Design of Suitable Meeting Management Model for WebELS Meeting to Meet the Business Situations

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Abstract—**This paper proposes a meeting management system for controlling member groups and contents in the WebELS Meeting system to meet suitable meeting controls at reasonable cost in business situations. The system is divided into two parts: the system management and the conference streaming management. This feature has been required for the system in implementing software as a service (SaaS) concept. The main concept of the system is group-based management of members and contents. We designed a new simple group-based structure for easier management. Each group holds two password types: manager password and guest password. The group manager can manage the contents on their group. The system can limit number of content and concurrent access in each group. Moreover, the system can control the behavior of logging-in members. We proposed the auto-reconnection network for booting up the performance of web-based online conference system to be used in the unreliable network environment. This system can help the administrator for managing and controlling the member groups and contents in the meeting system. Furthermore, our solution helps the participants who use the unreliable network by preserving the quality of online conference operation for the best distant meeting. This system increases efficiency and performance especially in operating WebELS Meeting as SaaS.**

Keywords- meeting management tool; simple group-based concept; business meeting; auto-reconnection; WebELS Meeting;

I. INTRODUCTION

As the Internet-based communication is rapidly growing, many kinds of online Internet applications have been developed to support new lifestyles, e.g., social networking, online businesses and so on. Online video meeting or conference technology becomes popular because it can help in organizing a meeting comfortably via the Internet. This technology is used to link members to join from any place to meet in a virtual room. Online video meeting usage is now wide-scale in many major areas, i.e., distant e-Learning [1], organizational business situation [2], tele-medical cares [3][4] and etc. This highly-technological change in business communication can reduce operational administrative costs and can make stronger business competition [2]. Currently, several video meeting systems and products are available in business sector. There are many well-known online conference systems, such as Skype [5], Polycom [6], Cisco WebEx meeting [7], Microsoft Live meeting [8], and Pc Video Conference [9]. Each system has different features and infrastructures. Most products have been integrated with useful services for supporting meeting processes, e.g., chat messaging, file sharing and so on.

Skype is the first to make Voice-over IP (VoIP) a massively popular tool [5][10]. It is a form of peer-to-peer network. A user who logged in can locate other users on the Skype and take part in audio or video call across the Internet. The benefit of Skype is the free connection to other Skype users. Furthermore, Skype's sound quality keeps the high and low tones of sound, whereas telephones and other VoIP software/hardware clip out those parts of speech. However, while it may be desirable to prevent telephone conversations being tapped, users and computer must be able to protect themselves. Polycom is a popular TV conference system that is used for real-time distant video communication [6]. It is a complete conference solution, however it requires special and expensive proprietary devices and technologies. It needs specially designed telecommunication infrastructures, cameras, and related devices. Cisco WebEx meeting, Microsoft Live meeting and Pc Video Conference are similar systems and technologies that propose for computer-based meeting via Internet [7][8][9]. Cisco WebEx meeting and Pc Video Conference support the cross platform environment. However, Microsoft Live meeting only supports cross platform in web access system. All of these systems can use the general computer with attached web camera and microphone units.

On the other side, there are some open-source web-based conference systems, e.g., OpenMeeting [11], BigBlueButton [12], which can be used for real-time meeting. The problem in the business point of view on these systems is the privacy of contents. In business meeting point of view, security and privacy of meeting contents and user information are very important. Furthermore, online meeting system should have an easy-to-use user interface and configuration that meets the technical abilities of non-IT users. Generally, most open-source web-based conference systems do not meet the necessary requirements in business meeting situations. In addition, most of the systems have limitation such that it requires high bandwidth network for providing better output quality in online meeting operations. Moreover, it also
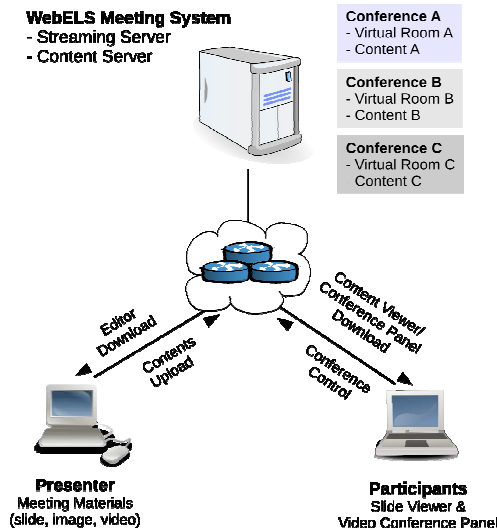
Figure 1.   WebELS Meeting System Diagram

Figure 2.   Example of using slide presentation and video conference

requires intricate proxy or firewall setting to access the system, so usability conditions are limited.

WebELS Meeting is one of the video conference applications that congregate several functions for supporting online meeting activities. The benefits of this system are: (1) online cursor synchronization that requires less bandwidth of network compared with the other online meeting systems, and (2) the online video conference of the system overcomes the network environment that defines strict firewall policy. The video stream can access through the firewall rules because it uses the general web protocols [13]. Since these features were appended in the WebELS Meeting, the usefulness and performance of the system has improved and its usage is now wide-scale that has eventually opened the opportunity for the business sector.

Several issues were discussed and considered in the business point of view to make an online video conference product that is credible and suitable for business companies [14] i.e., management functions, security issues, privacy of content, etc. Both privacy and security of content are important issues for business communication, since content is an asset of the person who has created the content. For content privacy, each member of the group can only access their own group's content. For content security, the system should have functions for protecting the content. i.e., data encryption, system firewall and etc [15]. The auto-reconnection is also required for improved system performance. The system should automatically connect the video meeting when disconnected from the network [16]. Several video conference systems do not have the function for managing this situation. Participants who lost the network connection manually re-connect the system by themselves. It makes uncomfortable usage for the members. Sometimes the unusual attendees occur during meeting. Therefore, the system should have some function to break the usage from the unusual attendee. i.e., pause any actions or eject that attendee out of the meeting.
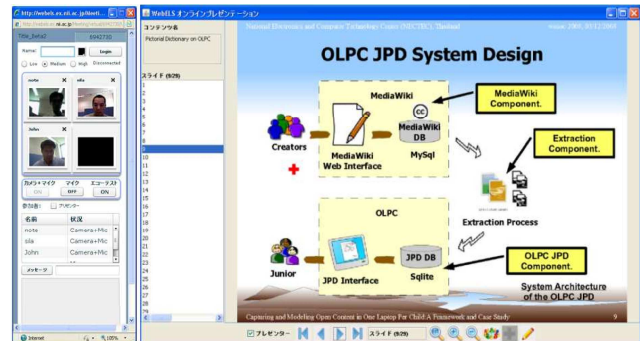
To make more profit for the business companies, any cost of resources should be reduced. According to Gartner's survey [17], trend of business services moves to use Software as a Service (SaaS) model. SaaS is an emerging business model that delivers software applications to users through Web-based technology. Adopting SaaS applications allow companies to save their information technology cost, save time for deploying the system, addressing security concerns of customers and meeting service level agreements [18][19].

In this paper, we developed a suitable meeting management function for the WebELS Meeting system used in the business sector. We propose the management tools for controlling the member groups and contents. We also propose a method for using the video meeting in the unstable network environment. In addition, the system is developed based on the SaaS system for allowing small companies to minimize their operational cost.

II.   WEBELS MEETING OVERVIEW

WebELS Meeting is designed based on online meeting via Internet-based technology for supporting a content-centered E-Learning Platform in Postgraduate Education [20][21]. To support the online meeting activities, several useful functions were integrated into the WebELS Meeting system such as content-authoring, online presentation, video conference and so on. This system involves fusion of synchronous features with powerful authoring tools for Internet meeting [22]. WebELS Meeting is designed as an administrator free system for authoring tool, slide presentation tool and video meeting window. Every logged-in user has the same right. By clicking the presenter button a user can obtain the presenter right who can change slides, point a cursor, annotate drawings, zoom and scroll slides and so on. It also has an easy-to-use interface for non-IT users. Users can edit their own meeting contents on their personal computer and share to the meeting participants. Some main features are listed as follows:

- Web-based usage: Easy to use and no need to install special programs. It can be used by any web browser application.
- Real-time meeting: Simulates the virtual meeting room. Anytime, anywhere and anybody concept to support a variety of usage.
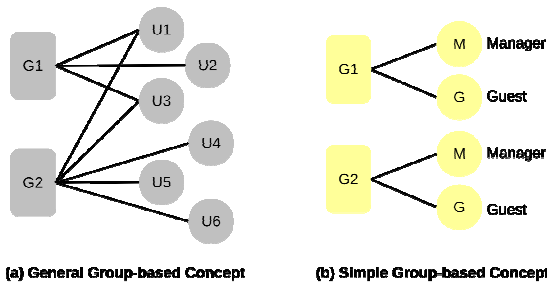
Figure 3.   Comparison of general group-based and simple group-based concept

- Synchronous and Asynchronous: Supports slide synchronized with video and audio while used in online Internet.
- Cross platform solution: Operates on Windows, Macintosh and Linux at the same quality.

WebELS Meeting authoring and presentation tool are Java-based server systems. It functions even in a low-speed Internet environment [23], because the contents are pre-downloaded onto every participant computers and only control signals and data are synchronize to the server and updates by itself. Since WebELS Meeting uses HTTP protocol for online presentation and RTMP protocol over port number 443 for video conference, WebELS Meeting can be used under strong firewall setting rules. Fig. 1 shows the system diagram of the WebELS Meeting. The basic design of WebELS Meeting was proposed for content-based meeting. Each content has its own virtual room that can be used for meeting management. Any users who are accessing to the same content can share the online presentation and join the online video conference at the same time. Fig. 2 shows an example using that collaborate between live presentation function and live video meeting function.

III.   METHODOLOGY AND SYSTEM DESIGN

In this paper, we proposed an approach in designing the business WebELS Meeting system to support business applications. We added the management tools for controlling the user groups and contents to achieve suitable security management functions while keeping easy-to-use concepts onto a standard WebELS Meeting. Using shared single server system, small companies can share the system at lower costs with suitable security management safe guards. Each user group can manage separate secure online business meeting concurrently. We also invented a network connection handle function for the online video meeting to utilize in the unreliable network situation. The details are explained in the following sections.

A.   Simple Group-based Concept

The group-based management concept is reasonable and popular for managing e-Meeting systems because it is easy to control multiple users in one time. One group consists of several users and one user can become a member of several groups too. Fig. 3 (a) shows a general group-based concept. From the business requirement, a disadvantage of this concept is very time-consuming while the administrator adds
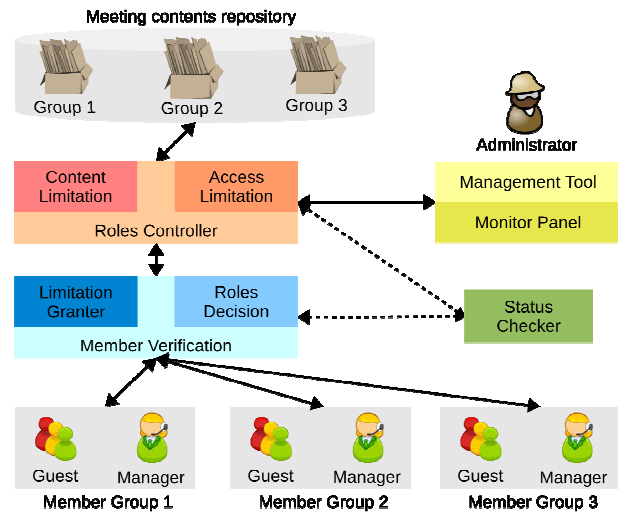

Figure 4.   System architecture of system management for the business meeting

new members. It is better to use the same user name in each group for accessing contents. Therefore, we designed a new simple group-based concept that is easier to manage than a general group-based concept. Fig. 3 (b) shows a simple group-based concept to manage security of contents for the business sector. Each group consists of two members, i.e., manager member and guest member. Also members in each group cannot become a member of other groups.

B.   System Architecture

In response to the business meeting requirements, we have designed and implemented a new managing structure to override the existing structure while keeping the same technologies for future development, i.e., the old structure of the system is being preserved. We divided the system into two main parts, .e.g., system management and conference streaming management parts.

1)   System Management Part

The concept of the system is based on our simple user-group control. The users in the system consist of member groups and administrator. The administrator can manage the member groups and system, but he/she cannot create and edit contents. For the member groups, each group hold two passwords i.e., (1) password for group manager, and (2) password for guest of the group. The group manager can manage the contents in own group and also monitor member group activities. Contents in each group cannot be accessed by members of other group which is an important policy in the business situation. Fig. 4 shows the system design of functional structure for supporting the business sector. In the design, we separated the system into 3 modules, i.e., (1) Member Verification, (2) Roles Controller and (3) Administrative modules. The details of modules are described as follows:

a)   Member Verification Module

Member Verification module is used to identify the member and separate the member role. Since the system has two passwords for one group, we use the group name the

Figure 5. Example structure of user and group data

same as the user login name and use two records of user table to keep the user data and group role as shown in Fig. 5. To strengthen the security technique, every user password is encrypted into two steps. First, the plain text password is encoded by WebELS key-code. Second, the password is encrypted again by MD5 [24].

This module consists of two main sections for this module, i.e., Role Decision and Limitation Grantor sections.

Role Decision: Since the group role is dependent on the user login name and user password, this section matches both user login name and user password. The system uses the user class where the record is specific for the group role. This value is feed to the Role Controller module subsequently.

Limitation Grantor: This section is introduced for checking the special member properties. The block property is utilized to allow or deny the usage of members in the system. While a member group is blocked, every member cannot access the system even if the contents of this group have existed in the system. When a member group is unblocked, every member can use the system to carry on the existing contents of the group. Not only block property is available but also the expiry time is utilized for controlling the usage limitation time of the system for each group, in the case of free trial service for customers.

b) Roll Controller Module

Role Controller module consists of two main sections, i.e., Content Limitation and Access Limitation sections.

Content Limitation: This section is utilized for limiting the number of contents in each group. While the group manager creates a new content, the system checks the number of existing contents of their group and compared with the limitation value of that group. In case the number of existing contents equal or more than the limitation value, the permission for creating and any authoring tools will be denied.

Access Limitation: This section is generated for limiting the number of users who access to the system at the same time in each group (concurrent access). We defined the user status if login succeeds and the status will be cleared after the logout. The system uses that status for counting the number of accessing users. For the logout status, it is complicated for implementing because we could not control any users for logging-out from the system in a proper method, e.g., when someone who has logged-in to the system has accidentally shutdown their computer, or someone closes the browser without logging out from the system, etc. Therefore, the user status is not cleared, and the number of logging-in users is incorrect, too. We solved this problem by creating a system checker [25] that runs in the background mode for clearing the user status automatically.
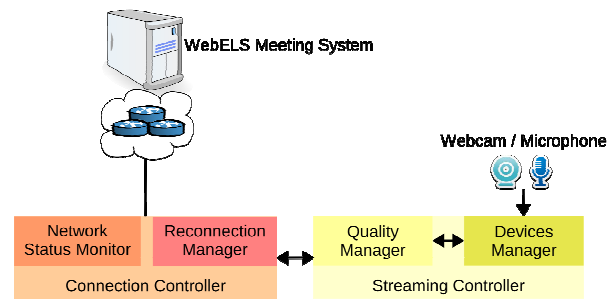

Figure 6. System architecture of streaming management for the business meeting.

c) Administrative Tool

The Administrative tool, a feature for the administrator user, is used to manage and control the system.

Management Tool: This tool is used for adding, editing and deleting group members and group roles information. For security reason, this tool cannot manage the contents in each group. When deleting a group member, this tool removes all contents of deleted group from the system, i.e., database, virtual room and data in physical storage.

Unusual Member Controller: This section is used to manage meeting participants while the meeting is running. There are two actions, i.e., break any actions and eject (kick-off) from the meeting. The participant who become an administrator of meeting can use those functions to control an unusual participant who has a behavior to disturbed other participants during meeting.

Monitoring Panels: We designed the monitoring panels for helping the administrator and group manager to monitor their system. This tool is important instrument for checking-up the system information. It is separated into two kinds, i.e., (1) System Monitor Panel is purposely for the administrator. This panel is used for monitoring the overall information of the system, such as, Number of contents, Number of users, Content size, etc, and (2) Group Monitor Panel is used by group managers. The group manager can track the activities of each user in their group, such as, Number of logged-in user, active and action content of each user, etc.

2) Meeting Streaming Management Part

This part is used in the client node for connecting to the virtual room of online meeting system. The system is automatically downloaded and run on the client computer via web browser when the members access to the conference web page. Fig. 4 shows the design structure on client side. The system consists of two modules as follows;

a) Connection Control Module

Connection Controller module is used to manage and control the network connection of the client nodes. There are two functions included in this module as follows;

Network Status Monitor: This section is used for monitoring the network connection status while the meeting session is ongoing. After the member logged-in to the system, this function is always check the network connection between server and client nodes. When losing connection, the reconnection manager function is triggered for handling the connection.

Reconnection Manager: This section is used to keep the network connection and waits for the new connection status. When the connection signal appears again, then login process is automatically done by using the latest meeting information.

b) Streaming Controller Modules

Streaming Controller module is used to control the streaming input of the client node including two functions.

Device Manager: This section is used to manage the basic input devices, such as microphone and web camera (or video camera). It is used for controlling the state of input devices such as setting the devices connect/disconnect or on/off. It also chooses proper features refer to the input devices of the client node.

Quality Controller: This section is used for controlling the quality of streaming data from the input devices. Several parameters are used for configuring the conference streaming data, i.e., video size, video scale, voice gain, voice silence level and etc.

IV. DISCUSSION

The new features in the business meeting system were designed based on functional standard WebELS Meeting version. Several features were developed to support the business roles to meet the requirements from the business sector while important features of standard version are preserved. The administrative tool was developed for managing and controlling the group members. The role controller was applied for group-based control. We have evaluated the system by comparing the new system with the standard system and other business conference systems. Table I shows the overview comparison of meeting systems. There are contrasts in the objective and usage of all systems. The standard WebELS Meeting was mainly designed for supporting the higher education while the other systems were mainly designed to be used in the business sector. Our new system has distinctiveness, by introducing the simple group-based for managing and controlling the contents and system.

Only our new system has special functions -- contents limitation, concurrent access limitation and system limitation is managed by simple group-based concept. We used the system checker for solving the incompletely logout problem and clearing the member status. The usage time limitation is one significant matter for restricting the free trial customers for the business approach. Furthermore, unusual member controller is integrated to be operated the logging-in participant who has a behavior to disturbed other participants during meeting operation. In the business sector, security of content is also important. Any content are protected and accessible by the group owner and members who have been granted permission only by the owner. Even an administrator of the system cannot manage the contents in member groups. Moreover, usage time limitation is one significant matter for restricting the free trial customers. That function meets the reasonable security in business situations. This is a benefit for merging the meeting system with SaaS in the business model.

TABLE I.   SYSTEM OVERVIEW OF MEETING SYSTEMS

Criteria	A	B	C	D
Objective	Support the e-Learning	Support the business sector		
Target group	Higher education	Company / Organization		
Distribute	Open-source	Proprietary		
Concept	Content-base	Group-base		
Privacy of content	Open	By group	Depend on publisher	
System Limitation	Unlimited	By group	By product	

Note: A = Standard WebELS Meeting, B = Business WebELS Meeting, C = Cisco WebEx Meeting, D = Microsoft Live Meeting
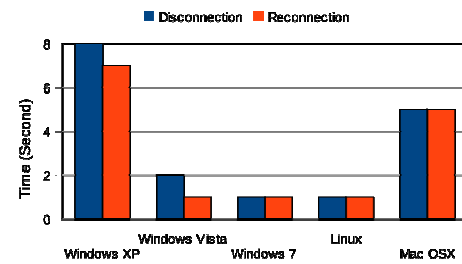

Figure 7.   Comparison disconnection and reconnection time of each OS

Figure 8.   Distant meeting of e-CC Seminar using the new WebELS meeting for business model system.

Not only the system management part but also conference streaming management was invented. The system has a feature to support meeting connection and quality while using the system in the unreliable network environment. Auto-reconnection is the convenient function for participant who lost the network connection during meeting operation. The system can keep the meeting session and automatic operation with the reconnection technique when network connection is restored. This feature is tested on many OS environments such as Windows, Linux and Mac OSX. In the evaluation, we focus on the effect in two events, such as (1) a disconnection time range after losing the network connection and (2) a reconnection time range while network status is appearing. Fig. 7 shows the approximate automatic reconnection time. This feature can work in all OS but the time range for automatic reconnection process differs and that it depends on the network connection probing of each OS.

This system was proven by several usages from companies and communities, such as, Kyosei Systems Inc – Japan, etc. Every feature worked well within the business situations. The system can limit the number of contents and number of concurrent user access in case of content limitation or access limitation was defined. The system can provide as a TV conferencing system, like Polycom system, with high-quality video and audio streaming service. The system can be easily used anywhere and anytime without firewall and proxy settings. Participants can attend the meeting by using their personal computer or laptop that is connected to the Internet.

V. CONCLUSION

In this paper, we proposed the suitable meeting management tool for the WebELS Meeting module to meet the requirements of the business sector. The main function of the management tool is to be utilized for controlling user members and contents using simple group-based control concept. The administrator could manage the whole system. The group manager could manage the contents and also monitor activities of each user in their group. Member Verification and Role Controller methods were described using our techniques for controlling users and contents. Our management tool helps the administrator manage the system easily. We also developed network connection handler for online conference system when used in the unreliable network environment. To preserve the meeting operation, the system can keep the meeting session in operation with the reconnection technique when network disconnection occurs intermittently. Moreover, we implemented the WebELS Meeting system as a SaaS concept to minimize IT investment costs of business companies. The usefulness and performance of the system have been proven by practical uses of the business companies and community sectors. This system increases the efficiency and performance of the WebELS Meeting module in business sector.

ACKNOWLEDGMENT

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