Abstract—In Korea, ATSC 3.0 based terrestrial UHD broadcasting service is on the air and emergency alert service is also being developed. In addition, the Ministry of Science and ICT (MSIT) plans to expand its emergency alert service for public media, such as digital signage, public transportation and public facilities by utilizing terrestrial UHD broadcasting.

This paper presents the design and implementation of emergency alert gateway that can provide emergency alerts and disaster information via TV, companion devices and digital signage.

I. INTRODUCTION

Recently, due to the impact of climate change, natural disasters such as earthquake, flood and typhoon have been increasing. Besides, the social and economic damage caused by them has been becoming larger and larger. Accordingly, many countries are trying to use various methods to quickly deliver emergency alert and warning for protecting people's lives and property.

Natural disasters are repeated in Korea. In particular, there were two powerful earthquakes with magnitude 5.0 or higher, and a series of big wildfires occurred repeat in recent years. It caused a great deal of damage and all people were left in a state of shock. However, emergency alert and warning system did not work properly.

Ministry of Science and ICT (MSIT) started R&D project to develop the new emergency broadcasting system that can be applied to ATSC 3.0 based terrestrial UHD broadcasting. And they have a plan to extend its emergency alert service for public media, such as digital signage, public transportation and public facilities by utilizing terrestrial UHD broadcasting.

The Advanced Television Systems Committee (ATSC) 3.0 standard can vastly provide new features and advancements for next-generation broadcasting services, such as enhanced television viewing experience, IP-based data transmission, conditional access, addressable advertising, hybrid networks, and mobile services to smartphones and connected cars. Besides, it provides several features for enhanced emergency communication, such as emergency alert wake-up, advanced emergency alerting (AEA). It also can provide a various emergency data, such as text, alert sound, evacuation map through reliable broadcast networks. These technical features enable ATSC 3.0 UHD broadcasting to hold a great deal of potential as a public media for providing emergency alert.

Fig. 1 illustrates the benefits of ATSC 3.0 as an emergency alert media.

In this paper, we present the design and implementation of emergency alert gateway that can provide not only emergency alerts and disaster information via TV and companion devices at home, but also send emergency alert message to the digital display in public facilities.

II. ATSC 3.0 EMERGENCY ALERT GATEWAY

Fig. 2 shows the overview of the proposed emergency alert gateway structure. This device is usually ATSC 3.0 UHD broadcasting receiver, when used at home. It can receive ATSC 3.0 broadcasting service using multiple tuners, provide UHD broadcasting services to TV and transmit the user selected program to connected companion devices or OTT box.
without ATSC 3.0 tuners.

In case of emergency situation, it receives ATSC 3.0 AEA message and provides viewers with emergency alert and disaster information via TV, and re-transmit the demodulated data including AEA to connected companion devices immediately. On the other hand, an emergency alert gateway, used at outdoor digital signage, sends only AEA messages excluding UHD AV data. The digital signage that receives them immediately display the corresponding message on screen.

Fig. 3 illustrates functional block diagram of the proposed emergency alert gateway

**III. REAL TIME VERIFICATION OF IMPLEMENT SYSTEM**

In this section, we present implemented system and verification result of the above proposed concept, as shown in Fig. 4. A verification test is to evaluate the functionality of the proposed emergency alert gateway. We used an UHD A/V streamer to input real-time UHD streams. Emergency Alert Generation/AEAT Converter for generating disaster-related emergency alert messages and Signal and ESG Encoder/IP MUX for transmit ATSC 3.0 broadcasting signal containing AEA messages are also used.

![Fig. 3. The functional block diagram of emergency alert gateway](image)

Fig. 4 shows real-time emergency alert message reception test environment. We have confirmed that the proto-type emergency alert gateway output emergency alert texts on UHDTV and digital signage displays, after receiving the AEA messages.

**IV. CONCLUSION AND FUTURE WORK**

In this paper, we present the design and implementation of emergency alert gateway that can provide not only emergency alerts and disaster information via TV and companion devices at home, but also send emergency alert message to the digital display in public facilities.

We assured that the emergency alert gateway can provide emergency alert and disaster information directly to the end-users, or provide disaster information in conjunction with various types of media devices. (e.g., outdoor digital signage)

The emergency alert gateway can be connected to IoT devices and could also be used for lighting control, sound or vibration generation in an emergency alert situation at home.

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**REFERENCE**