A Web Based Multimedia Collaboration System with a Session and Error Management Agent running on Home Network Environment

Eung-Nam, Ko
Department of Information & Communication
Baekseok University
110 Anseo-Dong, Cheonan, ChungNam, Korea, 330-704
Korea

Abstract: - This paper describes WBMCS_HNE(a Web Based Multimedia Collaboration System with a Session and Error Management Agent running on Home Network Environment). WBMCS_HNE is a system that is capable of detecting and recovering software error based on distributed multimedia environment. DOORAE is a framework of supporting development on multimedia application for distributed multimedia environment. The purpose of this research is to increase a reliability by maintaining and recovering DOORAE' WebNote session automatically. We have given a detailed discussion of WBMCS_HNE, a suit of an error detection recovery system that ensures the QoS of continuous WebNote applications. There are several constraints which must be satisfied to provide QoS guarantees running on web based multimedia distance education environment. They are time, space, device, frequency, reliability constraints and so on. In this paper, we have discussed a method for enhancing reliability through a fault tolerance system. Fault tolerance system can be classified as software techniques, hardware techniques and composite techniques.

Key-Words: - WBMCS_HNE, Home Network Environment , distributed multimedia environment, reliability, an error detection-recovery system, fault tolerance system.

1 Introduction

A home network interconnects electronic products and systems, enabling remote access to and control of those products, systems and any available content such as audio, video, or data[1]. The multimedia distance education is concentrated an interest about new education methods by join an education engineering and an information communication technology. Internet today represents a potentially effective platform for distance education , since it offers tools that may help the educational process in any of the related tasks, from the definition of curricular to the collection of educational material , from the delivery of this material to the interaction among the involved actors[2]. A general web-based distance system uses video data and audio data to provide synchronize between teacher and student. Even though there have been a number of research efforts on collaborative systems in recent years, study on fault-tolerant of web-based application software has not actually been enough. This paper describes an WBMCS_HNE. It is a fault-tolerance system running on multimedia collaboration works with an URL(Uniform Resource Location) and error synchronization function. The system for multimedia collaboration works includes several features such as audio, video, whiteboard, etc, running on internet environment which is able to share HTML format. It detects an error by polling techniques and GetExitCodeprocess() API function. After it, WBMCS_HNE delivers such snatched error events to its own application program and then receives and sends results to WBMCS_HNE. In this paper, we discuss a method for increasing reliability through an error detection-recovery system. The rest of this paper is organized as follows. Section 2 describes related works. Section 3 discusses our approach to URL synchronization and an error detection recovery system. Section 4 describes simulation results. Section 5 provides some conclusion.

2 Related Works

To analyze the performance of multimedia service systems, which have unreliable resources, and to estimate the capacity requirement of the systems, developed a capacity model using an open queueing network[9,11]. In[10,11], analyze the behavior of a heterogeneous finite-source system with a single

server. As applications of this model, some problems in the field of telecommunications and reliability theory are treated. As shown in Table 1, you can see the characteristic function of each system function for multimedia collaboration system[3-6]. Basically, there are two architectures to implement such collaborative applications; the centralized architecture and replicated architecture, which are in the opposite side of performance spectrum. Because the centralized architecture has to transmit huge amount of view traffic over network medium, its performance is reduced to contaminate the benefits of its simple architecture to share a copy of conventional application program. On the other hand, the replicated architecture guarantees better performance in virtue of its reduced communication costs. However, because the replicated architecture is based on the replication of a copy of application program, it is not suit to use for application sharing realization.

Table 1 Comparison of conventional multimedia collaboration system

Functior	Sha-Stra	MER-MAID	MM-conf	CE-CED
OS	UNIX	UNIX	UNIX	UNIX
Develop ment Locatior	Purdue Univ. USA	NEC, JAPAN	Cam-Bridge USA	SRI, Inter-national
Develop ment year	1994	1990	1990	1993
Structur	Server /client	Server /client	Cent-ralized or Repli-cated	Repli-cated
protocol	TCP/IP	TCP/IP	TCP/IP	TCP/IP multicast

3 Our Approach

This paper describes WBMCS_HNE. It is a system that is suitable for detecting and synchronizing a software error rapidly occurring on home network environment for a web based multimedia collaboration environment by using software techniques. It is used to realize the application sharing.

3.1 Home Network Environment

As shown in Fig.1, the organization of WBMCS_HNE includes 4 layers. They consist of a communication layer, a system layer, a DOORAE agent layer and an application layer. As shown in Fig.2, a communication layer consists of home network environment. The communication network is being presently developed with UDP broadcasting in order to decrease communication rate and TCP/IP on the Ethernet and ATM. Additional packet form has been defined and expanded for realization of DOORAE's functions.

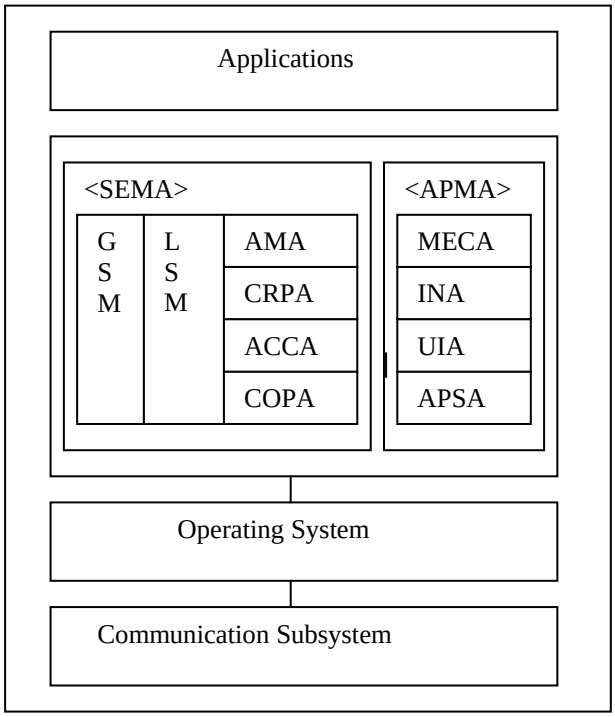

Fig.1 The organization of WBMCS_HNE

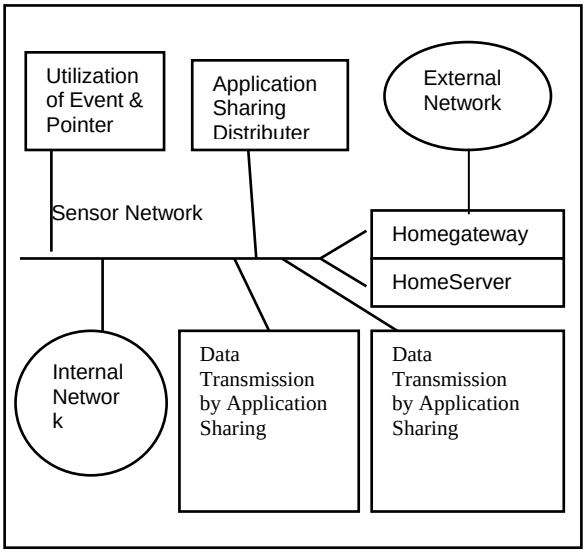

Fig.2 home Network Environment

The hardware environment of DOORAE consists of multimedia PCs, a network adapter, keyboard/mouse, image scanner, microphone, video camera, monitor, speaker, printer, video processor and accelerators. The operating system was first developed on windows 3.1 but presently windows 98, windows 2000, windows NT, and windows XP are supporting the development as well. The multimedia application layer includes general application software such as word processors, presentation tools and so on.

3.2 Web Based Multimedia Collaboration System

As shown in Fig.3, you can see the message flows in relationship between WBMCS_HNE and the application software.

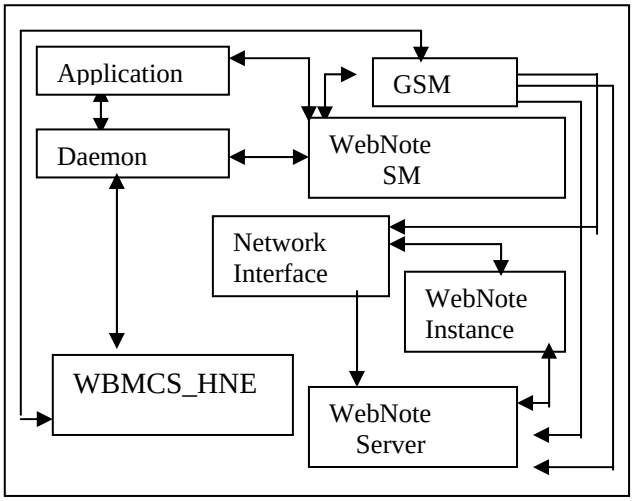

Fig.3 DOORAE agent layer

DOORAE agent layer consists of an WBMCS_HNE, GSM(Global Session Manager), Daemon, WebNote SM(Session Manager), WebNote Instance, and Network Interface. GSM, Daemon and WebNote Session Manager control the access to the whole session. This facilities video conferencing, distance learning, game and devlopment of any software. DOORAE manages several classes(lecture course) with GSM and WebNote SM. WebNote SM is a lecture class in cyberspace. GSM has the function of controlling whole session when a number of sessions are open simultaneously, and WebNote SM manages only own session. In other word, when a multiple WebNote SMs are established, GSM manages multiple WebNote SM. If a teacher request a teaching class, WebNote SM can create a class.

3.3 WBMCS_HNE

SEMA consist of GSM, LSM, AMA, CRPA, ACCA, and COPA. APMA consist of MECA, INA, UIA, and APSA.

3.3.1 SEMA

AMA is an agent that has functions of application management. CRPA is an agent that has functions of managing formation control of DOORAE communication protocol. ACCA is an agent that has functions of managing floor control and concurrency control. COPA is an agent that has functions of providing participants same view.

SEMA is a session management agent that controls and manages the whole session access. As is shown in Fig.4, nested SEMA have functions of media service provider control, the method to support multiple instance, nested session which is a side meeting to resolve same issue, and session recovery.

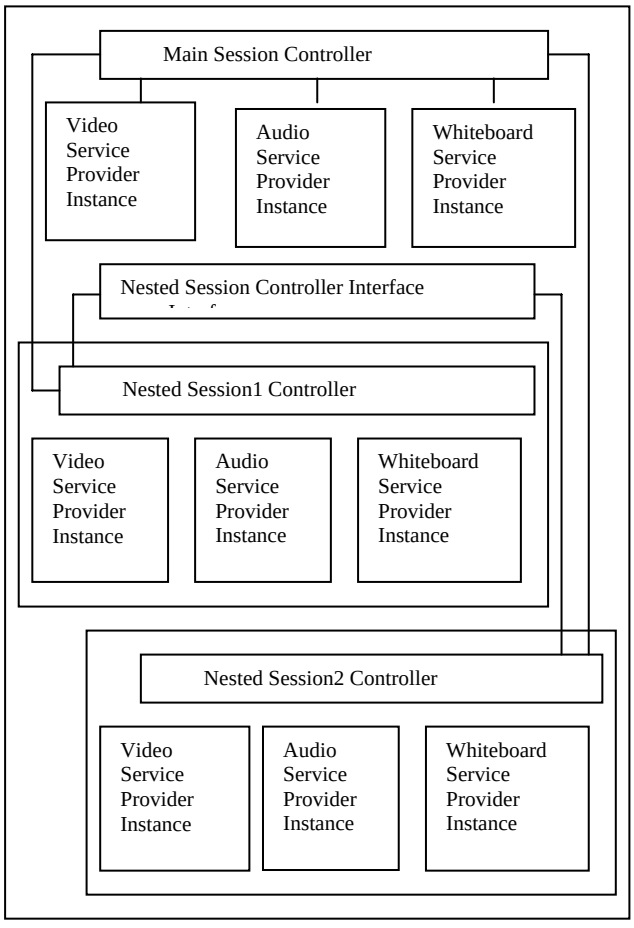

Fig.4 The Organization of Nested SEMA

DOORAE has distributed architecture so that initial session initiator becomes session manager, which

means that all the platforms connected DOORAE environment can be se- ssion initiator and/or session manager session control permits access to the session or restricts it. Also, SEMA supervises beginning and ending of each session, permits access to participants and visitors and controls and manages permission to open other session. This module, to control several lecture class at a time, is composed of LSM(Local Session Manager) and GSM(Global Session Manager). DOORAE supports simultaneous multi-session when more than one session is opened, GSM lets each session to run independently. Each LSM manages only its own session. To ensure each session's independent communication, GSM maintains session management table which manages LSM and prevents collisions between LSMs. One of functions of LSM is to admit late comer to the session and if on early student's withdrawing occurs, LSM automatically cuts off the student's communication system to reduce traffic within the network.

3.3.2 Error Synchronization

To ensure required reliability of multimedia communication systems, WBMCS_HNE consists of two steps error detection and error correction. You can see message flows in WBMCS_HNE. DOORAE consists of Daemon, WebNote Session Manager and WBMCS_HNE. The relationship among WBMCS_HNE, Daemon and WebNote Session Manager are as shown in Fig. 5 and Fig. 6.

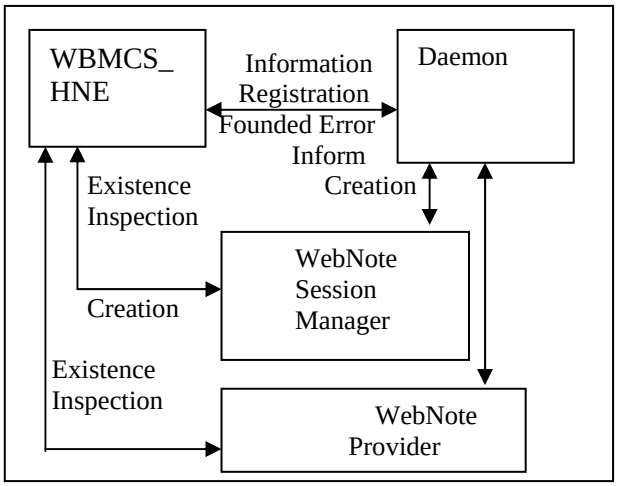

Fig.5 Relationship between WBMCS_HNE & Daemon

First, before an error is to be detected and recoverable, you must create sequences below. This system creates a session with initial configuration information. It requests port ids for audio, video and WebNote servers to build up a WebNote Local Session Manager. It assigns port ids for audio, video and WebNote servers of an application. It invites to the session and build-up a WebNote Session Instance Monitor. It sends invited messages to start build-up of WebNote Session Instance Monitor. It builds up Session Instance Monitor using the configuration information from WebNote LSM. It sends joint message to the WebNote Local Session Manager. It sends session information to Global Session Manager for set-up of GSM Table.

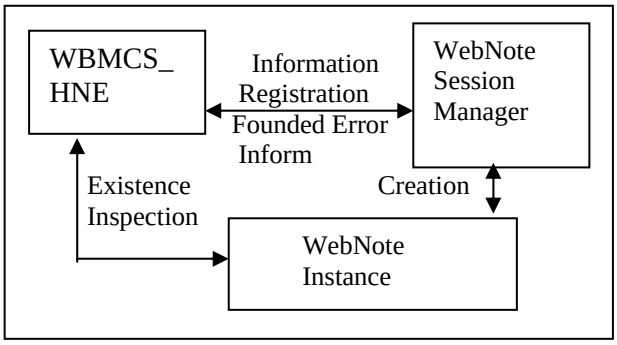

Fig.6 Relationship between WBMCS_HNE & WebNote Session Manager

It begins a session. It exchanges message or command between WebNote LSM and PSM and media data between media or WebNote server based on interpretation of message handler. After it, you can create WebNote Session Manager. Second, you must run WBMCS_HNE. Third, you must register information of creation of service handle and WebNote Session Manager handle by Daemon. Forth, you must register Information to on WebNote Session Manager of creation of instance handle and application handle by WebNote Session Manager. Fifth, You must WBMCS_HNE can receive registration information from Daemon or WebNote Session Manager. This method detects error by using polling and GetExitCodeProcess() function when events occur with relation to DOORAE's WebNote session. Daemon provides WBMCS_HNE for an information on application to be necessary for session's process and instance of WebNote Service Provider. It informs the detection of error in the process to Daemon to create the watched object.

4 Simulation Results

To evaluate the performance of the proposed system, an error detection method was used to compare the performance of the proposed model with it of the conventional model by using DEVS formalism. In DEVS, a system has a time base, inputs, states, outputs based on the current states and inputs. DEVS(Discrete Event System Specification) is a formalism of being developed by Bernard P. Zeigler[7,8].

Table 2 Analysis of conventional multimedia distance system

Function	Sha-Stra	MER-MAID	MM-conf	CE-CED
OS	UNIX	UNIX	UNIX	UNIX
Development Location	Purdue Univ. USA	NEC, JAPAN	Cam-Bridge USA	SRI, Inter-national
Development year	1994	1990	1990	1993
Structure	Server /client	Server /client	Cent-ralized or Repli-cated	Repli-cated
protocol	TCP/IP	TCP/IP	TCP/IP	TCP/IP multicast
Concu-rrency control	No	No	No	No
Applica-tion sharing	No	No	No	No
Error control	No	No	No	No

Before this system analysis, the variable that is used in this system is as follows. The letter Poll-int stands for "polling interval". The letter App_cnt stands for "The number of application program with relation to DOORAE'session". The letter App_cnt2 stands for "The number of application program without relation to DOORAE'session". The letter Sm_t_a stands for " The accumulated time to register information in SM". We can observe the following. The error detected time interval is as follows.

Conventional method:

$$Poll\_int*(App\_cnt + App\_cnt2)$$

Proposed method:

$$Poll\_int*(App\_cnt) + Sm\_t\_a$$

Therefore, in case of App-cnt2 >App-cnt ,

$$Poll\_int*(App\_cnt + App\_cnt2) > Poll\_int*(App\_cnt) + Sm\_t\_a$$

That is, proposed method is more efficient than conventional method in error detected method in case of App-cnt2 > App-cnt. We have compared the performance of the proposed method with conventional method. This method detects an error by using GetExitCodeProcess() function when events occur with relation to DOORAE's session.error rapidly occurring on web based multimedia collaboration environment by using software techniques. It is used to realize the application sharing.

5 Conclusion

This paper is proposed a fault-tolerance system running on home network environment for a web based multimedia diatance education system with an URL and error synchronization function. The system for web based multimedia distance education includes several features such as audio, video, whiteboard, etc, running on internet environment which is able to share HTML format. It detects an error by polling techniques and GetExitCodeprocess() API function. After it, this system delivers such a snatched error events to its own application program and then receives and sends results to WBMCS_HNE. In this paper, we discuss a method for increasing reliability through an error detection-recovery system. They are time, space, device, frequency, reliability constraints and so on. In this paper, we have discussed a method for enhancing reliability through a fault tolerance system. Fault tolerance system can be classified as software techniques, hardware techniques and composite techniques. This paper proposed a method on the application QoS parameter through reliability enhancement. Our future work includes extending a network, a system, a user QoS and so on

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