韓國컴퓨터情報學會 論文誌
第16卷 第9號, 2011. 9.

2011-16-9-5-3

미들서버방식 한국형 IBT를 이용한 국가언어능력평가 시스템의 설계 및 구현

장 영 현*, 박 대 우*

Design and Implementation of National Language Ability Test System using Korean Style Internet-Based Test added Middle-Server

Young-Hyun Chang*, Dea-Woo Park*

요 약

본 논문의 목적은 미들서버에 대한 효율성과 안정성에 기반 한 한국형 IBT 시스템의 설계와 구현을 제안하는 것이다. 현재의 동일한 처리시스템은 전송절차, 비용, 시스템 부하 및 안정성에서 일부 불안정 요소들을 내포하고 있다. 본 논문에서는 최종적으로 고비용 제어, 운영 인적자원 및 특수한 운영 문제들로부터 관리 측면에서 다양성과 탁월성의 결과를 산출하는 한국형 IBT 시스템의 수행능력 향상을 위한 액티비티들을 처리한다. 미들서버를 사용하도록 제안된 시스템의 기술적 요소들은 최소단위의 모의시험 시스템을 사용하여 구현하였으며 실제 개발 절차는 수행 능력을 향상시키기 위한 기존의 IBT 시스템의 단점들을 개선하는 요구사항의 분석을 기반으로 시작하였다. 기존 시스템과 신규 개발 시스템의 효율성 비교는 다량의 운영자 영역, 비정상적 처리 조치, 시스템 유지보수를 대상으로 수행되었다. 다양한 부분에 대한 처리의 효과성에 대하여 미들서버를 사용하는 한국형 IBT 시스템은 최대 2배 정도의 성능을 달성하였다. 미들서버를 사용하는 한국형 IBT 시스템은 관리시스템과 사용 편리성에서 운영자와 관리자의 탁월한 평가를 도출하였다.

▸ Keyword : 미들서버, 한국형 IBT, 인적자원, 수행능력향상

Abstract

The purpose of this paper is to propose the design and implementation of a korean style internet-based test system on the basis of efficiency and stability for middle server. The current assessment system has some unstable elements with regard to transmission procedure, cost,

• 제1저자 : 장영현 교신저자 : 박대우
• 투고일 : 2011. 08. 05, 심사일 : 2011. 08. 16, 게재확정일 : 2011. 08. 25.
* 호서대학교 벤처전문대학원 IT응용기술학과(Dept. of IT Application Technology, Hoseo Graduate School of Venture)

system load and stability. This paper proposes a series of activities for the performance improvement of korean style internet-based test system which finally produced various excellent results in the administration of expense control, human resources, and special operational affairs. The proposed system's technological factors using middle server have been tested through a basic simulation pilot system. Actual development procedure starts from the analysis required by improving the shortcomings of existing internet-based test systems. A efficiency comparison with existing system and newly developed system was made in the area of number of operators, abnormal processing, system maintenances. Korean style internet-based test system using middle server has shown great efficiency increased to the maximum of 2 times about the effectiveness of processing for various parts. The korean style internet-based test system using middle server have been given good evaluations with regard to the convenience of their use and the management system for operators and supervisors

▸ Keyword : Middle Server, Korean Style IBT, Human Resources, Performance Improvement

I. Introduction

In many countries, national examinations are categorized by academic sciences and technical fields, which operational systems were primarily managed offline at the earlier time and later gradually both on and offline with the aid of information technology, and currently entirely online.

Unfortunately, technical failures would frequently take place where computer based tests were scheduled to be held at Korean local universities which were committed to serve as testing agency for U.S based linguistic tests, and yet found it often difficult to remedy technical errors, and compel them not to act on behalf of language testing agency headquartered in the United States.

Korean applicants were helplessly directed to apply for overseas language tests via online application systems overseas such as in Japan and Philippines.

The technical defects remain incompletely cleared of although U.S based testing agency had addressed to transfer U.S based internet server involving language tests to Korea and extend additional computer systems. It is therefore needed to establish and operate Korean style language test system that is independently designed by local technology[1,2,3,4].

Successfully establishing and operating Korean style language test system using middle server would be a cornerstone that could be helpful for exporting of technical administrative system, qualification system, question articles, operational approaches, internet application techniques, electronic payment, IDC operation, network infrastructure, wireless internet, security system, information portal, e-commerce, VAN, banking operating technology, etc[5,6].

II. Technical Researches and Case Studies

In relation to Korean style language test system, merits and demerits are extensively examined through local and international technical comparisons. Technical Researches and Case have been examined in four cases

1. Application System

The applicable scope of the system is gradually being extended since it has been necessarily used for university entrance examination and employee recruitment. By using online system, texts and images are loaded into database set for collection of personal information[7,8]. Load distributing technology is required when internet based applications are showered within a specific time limit. This method does not use a middle server system and payment systems are linked to external systems.

2. Integrated Qualification Management System

Once applications are filed online, the entire procedures for examinations and follow-ups are managed by the integrated system. It is important to technically connect main server with middle server on a real time basis. American style language test system was in operation where the main server was separated from middle server except for a specific time, whereas Korean style internet-based system advances the synchronization of main server with middle server so that existing technical failures can be remedied. This system does not use a middle server system[9].

3. KORCHAM's National Certified Technical Qualification System

The system was extensively applied to national certified examinations taken online for the first time locally, and is featured by the largest qualification management system infrastructure in Korea, throughout a serial steps of application online and offline, screening, examination, and follow-up. The system is not only entirely managed by internet-based test system but also primarily by computer-based test system and secondarily by internet-based test system in part. This method does not use a middle server system. This method uses a simple middle-server system.

4. TOEFL IBT System

Regarding certification tests, PBTs are rarely problematic, while IBTs often face difficulties including technical failures as it is somewhat challenging to identify and manage applicants for qualification exams which are to be managed in a real time. Therefore, efforts to extend server are under consideration for trouble shooting. This system does not use a middle server system.

III. Designing of Korean Style Internet-Based Test System

Regarding Korean style internet-based test system, key software processors consist of application system, internal management system, question articles subscription system, scoring system that are interconnected via main server, test management server and middle server.

1. Composition of Korean Style IBT System Software

1.1 Requirements for application and management system

- Management of information received
  (data transferred to test headquarter after applications for test are closed)
- Information of applicants
  (application No. ID No, name, test type, grade, test division, testing time)
- Information of test place
  (place, room where test is scheduled, capacity of applicants per room)

1.2 Requirements for internal management system

- Test paper file
  (test papers transferred separately on a basis of class, grade, testing time)
- Test paper file generated on a testing time basis
- Result of applications
  (accounting of applications at test place)
- Management of applicants who pass through, do not show up for test, and test scores

1.3 Main server and test management server

- Management of test related data
  (transferred to middle server)
- Middle server/client execution file, test paper file, applicant info and test place info
- Monitoring of test place
- Monitoring of progress at test place/room
- Accounting of applications at test places
- Reception of applicant's paper and result info on a basis of test place/room, Scoring
- Paper scoring upon completion of test
- Final application result transferred to internal manag ement system, Scoring results (qualified,

disqualified, final scores) transferred to internal management system

1.4 Middle server

- Version management (identifying/updating execution file version)
- Test related data management (test related data reception)
- Client execution file, test paper file, applicant info and test place info
- Application management, testing time selection, person info transmission and printing
- Test starting, paper collection, application closing, paper checking and application result transmission
- Application progress check by test place/applicant
- Client paper file backed up to middle server per 1 minute

2. Composition of Korean Style IBT System Hardware

The hardware consists of test application server managed by application & management system, internal management server and test article bank server by administrator server internal management system, main server and test management server by test headquarter and middle server at test room.

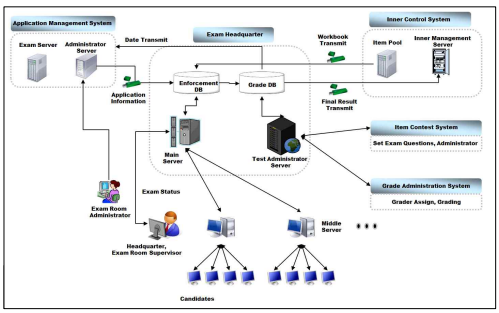

Fig. 1. Korean Style IBT System Configuration

IV. Implementation of Korean Style IBT System

Korean style internet-based test system for middle server has shown great efficiency increased to the maximum of 2 times about the effectiveness of processing for various types. The korean style internet-based test system have been given good evaluations with regard to the convenience of their use and the management system for operators and supervisors.

Korean style IBT system procedures are advanced throughout 3 steps; identifying online questions by using question articles subscription system and storing them in question bank at step 1; applicants handling by application system at step 2; accounting and publishing scores online and managing scoring results at step 3.

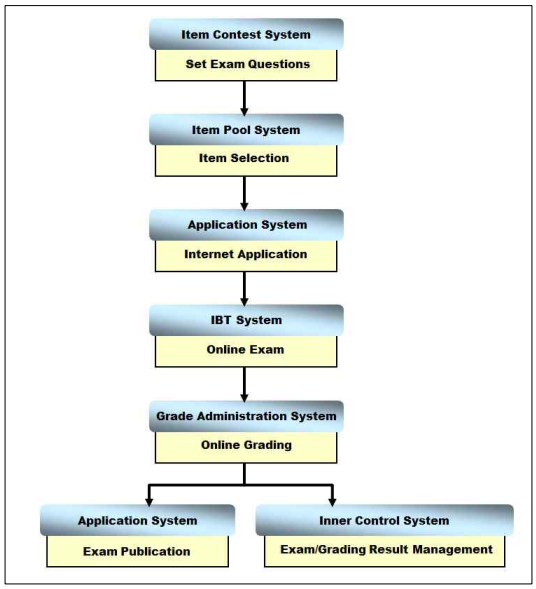

Fig. 2. The Entire Process Schematic

1. Example of Korean Style IBT System

National Language Ability Test using Korean version of IBT is composed of 5 kinds of test areas of multiple choice questions, hearing, reading, speaking and writing and user questionnaire survey to be completed after the test. when multiple choice test is finished, answers are automatically saved and compiled and therefore separate saving or transmission of answers is not necessary. Figure 3 shows the sample screen for hearing test, figure 4 is that for reading test, figure 5 is for speaking test and figure 6 is for writing test.

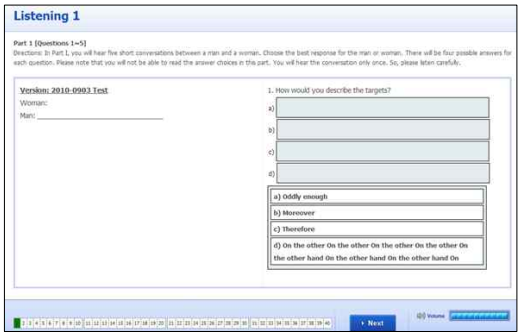

Fig. 3. Listening Comprehension Test

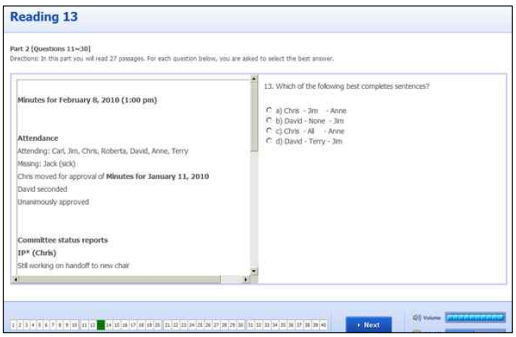

Fig. 4. Reading Comprehension Test

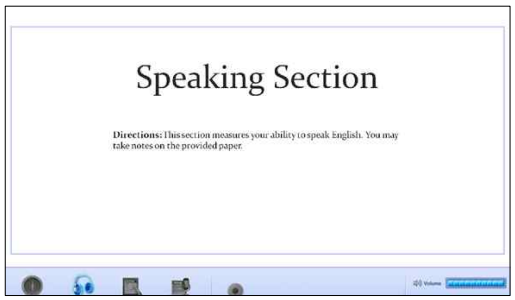

Fig. 5. Speaking Section Test

Fig. 6. Writing Section Test

Fig. 7. Writing Section Test

Figure 7 is the screen to confirm the contents of the applicable question by pressing "View XML" button after the creation of respective questions. When an area is selected from the upper combo box, the details of the applicable area will be shown. When Play, View Question Item, View Details or View all XML button after selecting an applicable area, respective function can be executed. When clicking Play button, applicable voice file is executed, and the details of applicable question item appears in the form for testing when clicking View Question Item while the details of applicable question item is fully shown when clicking View Details button. When clicking View all XML button, the details of XML which creates the applicable question item is shown as in the figure 8.

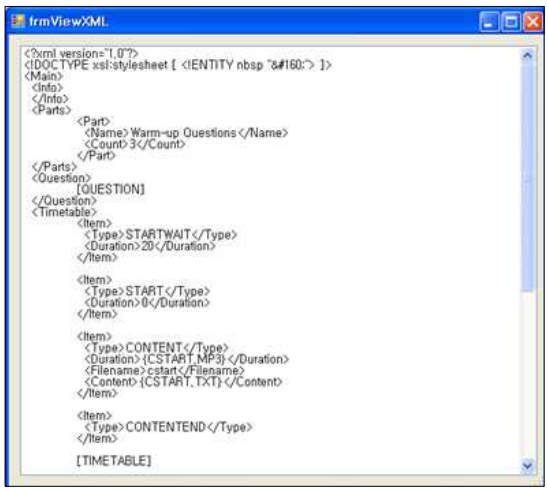

Fig. 8. XML Source for Selected Problem

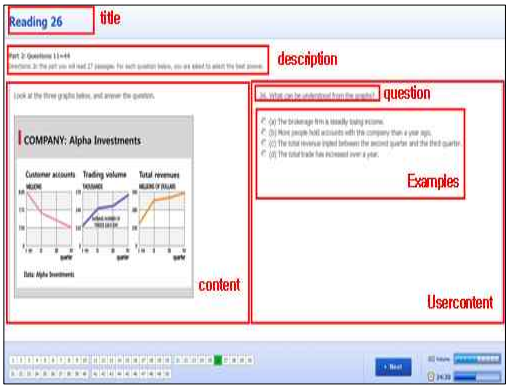

Fig. 9. Main Six Parts of XML Source for Selected Problem

The details which appear on the screen will exist on XML data using the names given on the right side of 6 boxes indicated on figure 9. In the case of right area, when the question is for user definition, two items of question and examples are not used and only usercontent item will be used instead. In the case of inserting flash mbile Image, <object> tag can be used as shown below.

<OBJECT classid="clsid:D27CDB6E-AE6D-11cf-96B8-44 4553540000" codebase="http://fpdownload.macromedia.co m/pub/shockwave/cabs/flash/swflash.cab#version=8,0,0,0" WIDTH=606 HEIGHT=456>
<PARAM NAME=movie VALUE="question/movie_2.swf">
<PARAM NAME=quality VALUE=high>
<PARAM NAME=menu value=false>
<PARAM NAME=allowScriptAccess value=always>
</OBJECT>

The proposed system will be applied to national language ability test system which has been conducted since 2012.

2. Test Results of Korean Style IBT System

For the language qualification Test using Korean version of IBT which is in the process of development, Beta tests were performed two times and actual system will be operated after going through the Beta tests for total four times. Two Beta tests which were performed up to now were carried out for total target of approximately 3,000 examinees using the method of testing 50 examinees per a middle server. The Beta tests were carried out particularly focusing on the functional test of middle server which was adopted as an alternative for the loss of test answers and records incidentally occurred pursuant to the phenomena of heavy system load and network down which were the biggest problems of existing IBT System. From approximately 80% test places which carries out two Beta tests, the functions for saving the test answers and records to middle server every 1 minute and then transmission to main server were normally processed without any problem. Minimum level of problems related to test answers and records status were occurred from approximately 20% of test places depending on the environments of middle servers. Most of the problems were due to the environment variables of middle server and current Korean version of IBT System added diversified and comprehensive checking method to rectify the problem.

Table 1. Test Result of Middle Server for the Saving of Test Answers and Records Status

Number of times	Test places	Middle Servers	Number of Applicants	Success rate
1	41	41	2,000	78%
2	62	62	3,000	82%

V. Conclusions

The proposed system's technological factors using middle server have been tested through a basic simulation pilot system. Actual development procedure starts from the analysis required by improving the shortcomings of existing internet-based test systems. A efficiency comparison with existing system and newly developed system was made in the area of number of operators, abnormal processing, system maintenances.

Korean style language proficiency IBT system is integrated and improved with a variety of CBTs, local and international, and turned out to be practical as it was primarily focused on networking stability and reinforced by data processing and storing approaches using middle server. It was verified that possible technical failures could be feasibly prevented and protected during IBTs. Korean style IBT system was effectively applicable to national language

proficiency tests provided in real time and would be further updated with additional specific functions.

Technical problems and errors from system overloading were corrected by Korean local technical expert and Korean style language proficiency IBT system was born with local independent technology and would extensively be available for worldwide English proficiency tests.

References

[1] Yong Jin Kim, "Research of web design management regarding to web accessibility," Design Management, SungKyunKwan University, 2010.

[2] Jeong Min Seo, Mun Hyung Man, Park Chang Seon, Hwang Jung Hwan, Kim Byung-ju, "An Study of Life-log Analysis and Risk Detection System For Disabled Person Used by Mobile Sensor Networks," Journal of The Korea Society of Computer and Information, Vol. 18, No. 2, pp. 311-314, Jul. 2010.

[3] Su Jin Kim, "A Study for Selecting Web Accessibility Evaluation Tool in Suitable of Homepage Characteristics," Computer Science Incheon University, 2010.

[4] Young Hyun Chang, "Design and Implementation of a Large Scale Qualification Management System for Performance Improvement Through the Use of a WCBT(Web and Computer based Test),"Journal of The Korea Society of Computer and Information, Vol. 13, No. 2, pp. 67-78, Mar. 2008

[5] Young Hyun Chang, Jeong Man Seo, "Development of Natio nal Qualification Management System for Performance Improvement based on Real-Time Data Sharing," Journal of The Korea Society of Computer and Information, Vol. 13, No. 4, pp. 214-220, Jul. 2008.

[6] Jong Youl Park, "Design and Implementation of Application system for Mobile Internet," Computer Science Dongguk University, 2001.

[7] Shin Seong Yoon, Rhee Yang Won, Pyo Seong Bae, "Real-Time Evaluation System for Acquisition of A Computer Certificate of Qualification," Journal of The Korea Society of Computer and Information, Vol. 14, No. 1, pp. 221-228, Jun. 2006.

[8] JayKwang Yun, JinHyun Tak, YongTae Baek, SeHoon Lee, "Web Site Building System Using Templet," Journal of The Korea Society of Computer and Information, Vol. 15, No. 1, pp. 83-87, Jun. 2010.

[9] Young Hyun Chang, Dae Woo Park, "Design and Implementation of National English Ability Test System using Korean Style Internet Based Test", Korea Institute of Maritime Information and Communication Science, Vol. 4 No. 1, pp. 24-26, June. 2011

About the Author

Young-Hyun Chang (장 영 현)

1985 : The BA degree in computer science from the INHA University

1985 : Director of INHA Computer System

1987 : The M.S. degree in computer science from the INHA University

1987 : Senior Researcher of KOREA WAD(Westinghouse Automation Division) System

1991 : Professor of Baewha Women's University

2011: Doctor's course in Dept. of IT Application Technology, Hoseo Graduate School of Venture

Interests : System Program, Realtime Processing System, Automatic System, e-Business, Mobile Communication Security

Email : baewhaoa@paran.com

Dea-Woo Park (박 대 우)

1998 : The M.S. degree in computer science from the Soongsil University

2004 : The Ph.D. degree from the computer science department of the Soongsil University

2000 : The Head of Researcher and Developer Laboratories at Magiccastle co.

2004 : Adjunct Assistant Professor, Department of Information Security of Soongsil University Graduate School of Information Science

2006 : Senior Researcher of KISA

2007 : Adjunct Professor of IT Application Science Department at the Hoseo Graduate School of VENTURE

Interests : Hacking, Forensic, Information Security of computer and networks, Mobile Communication Security

Email : prof1@paran.com