

OHTV(Open Hybrid TV) Service Platform based on Terrestrial DTV

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Abstract— The viewer's behavior of contents consumption is changing from passive to active due to the progress of internet. Since the television is able to support some sort of restricted internet service through digital television and internet technology, the TV broadcasters can respond the viewer's active behavior.

In Korea, TV broadcasters prepare OHTV(Open Hybrid TV) service which combines terrestrial DTV and internet together for the analog TV switch off in 2012, providing terrestrial DTV viewers with various contents and bidirectional interactive service. Also, broadcasters and TV manufacturers cooperate to make OHTV standard in authorized standardization organization for equivalent marketing opportunity.

Keywords— DTV, Internet, Hybrid, TV Portal, OHTV

I. INTRODUCTION

The new media services like IPTV and TV portal come true as high quality program or VOD can be transmitted through network because of the progress in broadband network. Also, the viewers want to store A/V contents on their own personal device to watch them in their free time as the device technology is advanced. So, the request for this kind of on-demand service is growing.

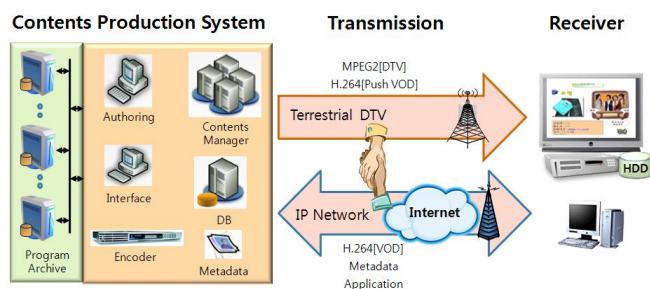


Figure 1. OHTV service concept

In the broadcast-telecommunication convergence era, traditional terrestrial broadcasters do not possess the bidirectional network which is the key point of convergence service and the broadcasters could not respond to the viewer's request for on-demand service well. Naturally, it is not easy for the broadcaster to provide high quality VOD

service compared with the telecommunication company. So, the broadcast and internet combined hybrid TV service can be an alternative to use the internet efficiently. The open hybrid service is to provide A/V contents to viewers using internet and receiver's store device based on terrestrial DTV channel as in Figure 1.

In this paper, KBS propose the production system of hybrid TV contents, contents transmission technology, and OHTV receiver. Upon this system, various services that the terrestrial broadcasters would like to present are dealt with.

II. OHTV SERVICE

A. Contents Navigation Service

The contents navigation service is composed of navigation menu and my contents menu and help the viewers can access and download contents to watch easily. The navigation menu provides easy access to contents through the advanced EPG(Electronic Program Guide), various VOD menu and contents search menu. The viewed contents can be retrieved from the viewed menu and the reserved high quality contents for full download can be viewed in the reserved menu. Also, in my contents menu the over the air push VOD contents are automatically stored. So, the viewers can search push VOD contents and watch them if they want. Basically, the bit rate for over the air push VOD is assumed to be 1Mbps, so the OHTV video contents format is H.264 instead of MPEG-2 because of relatively low bit rate.

When the viewer watch the A/V contents through the navigation menu or my contents menu, the pre-roll advertisement contents play first and then the main A/V contents play. While the main contents are played, the viewers can make video bookmark data and send them to video bookmark server. Then the transferred video bookmark data is being used for contents sharing with other people in the next TV community service.

B. TV Community Service

The TV community service help viewers to establish community with other people who have the common concerns on the basis of contents. The more viewers add additional information on contents, the more other people can utilize this information. Also, scene associated advertisement can be another business model using this shared information. For

example, one viewer can make a video bookmark and SAI(Scene Associated Information) tag data which explain the scene shortly. And then, the viewer can send the video bookmark and SAI tag data to video bookmark server, so the other people can watch the contents from specific position through this video bookmark. While the contents are being played, the scene associated information or advertisement can also be displayed.

Besides, broadcaster can provide various contents related service and other information service in open oriented style without discussing with TV manufacturers each time because of the receiver's middleware standard. Figure 2 shows the OHTV service menu example.



Figure 2. OHTV service menu example

III. CONTENTS PRODUCTION SYSTEM

A. A/V Input System

The A/V input system requests for contents to be served from archive system and performs editing and transcoding the contents. At this time, two different versions of A/V files are stored. One is high quality A/V file for service and the other one is low quality A/V file for contents searching and authoring. After mapping contents to related metadata, The A/V input system stores A/V basic contents information metadata, media information metadata and contents ID in the database.

B. Schedule Input System

The KBS program schedule system supports standard interface and provide related system with schedule information. The schedule input system for OHTV service interfaces with this KBS program schedule system and brings program schedule information. The schedule input system is composed of the schedule information agent that supports SOAP(Simple Object Access Protocol) standard

interface and the schedule information processor that stores schedule information in the database for OHTV service.

C. Contents Manager

The contents manager manages services necessary for OHTV service like A/V, advertisement and video bookmark information for contents sharing.

The metadata for OHTV service is composed of contents description metadata and service description metadata. The basic data for contents description metadata is filled in the A/V input system and the schedule input system. The contents description metadata authoring module inputs data for missed items in contents description metadata manually and manages contents and metadata connecting A/V contents and ads.

The service description metadata authoring module inputs data for contents sharing service and can play, pause, stop and control A/V position using scroll bar. It is easy to get the video bookmark data at any random position using this kind of control function. The video bookmark metadata authoring module includes thumbnail image generation, program ID, position, title and tag input function at specific A/V position. When a video bookmark metadata is generated, a video bookmark ID is also generated and then used for contents sharing service.

And, because the RIA technique helps present and manipulate web based application easily, the OHTV metadata authoring environment uses RIA architecture. Figure 3 shows the OHTV system architecture.

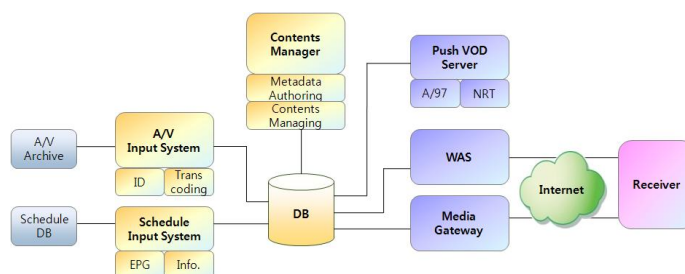


Figure 3. OHTV system architecture

IV. CONTENTS/METADATA TRANSMISSION

A. Over the Air Transmission

Contents like A/V, clip, information, game, etc. can be stored automatically in receiver using over the air transmission, as shown in Figure 4.



Figure 4. Over the air push VOD concept

Over the air push VOD transmission technique uses same multiplexing method in transport stream with A/V signal.

At present, the ATSC(Advanced Television Systems Committee) A/97 standard which is made to transmit software and data over the air is available to transmit push VOD contents multiplexed in DTV transport stream. But the more proper NRT(Non-Real-Time) standard for non real-time VOD transmission is being standardized in ATSC based on FLUTE protocol. Figure 5 shows the NRT layer structure.

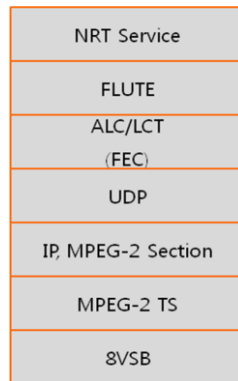


Figure 5. NRT layer structure

The NRT standardization would be finalized in 1Q of year 2010 and the then standard would be replaced with NRT.

Before the NRT standard finalized, the push VOD transmission method using A/97 standard could be used as alternative way. To transmit push VOD contents in separated virtual channel with A/V, a virtual channel of service_type 0x05 in VCT(Virtual Channel Table) is used. And this virtual channel must have more than one stream_type 0x0B of DSM-CC(Digital Storage Media Command and Control). This time, the signaling for push VOD download data uses 2-layer carousel scenario to transmit different group simultaneously. To distinguish the separate virtual channel of push VOD from other data download the compatibility descriptor specifically the OUI(Organizationally Unique Identifier), model, and version information is used. And additional information to transmit and store VOD contents is carried in sub descriptor. The sub descriptor contains broadcast_count, save_path, filename and etc.

Push VOD server write download service information in DSI(Download Server Initiate) message and divide VOD files into module. The module information is carried in DII(Download Info Indication) message and the module is divided into 4k byte DDB(Download Data Block) block once again. Push VOD contents delivery schedule can be transmitted using schedule descriptor in DII message, but this schedule function is optional.

B. Internet Transmission

Because the terrestrial broadcaster do not possess the bidirectional network, DnP(Download and Play) protocol using HTTP is suitable for contents request and response

instead of streaming RTP protocol from the view of convenience, stability and efficiency of network.

The OHTV receiver request WAS for contents with assigned URL(Uniform Resource Locator) of application UI page using HTTP 1.1 request message. At this time, parameters like contents ID are transmitted attached to URL using HTTP GET method. Furthermore, the receiver can request a part of contents in the case of skip or succeed download. In this case, the range parameter of HTTP 1.1 request message header or byte offset, size parameter of HTTP GET/POST method can be used.

Then the media gateway analyzes the request contents ID and transmits the contents and metadata to the receiver using HTTP response message. When a part of contents is requested using range parameter, the response uses content-range parameter defined in entity-header of HTTP 1.1 standard. The status code of response header is '206 partial content' representing a part of contents. Specifically, the position and length is carried in content-range header and content-length header individually. Then the contents are carried in message-body. And when a part of contents is requested using HTTP GET method, the contents are carried in message-body of HTTP response message. In this case, the status code of HTTP response message header is '200 OK' and the content-range parameter is not used.

Also, to transmit contents file and related many metadata file simultaneously, the media gateway and receiver support HTTP multipart transmission standard. And the receiver can use "MediaList Scripting Interface" function defined in CEA-2014 "CE-HTML Scripting Objects/interfaces" to manage downloading contents list.

V. RECEIVER

Viewers use remote control device to interact with OHTV service ready DTV receiver, as shown in Figure 6.

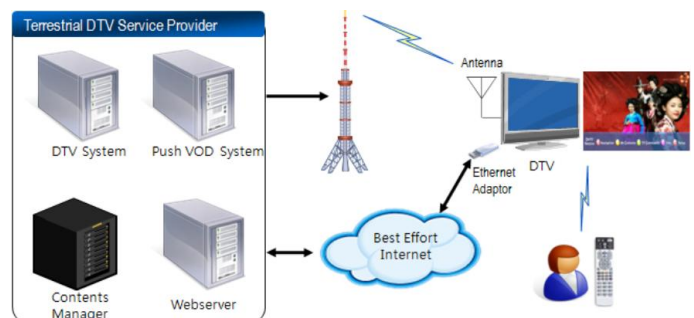


Figure 6. OHTV receiver environment

Terrestrial DTV service provider transmit DTV program and Push VOD contents over the air. And the other contents and additional information are delivered using best effort internet. Thus the receiver should have RF antenna and internet adaptor.

In addition to this physical interface, the OHTV receiver should support media player, A/97 or NRT standard, contents download through internet, browser or ACAP(Advanced Common Application Platform) middleware, metadata parsing,

video bookmark, SAI and etc. to support OHTV service listed above.

In Korea, broadcasters and TV set manufacturers cooperate to make OHTV standard in authorized standardization organization of “Next Generation broadcasting Forum”. Figure 7 shows the OHTV receiver’s software stack.

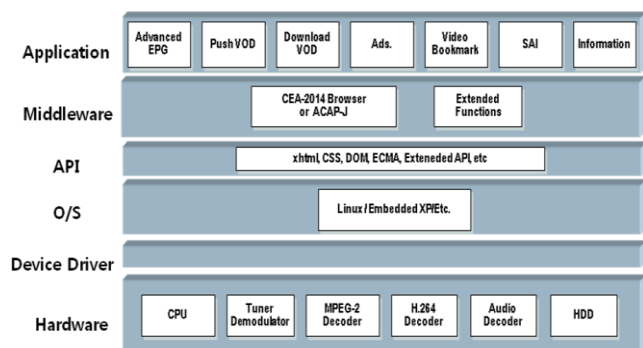


Figure 7. OHTV receiver's software stack

VI. CONCLUSIONS

Compared with IPTV, OHTV service category and service technology is similar. In transmission point of view, the telecom company uses QoS(Quality of Service) guaranteed premium network instead of legacy best effort internet to provide IPTV service. But the terrestrial broadcasting company possess neither QoS guaranteed premium network nor best effort internet.

In this paper, the DTV channel and best effort internet combined OHTV service platform was proposed to overcome the terrestrial broadcaster’s restriction of bidirectional network.

In Korea, broadcasters and TV manufacturers would cooperate to make OHTV standard according to the trend of other standard organization like ATSC NRT. And the broadcasters would keep developing new OHTV service to give viewers convenience.

This OHTV service would provide easy way of contents access, high quality contents service and distinguished service compared with analog TV. Thus the OHTV would contribute to analog TV switch off scheduled in 2012 eventually.

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