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An Interactive User Participation System Using Bidirectional Multimedia Technologies In Cloud Computing Environments

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Abstract**—** The aim of the project is to analyze the video communication system using IPTV in cloud environment. The demand for video applications continues to increase. In particular, watching live sports, watching clips online, making video calls, or videoconferencing are typical video applications that are daily used by millions . On the other hand, Internet Protocol (IP) technologies have been widely adopted on various network technologies, and their services have been also evolving to Internet-based applications. Additionally, various broadband access technologies such as fiber-to-the-home or Gigabit Ethernet make it easy to launch broad band multimedia streaming services. In this paper we propose new P-Module combined with bidirectional communication to achieve interactive user participation system in cloud computing environments in effective manner.

Index Terms - High-definition (HD) video, Internet Protocol television (IPTV), videoconferencing.

I. INTRODUCTION

Recently, smart TV (STV), which is a new digital television service, has been rapidly developing, particularly in South Korea. The STV is the integration of Internet into a television set or a set-top box (STB), in order to gain interactivity and to add advanced features to the traditional TV. A large number of global companies such as LG, Samsung Sony, Panasonic, etc., are adding a layer of improved web features to the traditional television viewing experience using web-connected applications that are specifically built for the TV in order to show the users' favorite digital content. For example, Google, together with Sony and Logitech, have announced new services for the STV that can be also controlled from a mobile phone running on the Android operating system. This kind of a TV solution offers new functionalities that were not present in old TV sets, such as e-mail, social networks, TV channels, web search, etc. These features make the STV a suitable device for a smart home environment in the context of digital entertainment. Recently, IP television(IPTV) has surfaced as a new killer application that can maximize the value of the convergence services.

AmigoTV is a well-developed IPTV system, which supports TPS in an integrated way. AmigoTV allows TV viewers to share opinions and feelings with friends via an interactive broadband link. AmigoTV provides not only the video multicasting service but also the presence service for the TV viewers and text/voice-based conversational services among the IPTV viewers. AmigoTV are simply integrated in the application level,it is difficult to support both the quality-of-service (QoS) control service and the multicast control service for the video multicasting in a dynamic way.

Due to the bulkiness of video, more stringent bandwidth demands, and high user expectation of the video quality, the degradation in video quality or interruption of the whole service is more tangible for HDVC. As a result, interruptions or low video quality is not acceptable. The main contributions of this paper are summarized as follows.

1) We developed the P-module for encoding 1080i high definition (HD) video data on a system simultaneously with community participation in cloud computing environments.

2) For community participation in cloud computing environments, we propose a user-participated interactive IPTV service, where the users can participate in broadcasting program by mixing their video and audio sources into the provider's content.

3) We propose a new protocol to provide bilateral Internet service that uses a connection via IP packets, sending images at a defined standard level and providing triple play service (TPS), including data streaming, which can be built on a cloud computing infrastructure.

4) We present an IPTV middleware system based on an additional compact computing module to resolve the question of poor compatibility, difficulty with different platforms, and an unfriendly user interface.

II. IPTV MIDDLEWARE, SIP, AND STB

A. IPTV Middleware

The middleware servers are the front end of the IPTV environment.All STBs communicate with the middleware server to request the specific content that they want. A browser within the STB will communicate with the middleware server, download the electronic program guide, and send requests to the middleware servers. The IPTV middleware acts as a broker between a number of systems and applications. More specifically, it interacts with the digital subscriber line access multiplexer (DSLAM), content servers, STBs, video on demand (VoD) and content streaming, and digital rights management server, as well as business applications among other systems. As with other software systems, each layer in the protocol stack on middleware servers communicates with the corresponding layer of the client on an STB, a PC, a smart phone, or other user devices.

In this paper, we focus on real-time video encoding and decoding of HD video data on a system for videoconferencing, which have developed based on MPEG2/4 video and audio coding, as well as the transport stream (TS) described by the MPEG-2 system standard. The system also provides for other

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video compression methods to be used, including JPEG and H.264 as the video and audio coding standard for supporting HDTV 1080i video for fixed TV sets and low-definition TV for mobile terminals.

The MPEG-2 and MPEG-4 video compression technologies are allowed to generate SD video streams of just 3.75 and 2 Mb/s, respectively, and HD video streams of 6–15 Mb/s. The development of corresponding codec chips and related software made PC-based multimedia processing possible so that various personal multimedia services, including user-created contents, are currently highly activated.

B. SIP

The SIP is a widely used session establishment and rendezvous protocol. Many existing systems have established mechanisms, such as authentication, charging, and QoS around SIP. The Real Time Streaming Protocol (RTSP) is a protocol for use in streaming media systems. The RTSP allows a client to remotely control streaming media server by issuing commands. The RTSP has a dual role: It establishes a media session for the delivery of streaming media and controls the streaming session once it has been set up. Since the SIP is also used for session establishment, there exists an overlap between the functionality provided by the SIP and the RTSP.

The RTSP is used to control the media streams that have been set up with the SIP. The Telecommunication and Internet converged Services and Protocols for Advanced Network (TISPAN) specifications allow for both full and partial support of the RTSP Request For Comments as part of the IPTV service. In the case of partial support of the RTSP, a light weight version of the RTSP without session setup semantics is used, whereas in the full-support scenario, a full RTSP with session setup semantics is used. In addition to TISPAN, the Third Generation Partnership Project (3GPP) and the Open IPTV Forum use the same model for using the SIP to establish an RTSP control channel.In our system, the TISPAN specifications were applied to our system for both full and partial support of the RTSP RFC as part of the IPTV service. In addition, SIP- based conversational services are integrated in the application level to support both the QoS control service and the multicast control service for the video multicasting in a dynamic way.

C. STB

The end point in the home network, to which user devices are connected, is a digital STB. An STB is usually installed with middleware client software to obtain the program guide data, decode MPEG-2 and MPEG-4 video data, and display on the screen. An STB can be also integrated with a DSL or cable modem or with an IEEE 802.11 switch for home Internet access networking.

Middleware is one of the key functions for IPTV services. By deploying scalable and modular IPTV middleware, a service provider can remotely control the usage of IPTV service and make it easy to integrate IPTV services into different platforms. Although middleware technologies are deployed in STBs sup- porting the IPTV, they cannot be deployed to mobile devices, which require lightweight middleware software. The scalable video coding (SVC) technology lets the system consider the network's terminal types and available bandwidth. Although SVC enables scalable representation of video content with high coding efficiency, it is difficult to perform real-time encoding because of the SVC encoders' complexity.

In this paper, we develop an interoperable STB, and a P-module provide a kind of plug-and-play STBs receiving IPTV service over IP and videoconferencing via universal-serial-bus communications device class (USB CDC).Video encoders in the P-module and VoD servers are the major sources of video content for IPTV services. The video encoder can encode real-time video analog signals or a live-event location to a digital format based on a given video compression technology, such as MPEG-2/4. A live video server encapsulates video streams with different formats that are received. The server also interfaces the core network and transmits the video signal over the core network toward the access network. A VoD server houses on-demand content with streaming engines and has a large storage capacity.

III. SYSTEM ARCHITECTURE

A. IPTV

We have implemented three different servers, which are a SIP proxy server, a media proxy server, and a conference mixing server. The SIP proxy server and the media proxy server deal with SIP connections and network address translation, respectively. The conference mixing server, including a signal controller and a mixer, transmits signal messages in the signal controller and video contents in the mixer controller. Initially, the signal controller checks for the authority of service controls in our IPTV system and establishes the connection using a SIP session, which has been set up in an initial step. The signal controller was developed to utilize the IP multimedia subsystem (IMS), which is proposed by the 3GPP. Most of the control signal is carried out using a standard SIP that has a compatibility feature with the IMS, next-generation networks, etc. Furthermore, the signal controller achieves the SIP functions for the IPTV service controls and connects the mixer server based on the internal control protocol. The controller's participation controlling features are opening/closing service sessions, adding/releasing other multimedia contents, and joining/releasing each participant, which are deployed in a cloud infrastructure.

The mixer aims to mix audio/video (A/V) streams for H.264 HDVC, specifically developed in the MPEG2/4 and H.264/AVC encoder. The mixer server decodes the received media streams and transcode the A/V streams into one stream. Finally, the Mixer server reencodes the decoded video into MPEG2/4 or H.264 video format. In both cases, these codecs are encapsulated in the well-known MPEG2-TS.

B. STB and P-Module

Existing IPTV STBs do not support real-time video encoding because the STBs incorporates an MPEG-2 and H.264/AVC decoder. In order to overcome the limitation of IPTV STBs, we developed a module called the P-module. The P-module aims to encode real-time video analog signals from a live-event location to a digital format based on MPEG-2 and H.264, and sends it using an MPEG2-TS container format. Fig. 1(a) shows the architecture of the P-module combined with an STB for videoconference service through an application programming interfaces (APIs). The P-module connects to the STB via USB CDCs. Fig. 1(b) shows the P-module prototype to encode real- time A/V media using a media codec with a built-in camera for IPTV videoconference and communicates with the signal controller using the SIP.

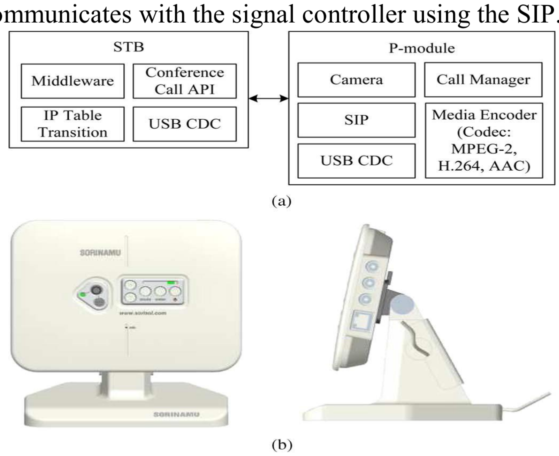

Fig 1

Although the P-module has restrictions such as the distance limitation of a USB connector and the high cost of high-resolution cameras, we can reduce switching costs because the providers do not have to change the existing STBs to adopt tele presence and conference systems using a decoder-oriented STB for HD videoconferencing.

C. Signal Controller and Mixer

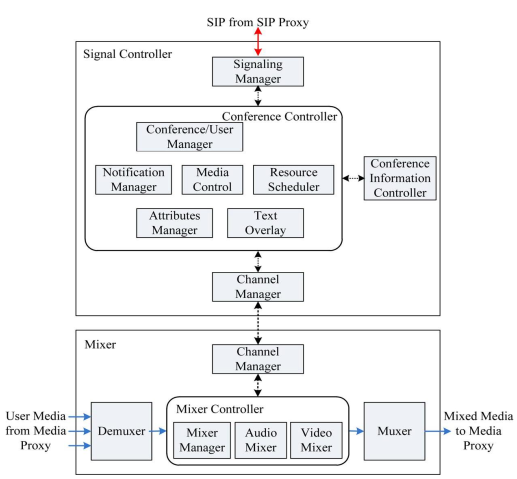

Fig 2

Fig. 2 shows the architecture for our proposed system. The proposed system consists mainly of the signal controller and the mixer, which deal with signal and media control, respectively. The signal controller controls SIP messages over the IPTV network, and the SIP messages are sent to the conference controller. The signaling manager contains a SIP stack and provides APIs for the conference application. Furthermore, the manager manipulates all session and media information of users.

The conference controller contains various features for the interactive participation service. Basically, the conference/user manager can control the created conference rooms and joined users. After creating a conference room, the notification manager alerts joining and leaving request to the creator of the room.

In the conference controller, the media control sends messages of layouts and positions of users to the mixer. Depending on the states of a conference room or users, the media control determines whether the received media control message is valid or not. The resource scheduler manages and distributes resources equally to prevent the concentration of resources in the mixer and to achieve a better performance. The attribute manager maintains conference attributes so that a creator changes the maximum user, a password, and a title of a conference. The text overlay checks in accordance with the user's status and to send the control message to the mixer. The conference information controller stores all information of the conference and joined users in the signal server. To make the signal controller communicate with the mixer, there are two channel managers in the signal controller and the mixer, respectively.

The channel manager in the signal controller sends control messages to the channel manager in the mixer with the routing information saved in the resource scheduler. The mixer consists the demuxer, the mixer controller, and the muxer. The demuxer not only divides media streams into audio streams and video streams but also decodes them for sending to the mixer controller. The mixer controller mixes the decoded A/V data and encodes them again, and then sends to the muxer. The mixer not only arranges layouts and positions of users in the screen but also sends audio mixing control message to the A/V mixer.

One of the most challenging issues in this context is to reduce end-to-end delay time. Most of end-to-end delay occurs in encoding video into MPEG2/4 or H.264 video format in the mixer controller. The mixer decodes multimedia streams from each source, mixes them into a single stream, and then encodes and muxes it into the MPEG2-TS stream. Participants receive and decode this stream, and render it on their TV screens.

D. Videoconferencing Using Mobile Devices

Mobile clients connect to the network to access IPTV services using various devices and terminals, such as TV sets, laptops, personal digital assistants, mobile phones, and other handheld devices. These devices possess heterogeneous characteristics in terms of screen resolution, size of display, data rate, limited processing, and storage capabilities. For smooth content delivery and acceptable QoS levels, it is essential to consider the capabilities of all devices at the receiving end. Furthermore, it is also possible that a single home accesses different TV channels using different terminals at the same time. In this context, the service provider needs to deal with the available bandwidth and efficient content adaptation to meet the needs of all participants. Video encoding is also considered an important aspect of A/V streaming applications and other IPTV services, and could allow optimizing the bandwidth usage. Efficient video coding techniques can lead to improved content portability and management, resulting in better quality of IPTV services. In our system, end-users can access videoconferencing using mobile devices that provide encoding and decoding at the same time.

IV. CONCLUSION

In this paper, we have presented the videoconferencing system to provide real-time participating services to audiences using IPTV on cloud computing environments.The developed system provides real-time participating services to audiences using IPTV on cloud computing environments. The proposed system is an advanced IPTV service that is combined with bidirectional multimedia communication technologies for interactive user participation. Our system provides high-quality video processing and bilateral network.

REFERENCES

[1] P. Gevros, J. Crowcroft, P. Kirstein, and S. Bhatti, "Congestion control mechanisms and the best effort service model," *IEEE Netw.*, vol. 15, no. 3,pp. 16–26, May 2001.

[2] J. She, F. Hou, P.-H. Ho, and L.-L. Xie, "IPTV over wimax: Key success factors, challenges, and solutions [advances in mobile multimedia]," *IEEE Commun. Mag.*, vol. 45, no. 8, pp. 87–93, Aug. 2007.

[3] H. Park, J. Yang, J. Choi, and H. Kim, "Qos negotiation for IPTV service using SIP," in *Proc. 9th Int. Conf. Adv. Commun. Technol.*, Feb. 2007,vol. 2, pp. 945–948.

[4] S. Zeadally, H. Moustafa, and F. Siddiqui, "Internet Protocol Television (iptv): Architecture, trends, and challenges," *IEEE Syst. J.*, vol. 5, no. 4, pp. 518–527, Dec. 2011.

[5] R. H. Thibadeau, "The television as robot servant," Robotics Institute,Pittsburgh, PA, USA, Tech. Rep. CMU-RI-TR-93-22, Aug. 1993.

[6] L. INFINIA, LG smart TVs, Feb. 2011. [Online] Available: http://infinia.lge.com/archives/2108

[7] Samsung, Smart TV with samsung apps 2011. [Online]. Available: http:// www.samsung.com/us/article/apps-built-for-your-tv

[8] S. Electronics, Sony redefines home entertainment with the world's first HDTV powered by google TV 2010. [Online]. Available: http://www.sony.net/SonyInfo/News/Press/201010/10-140E

[9] P. Corporation, 2011. [Online].Available:http:// panasonic.net /avc/viera/popup/smart_networking

[10] S. Google, Official Google blog: Here comes Google TV 2010. [Online]. Available: http://googleblog.blogspot.com/2010/10/here-comes-google-tv.html

[11] G. TV, Features 2011. [Online]. Available: http://www.google.com/tv/features.html

[12] Y. Lai, C. Lai, C. Hu, H. Chao, and Y. Huang, "A personalized mobile iptv system with seamless video reconstruction algorithm in cloud networks," *Int. J. Commun. Syst.*, vol. 24, no. 10, pp. 1375–1387, Oct. 2011.