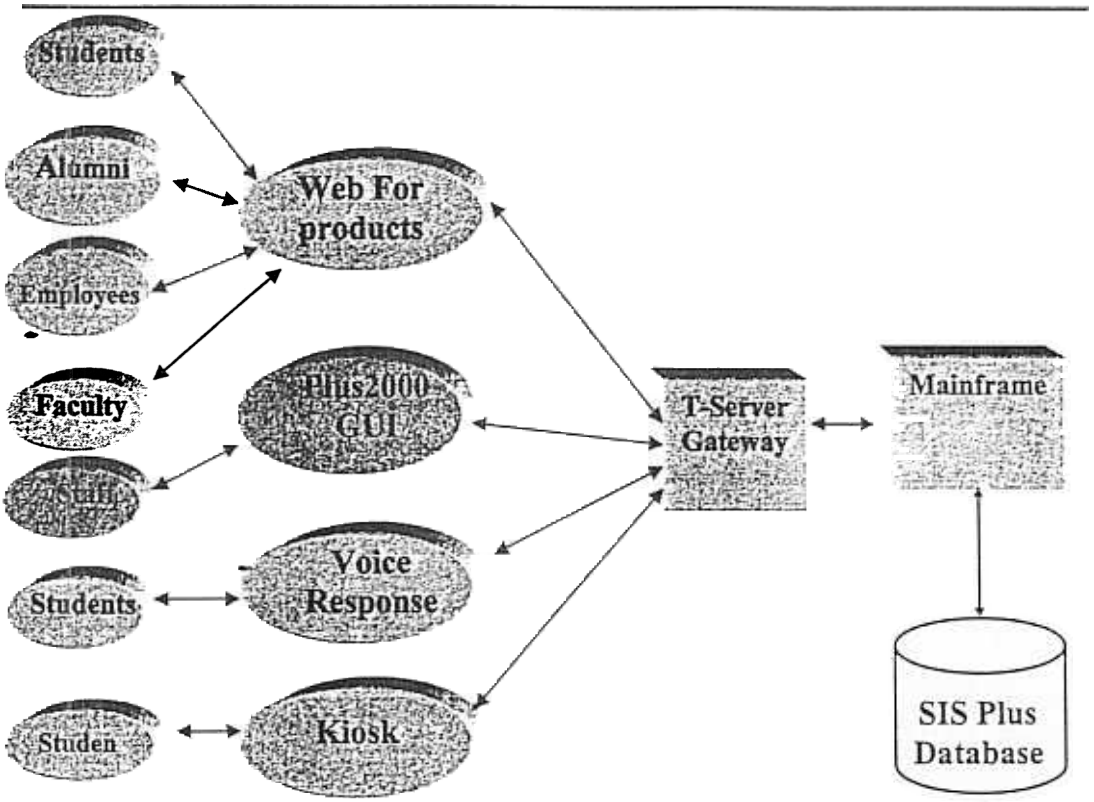

Figure 5: The Future directions for SIS

Moreover considering Windows NT security issues, it is also being considered to deploy Web for Students on UNIX servers in near future.

6. CONCLUSION

With Web based student Information System, KFUPM became a trendsetter in the Kingdom to provide easy to use state of the art Web technology to its students and teachers community. Instead of reinventing the wheel, same processes and business logic in on-line system is re-used to maximize benefits with minimum effort.

KFUPM's valuable information became securely available to students, faculty, advisors and employees any place, via any browser, with zero learning curve. Students can apply, register, query and update personal information on their own schedules. Using any Web browser from their desktop computers, faculty can manage course information and advise students, easing the burden on registrar office

Acknowledgement

The authors wish to acknowledge Dr. Mamdouh Najjar, Dean of Admission and Registration, KFUPM for his continuous support to implement this project.

7. REFERENCES

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