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Paperless Examination System for Subjective Assessment Based on Clustered Architecture

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Abstract: Conducting paperless examination is one of the key for modernizing the current examination system. Current online examination system, focus more on assessment of knowledge, using the objective questions rather than the deeper understandings of the subject, which can be tested only by using the subjective questions. This article explains a paperless examination system, for objective as well as the subjective questions, which will be scalable and highly available. Instead of having the Personal Computers, Tablet PCs will be used over a network. This system will resolve some issues of the already existing examination systems, like answering of subjective questions, storing of the answer sheets, misplacement or loss of answer sheets. This system will also make the archiving of answer sheets a hassle free process.

Keywords: examination, paperless, clustered, EJB, MVC, distributed

I. INTRODUCTION

Assessment is one of the major determinants in the examination process. Learning can be assessed by objective and subjective questions. Better the student in her subjective knowledge, more suitable she is for higher management or technical positions [1]. Computers have become an integral part of day to day life. With the advent of personal computers and networking, they have become an integral part of education system also. So there is a growing need to integrate assessment with the computer technology. Purpose is to achieve a paperless examination system which can be used not only for the objective questions but also for subjective questions. Also there is high importance of highly available and scalable applications in today's increasingly inter-connected world. So enhancement in already existing examination system is required to make them more suitable. Distributed and clustered architecture is used to model the new system. The remainder of this paper is organized as follows: Section II summarizes some already existing online examination systems. Section III explains the architecture of the system in brief. Modules which are present are given in section IV.

II. PREVIOUS IMPLEMENTATIONS

A research was conducted in "Web based general examination system" [2]. The paper emphasized on the development of a common examination system. It identified the major modules that should be part of a common examination system. The major modules identified are System Log Management, Subject Management, User Management, Test question base management module and Performance Management module. So the research emphasized, on the design of an examination system for the objective questions, automating the selection of test questions, submission of papers.

Zhikao Ren and Chuansheng Wang developed an examination system [3] which uses B/S structure [4] for objective or true false questions. Some functions of the examination system run in background and some in foreground. Functions like management of test papers, management of examination affair, management of examination scores and information are run in background of the system. In the foreground the module which is responsible for displaying the pages to the students is run. The system also calculates the difficulty coefficient of examination questions, and depending upon the difficulty coefficient the actual difficulty of questions is adapted.

III. ARCHITECTURE OF THE SYSTEM

Existing online examination systems have following limitations:

- They are not meant for subjective questions.
- They are not scalable. Examination system needs to support a large number of variable users.
- They are not highly available. Performance of the system will be highly impacted if one of the servers fails.

To remove the above drawbacks this new system has been proposed.

The system is based on MVC [5] and clustered design pattern. MVC will divide the application in three parts: Model, View and Controller. A cluster is a group of application servers that transparently run the application as if it were a single entity. A cluster uses many machines to service request. If one of the machines in the cluster fails, then another machine can transparently take over. Figure 1 defines the architecture of the system.

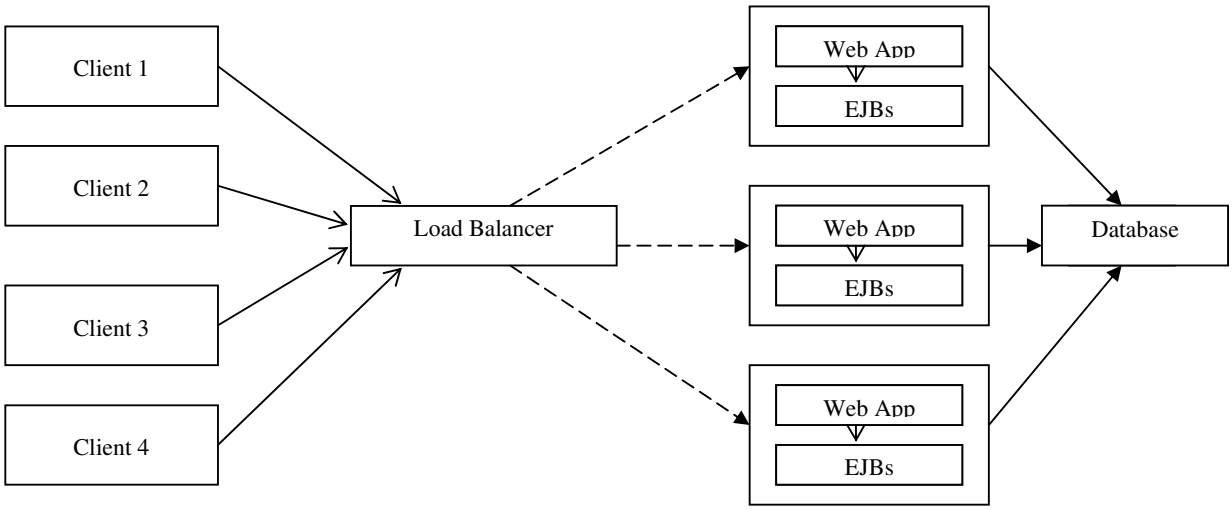

Figure 1: Architecture of Online Examination System

Architecture contains clients, load balancer and application servers, in which web application and EJBs will be deployed.

Clients will be students, teachers and administrators. Students will be using Tablet PCs, having hand writing recognizer. Hand writing recognizer will receive and interpret the input received from Tablet PC. Teachers need to submit question papers and evaluate the students answer sheets. Administrator will have privileges of performing user management and produce the required reports.

Load balancer is the component which plays an important role in clustering. It dispatches the requests from client to appropriate application server, depending upon the availability of server and number of requests which are already being processed by the server. When a particular application server is not available then request is forwarded to other application servers.

Collocated structure is used for web application and EJBs. In this case requests are load balanced at first level of web request and then the next EJB requests will be handled by the same server.

IV. MODULES PRESENT IN THE SYSTEM

A. Log Management System

Logs will be available only to the administrator. Logs will be maintained to check the users who have logged into the system. Logs will be helpful in tracing the students who have submitted their answer sheets successfully. This module will be implemented as a session less EJB with JMS queue connecting the application client and the EJB. There will be another JMS queue between web application and the EJB. EJB on receiving the log messages will update the same log file.

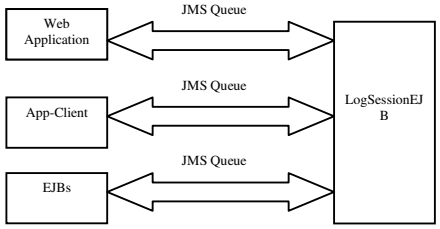

Figure 2: Log Management System

B. User Management System

There are three groups of users in the system: Administrator, Faculties and Students. Each of the group has different privileges. Administrator will be provided full privileges i.e. read and write access. Faculties will have read access to the answer sheets. Once question paper has been submitted, they will have only read access to them. Students will have only read access to question papers. Students will have no access to answer sheets after submission.

C. Test Paper Management System

Faculties need to submit sets of question papers for each subject online. All the Question papers will be stored in the database. The question paper which a student gets from the set will depend upon his roll number. This is required to restrict cheating among students.

Students on receiving the question paper will answer using the Tablet PC. During the examination answer sheet will be automatically saved in the database at regular intervals. A student can submit his answer sheet before the stipulated time also. If the stipulated exam time is over, then answer sheet will be forcefully submitted.

To check the answer sheets system will take course, semester and subject name as input, to fetch the answer sheets from database. After checking the results will be stored in the database for report generation.

D. Report Generation System

System will provide facility for various reports. Consolidated result, number of total pass students, total number of fail students, and number of students getting more than a particular percentage will be available. System will also be used to track the number of answer sheets checked or pending with the faculties.

V. DATABASE

There are six entities in the database design. Following is the preliminary design of entity types used for this examination system:

- USER

Eno, Password, Course_id

- COURSE

Course_id, course, sub_id

- SUBJECT

Sub_id, Name

- TEACHER

Group_id, User_id, Password

- ANSWER SHEETS

Eno, Filepath, Filename

- RESULT

Marks, Sub_id, Course_id, Eno

Figure 3 captures the ER diagram, depicting the relationship between various entities.

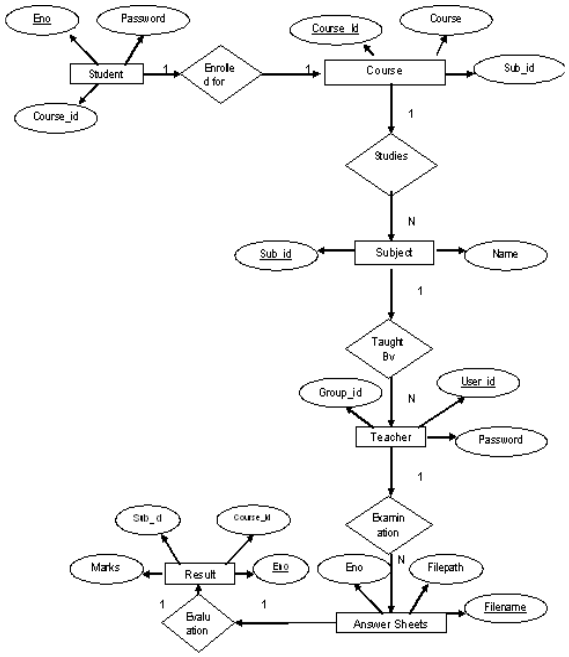

Figure 3: ER Diagram

VI. CONCLUSION

Using such an examination system it can give clear advantages over the already existing systems. This paper describes a paperless examination system which can be used to test the subjective knowledge also. Paperless feature is achieved by using handwriting recognizers in Tablet PCs. Design of this system is based on MVC and clustered design pattern. MVC provides the clear cut distribution of code. Clustered architecture provides high availability and scalability to the system, which is required as examination system is critical for any institution and the number of users who use such a system is highly scalable.

VII. REFERENCES

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