

The implementation of terminal for a personalized DMB service

Ji Hoon Choi, Han-kyu Lee

The Electronic and Telecommunications Research Institute(ETRI), Daejeon, Korea.

cjh@etri.re.kr, hkl@etri.re.kr

Abstract—the terrestrial DMB has supported us with a simple audio/video service as well as various additional data service such as BWS, Slideshow and TPEG. But DMB market doesn't want simple DMB services more without benefit. So personalized DMB conception has came out as a new growth power of the future DMB industry and market.

In this paper, we defined transmission method of metadata and signalling information through DMB data channels for support DMB ECG service that is one of personalized DMB services. And then we present personalized DMB terminal system and test result of performance and functionality.

Keywords— Personalized DMB, DMB ECG

I. INTRODUCTION

T-DMB(Terrestrial Digital Multimedia Broadcasting) service, which is started the world's first official mobile TV service in South Korea in May 2005, is emerging as new digital broadcasting paradigm subscribing to 13 million members in 2008.

T-DMB service had been started by a purpose to provide movable user with high quality multimedia service and its core technologies were defined by transmission standard based on Eureka-147, MPEG-4 AVC standard, MPEG-4 BSAC standard and MPEG-2/4 system standard. Especially, T-DMB data service had been provided with using various data transmission protocol standards such as MOT, TDC, IP tunnelling([1]-[8]). But an above-mentioned data service was a kind of simple information service and was limited to provide with a higher value-added DMB service like personalized DMB service because there were not metadata transmission specification and consumption specification for advanced DMB data service like based on DMB ECG(Electronic Content Guide).

In this paper, we propose a transmission method and a terminal system of personalized DMB service base on DMB ECG specification.

And then, we explain personalized DMB terminal construction and results of the personalized data broadcasting service test.

Finally, we propose methods how to transfer DMB ECG metadata through DMB channel and how to encapsulate DMB ECG metadata and signalling information as to container formats defined in DMB ECG standard.

II. TRANSMISSION SPECIFICATION

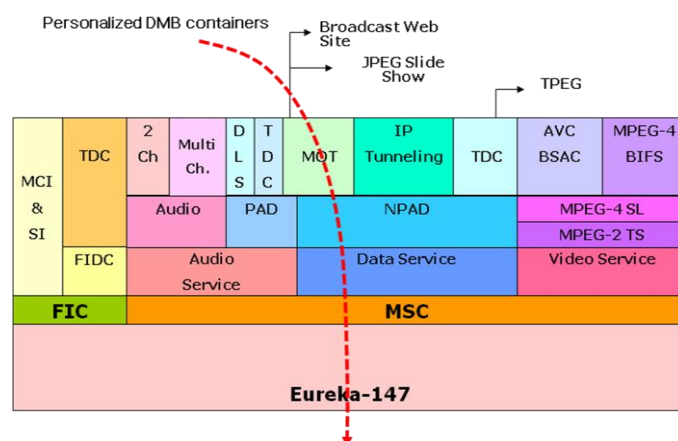


Figure 1. DMB transmission protocols

A data and information for personalized DMB service are encapsulated on type of container structure and are transferred through data channels with a MOT object.

In this chapter, we explain encapsulation method of ECG Init Message container, metadata container, CRI(Content Resolution information) container and image container, and transmission protocol.

A. Container Encapsulations

1) ECG Init Message & Metadata Container

A metadata container is consisted of metadata encapsulation structure, string or binary data encapsulation structure and ECG initiation information structure for identifying ECG metadata. If size of ECG metadata is large, it may be transferred by one more containers as shown in the figure 2.

The first thing terminal do, it must be initialized receiving environment for decoding ECG initialization information ([4]).

Here, it is necessary to consider of an efficient metadata transmission and update because of limited transmission bandwidth on T-DMB environment. So it can be transferred as set of several fragments meaning unit of metadata.

There are two types of metadata format for personalized DMB service. One is a general uncompressed textual fragment

metadata and the other is a compressed binary fragment metadata([4]). In this paper, we don't explain metadata scheme and binary compression method of metadata.

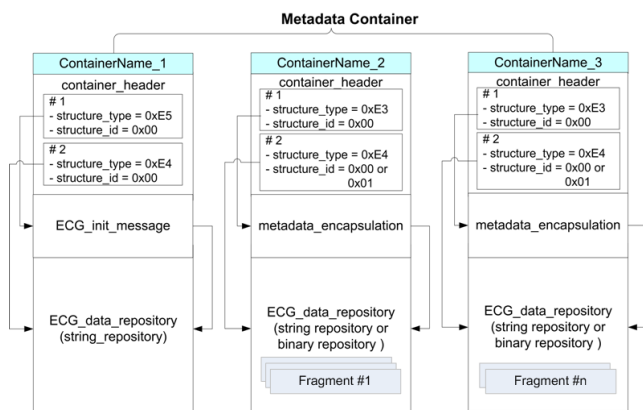


Figure 2. An example of metadata container structures

2) CRI Container

CRI(Content Referencing information) is mapping information between a CRID(Content Reference Identifier) and a physical location of stored DMB content. And it is necessary to identify channel information, stat time, duration and so on([4]).

If equality channel information is repeated in transferring locator information in CRI encapsulation structure, we may use ensemble index table for raising transmission efficiency.

A CRI container is consisted of CRI encapsulation structure and ensemble index table and must be transferred always in a pair of these through DMB data channel.

An example shown in figure 3 presents to be transferred by two containers in case that CRI information is a lot.

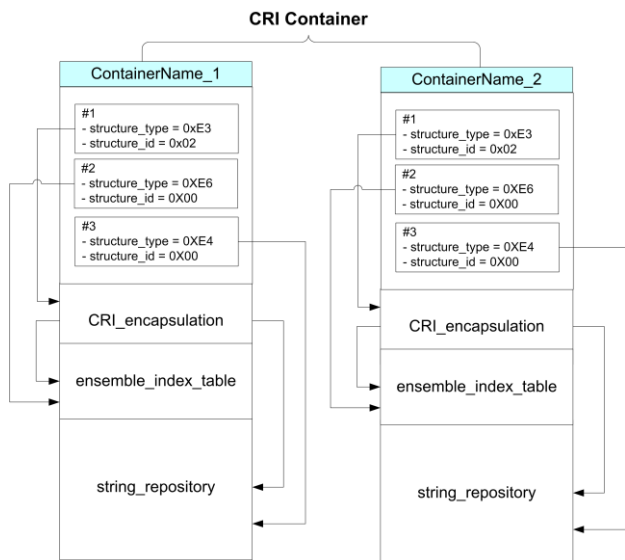


Figure 3. An example of CRI containers

3) Image Container

An image container is consisted of image encapsulation information and data repository. Image information like size, name and encoding format is stored in image encapsulation structure field and real image data is stored in data repository([4]).

An encoding type of image data can be identified extension name of 'image_URI' field on image encapsulation structure. It supports image file format such as JPEG and PNG format.

An example shown in figure 4 presents to be transferred by two containers in case that image data are a lot.

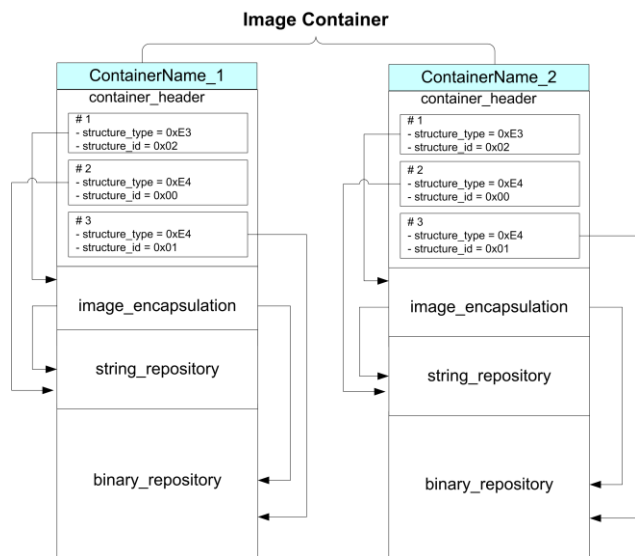


Figure 4. An example of image containers

B. Transmission Protocol & Methods

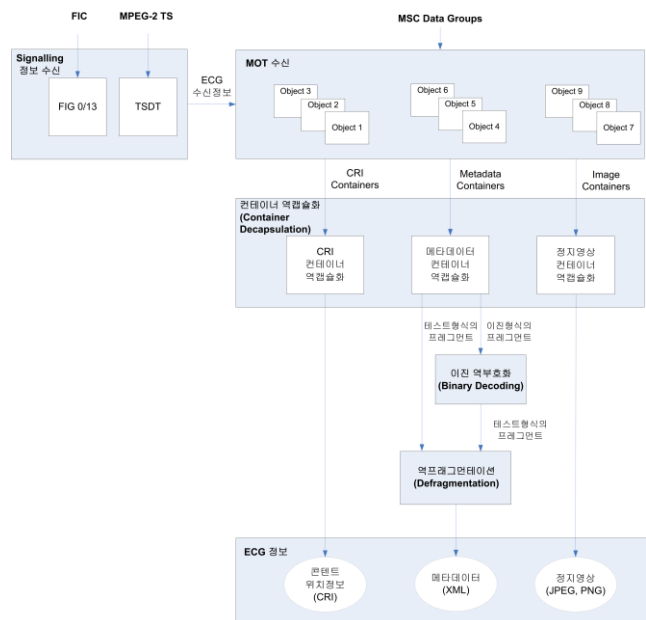


Figure 5. A transmission flow of container data

As mentioned in above chapter, containers are transferred with MOT protocol on DMB data channel. A terminal search FIG 0/13 signal information to indentify transferring data position, and then extracts and stores containers.

1) MOT Transmission Protocol

Values of A contentsType and a contentSubType field in MOT header core are defined by ‘000000’ and ‘00000000’, it is identified by MINE type of application/octet-stream.

It is necessary to use a ContentName parameter and VersionNumber parameter in MOT header extension to identify container type.

Table 1. Parameters in MOT header extension

Parameter	Parameter ID(b5-b0)	Frequency appearance	Note
ContentName	001100	1	A data name stored in MOT body
VersionNumber	000110	1	A data name stored in MOT body

Table 2. File extension definition as to container types

Value	Note
“i”	ECG Init Message container
“m”	Metadata container
“c”	CRI container
“g”	Image container

2) FIG 0/13 Signalling

The FIG information has signalling information for DMB audio/video/data service. For example, it is possible to transfer from DMB audio/video service name like ‘KBS HEART’ to DMB audio/video/data composition information. In here, FIG(Fast Information Group) 0/13, so it called a “user application”, must be set up ‘0x7ff’([4], [7], [8]).

A personalized DMB terminal construction is shown in figure 6. In this paper, we just explain about a metadata processing module function and DMB ECG application because of a few pages to describe all things about all modules on terminal([9]).

A. Metadata Management Module

Metadata processing module manages receiving and storing information of all containers, textual/binary fragment information, decoded image data, CRI information and so on. Also it manages container type and fragment information received from container decoder([4], [5]).

And then, it receives textual/binary fragment data from container decoder, and provides metadata engine with updating or adding fragment data only, and stores CRI and image data received from container decoder.

Finally, it receives ECG initialization information from container decoder and must reset all data and information stored on local storage if a version of ECG initialization information is changed.

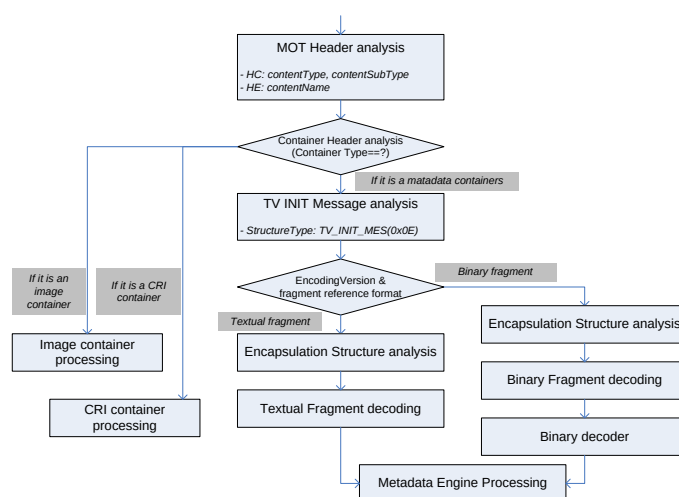


Figure 7. A flow chart of metadata processing module

III.DESIGN & IMPLEMENTATION

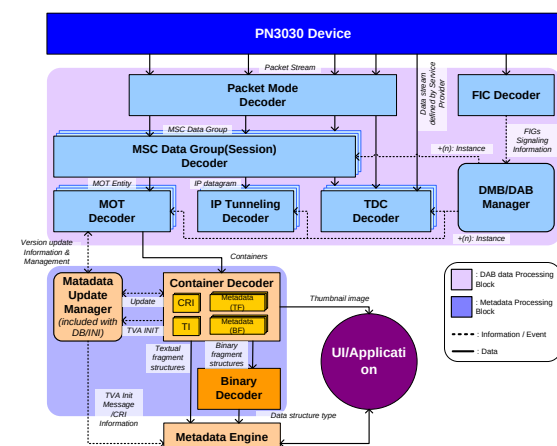


Figure 6. A personalized DMB terminal structure

Table 3. Modules initialization according to ECG information

ECG information field	Container Decoder Status	Metadata Processing Module Status	Note
EncodingVersion & fragment reference format	Initialize & Destroy	N/A	A container decoder module will be changed according to fragment type
MetadataReset Version	Reinitialize	Reinitialize & DB initialize	An initialization of fragment ID and version
DecoerInit(): version	Reinitialize	Reinitialize & DB initialize	The DMB ECG scheme will be changed

B. Container Decoder Module

Container decoder module decodes metadata container, CRI container and image container, and can send ECG initialization information such as version information, fragment encapsulation information and so on to metadata update module.

Also it can send decoded image data and stored location to metadata update module. In here, it is necessary of mapping information between location information and real physical location.

Finally, container decoder module sends fragment data to metadata engine.

IV. BROADCASTING TEST

As shown in table 4, 5, a test environment is shown below([9]).

- Transmission protocol: MOT
- User application type: 0x7ff
- Transmission data rates: 64kpbs
- Data container types: metadata containers, CRI containers, image containers, ECG init message container

Table 4. The result of test with image containers

Container Types	Total Sizes	Numbers	Average Object Sizes
ECG Init Message	1,180	1	1,180
Metadata	432,440	16	1,567
CRI	5,776	1	5,776
Image (320x240)	1,421,529	21	70,501
Total	1,860,925	39	

On the first broadcasting test, an average download and decoding time of all containers is about 176 seconds with the exception of data channel tuning times. Because of download times is proportionate to total container sizes generally, we think that it is more efficient to transfer all image containers through bi-directional data channel.

Table 5. The result of test without image containers

Container Types	Total Sizes	Numbers	Average Object Sizes
ECG Init Message	1,032	1	1,032
Metadata	73,051	4	1,269
CRI	5,974	1	5,974
Total	80,057	6	

On the second broadcasting test, an average download and decoding time of all containers is under 20 seconds with the

exception of data channel tuning times. Because of download times is shorter than a case of the first broadcasting test. If image container is not included, we think that a commerce possibility of personalized DMB service may be higher.



Figure 8. A main view of DMB ECG service

Encapsulated and transferred DMB ECG metadata has simple program schedule information as well as program segment information, program series information, program protection information and so on. But it is difficult to present the above-mentioned all information on DMB terminal with small size display generally.

So that, DMB ECG service which is the most basic one of personalized DMB services can show an audio/video view, program simple/detail information and user control view and so on.

On user control view, user can search various programs based on genre, preference and keywords. And users get information about program titles, characters, synopsis and a related media data like images

V. CONCLUSIONS

Recently, as the mobile broadcasting environment is becoming digitalization and convergence between broadcasting and telecommunication, the consumption of digital contents is becoming difficult and complex. As result of that, the various content metadata has been required necessarily for consuming DMB contents anytime, anywhere, and on any device.

We could have a DMB broadcasting environment and the world best DMB commerce technologies according as Korea commercialized the world's first DMB service.

Furthermore, a profitability of DMB service provider decreased rapidly because of free policy of most of DMB service in Korea. As result of that, the most DMB service providers have recognized that personalized DMB service is powerful business model to overcome the difficult market situation.

In this paper, we defined and showed DMB ECG service which is one of the personalized DMB services. And we explained those feature and advantages on detail. And then, we explained construction and functions of a personalized DMB terminal.

In future, it is necessary to discuss how to transfer huge amounts of data through DMB channel, and how much is the smallest visible image size, and how to minimize a null packet generation, and how to error recovery for efficient data download on MOT protocol level on an activation of a DMB filecasting service.

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