

Design of Disaster Alerting Functionality for Digital Signage Service

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Abstract—It is very important service to provide disaster alerting function via digital signage. In this paper, we describe the design of functionality to provide disaster alert event produced from the disaster alert agency to the digital signage terminal through the digital signage server.

Keywords—Digital Signage, Disaster Alerting, Disaster Measurement Report

I. INTRODUCTION

Development of Information and communication technology and the decline in the price of the display of signage was to replace the existing signage with digital signage. In general, most people outside of the home is facing digital signage media, and the proportion is growing. Digital signage is readily accessible media by generation alienated from information and communication equipment (cellular phones, DMB, computer generation, etc.).

It is very important service to provide disaster alerting function via digital signage. But, many digital signage services do not consider disaster alerting service. We need to consider how the digital signage service should operate during the disaster situation. So, we study the overall functionality for digital signage services under disaster situation.

In this paper, we describe to define functional architecture and information flows to provide disaster alerting service. We also describe the message and data structure, information flows for disaster alerting service among related functions.

II. FUNCTIONS ON DISASTER ALERTING SERVICES

Standardization on digital signage is working in the ITU-T SG16/Q.14 [1]. Functional architecture for digital signage is described in H.DS-ARCH [2]. Requirements on digital signage services under disaster situation are described in H.DS-DISR [3].

Disaster information defined in H.DS-DISR contains the following four aspects.

- Early warning to prevent and lessen damages of a disaster as possible
- Reporting disaster situations altering by the minute

- Announcements of evacuation plans comprised of information such as traffic situation and evacuation shelters
- Safety confirmation of victims

In H.DS-DISR, first and fourth aspects are treated as linking with other independent early warning systems and safety confirmation systems and second and third aspects, reporting disaster information and announcement of regional information, are mainly treated.

It is necessary to define functionality and procedure for disaster alerting service which satisfied the requirements defined in H.DS-DISR. We describe the disaster alerting service related functions on digital signage and the high level information flows among disaster alerting related players

First of all, we define disaster alerting related functional components. Disaster alerting related functional components are composed of Alert Agency, Disaster Alerting Server and Disaster Alerting Client functions as follows:

Figure 1 shows disaster alerting related functions within functional architecture of digital signage service defined in H.DS-ARCH.

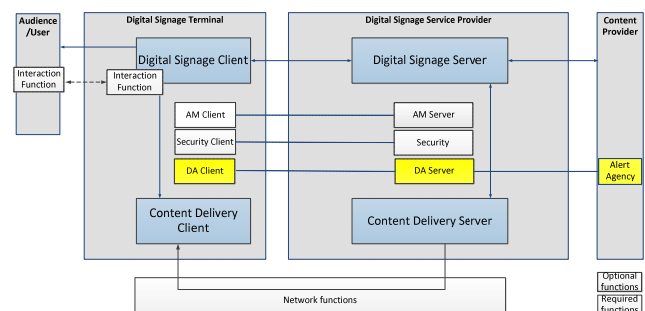


Figure 1. Disaster alerting related functions within functional architecture of digital signage service

- Alert agency functions: support overall management of disaster alerting on Content Provider;
- Disaster alerting server (DA Server) functions: support overall management of disaster alerting service such as scope of the distribution area, list of target DS terminal,

route to emergency exits, and barrier-free presentation functionality, and overall management of disaster measurement report;

- Disaster alerting client (DA Client) functions: support playback of disaster alerting message and measurement report of disaster event collected by the Digital Signage Terminal.

III. FUNCTIONAL ARCHITECTURE OF DISASTER ALERTING CLIENT AND SERVER

Figure 2 shows functional architecture of Disaster Alerting Client. Disaster Alerting Client consists of two functions; Disaster Alerting Functions and Disaster Measurement Functions.

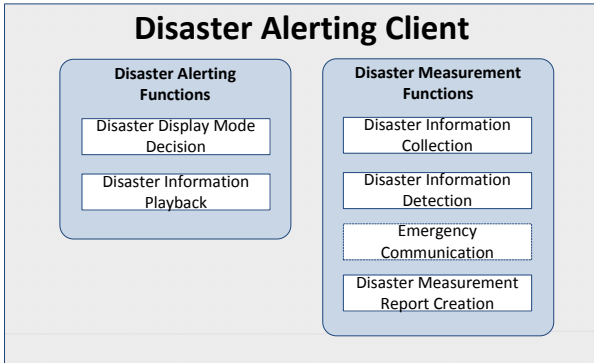


Figure 2. Functional architecture of Disaster Alerting Client

- Disaster Alerting Functions receives the disaster alerting message from DA Server and displays the disaster related information according to the type of disaster.
- Disaster Management Functions decides the level of disaster accordingly to the collected information by DA Client and sends the disaster measurement report message to DS Server.

Figure 3 shows functional architecture of disaster alerting server. Disaster alerting server consists of two functions; Disaster Alerting Management Functions and Disaster Measurement Management Functions.

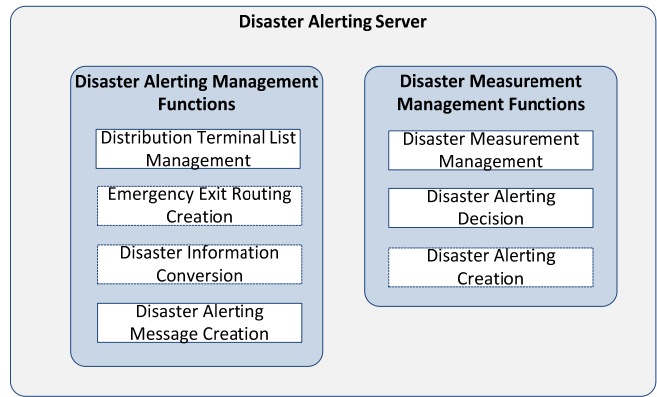


Figure 3. Functional architecture of Disaster Alerting Server

- Disaster Alerting Management Functions receives the disaster alert information from Alert Agency and controls the overall behaviour such as scope of distribution area, target terminal list, emergency exit route, and barrier-free presentation functionality. Disaster Alerting Management Functions creates the Disaster Alerting Message and Sends it to the DA Client.
- Disaster Measurement Management Functions receives the disaster measurement report message from the DA Client and controls the overall behaviour such as creation of new emergency exit route information, delivery of disaster measurement report to Alert agency.

IV. INFORMATION FLOWS ON DISASTER ALERTING SERVICES

This chapter describes information flows for disaster alerting service among DA Client, DA Server, Alert Agency, Digital Signage Client function and Digital Signage Server function in Figure 1.

Especially, we describe the disaster alerting message playback procedure.

When DA Server receives the disaster alerting from Alert Agency, Disaster Alerting Management Functions of the DA Server defines the scope of the distribution area and distribution terminal list according to the type (class or priority) of disaster and delivers the disaster alerting message to the pertaining terminal. Emergency exit route information in addition to the direction of evacuation, barrier-free presentation functionality (e.g., narration, sign language, and translation) for accessibility will be provided.

When DA Client receives the disaster alerting message from DA Server, Disaster Alerting Functions of DA Client will display the disaster related information.

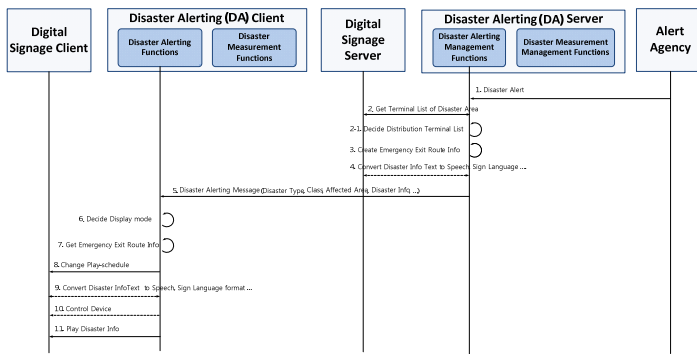


Figure 4. Disaster Alert Message Playback Procedure

- A. When DA Server receives the disaster alert from Alert Agency, Disaster Alerting Management Functions extracts the type, class and affected area of disaster.
- B. Disaster Alerting Management Functions extracts distribution terminal list according to the type, class and affected area of disaster by interacting with Digital Signage Server.
 - Disaster Alerting Management Functions can have the capability to decide the distribution area according to the type, class and affected area of disaster. Disaster Alerting Management Functions can have the capability to extract distribution terminal list included in the distribution area.
 - Digital Signage Server can manage the location of digital signage terminal. If not, Disaster Alerting Management Functions can manage the location of digital signage terminal.
- C. Disaster Alerting Management Functions can produce the emergency exit route information how to evacuate.
 - Disaster Alerting Management Functions manages the static emergency exit route information on how to evacuate according to the type and class of disaster basically. But, Disaster Alerting Management Functions can produce the new emergency exit route information in order to reflect the current disaster situation.
- D. Disaster Alerting Management Functions can support barrier-free presentation functionality (e.g., narration, sign language and translation) of disaster information.
 - Digital Signage Server can have the barrier-free presentation functionality, if the Disaster Alerting Management Functions provides such functionality by interacting with the Digital Signage Server
 - DA Client can have the barrier-free presentation functionality, if the Disaster Alerting Management Functions of DA Server does not provide such function.
- E. Disaster Alerting Management Functions creates disaster alerting message and delivers the disaster alerting message to the digital signage terminals within distribution terminal list.
- F. When DA Client receives the disaster alerting message from DA Server, Disaster Alerting Functions of DA

Client can decide the display mode according to the type and class of disaster.

- G. Disaster Alerting Functions manages the static emergency exit route information on how to evacuate according to the type and class of disaster basically. If emergency exit route information is included in the disaster alerting message, Disaster Alerting Functions uses emergency exit route information with the disaster alerting message.
- H. Disaster Alerting Functions changes play schedule according to the type and class of disaster by interacting with Digital Signage Client.
- I. Disaster Alerting Functions can convert disaster information into audio or sign language format for barrier-free presentation by interacting with Digital Signage Client.
- J. Disaster Alerting Functions can control the device according to the type and class of disaster by interacting with Digital Signage Client.
- K. Disaster Alerting Functions displays disaster related information by interacting with Digital Signage Client.
 - If barrier-free presentation disaster information is included in the disaster alerting message, Disaster Alerting Functions displays barrier-free presentation disaster information.
 - If emergency exit route information is included in the disaster alerting message, Disaster Alerting Functions displays emergency exit route information.

V. METADATA FOR DISASTER ALERTING SERVICES

This chapter describes the metadata for disaster alerting service shared between DA Client and DA Server. More detail descriptions of Elements/Attributes will be studied.

TABLE 1. DATA ELEMENTS/ATTRIBUTES USED IN DISASTER ALERTING

Elements/Attributes	Description
MessageID	An identifier of message
TerminalID	An identifier of digital signage terminal
DisasterType	Type of disaster
DisasterClass	Class of disaster
CurrentStatus	Current status of disaster
OccurredTime	Date and time that disaster is occurred
IssuedTime	Date and time that disaster alerting is issued
OccurredLocation	Location that disaster is occurred
AffectedArea	Region affected by disaster
DisasterRelatedInfo	Container to include the disaster related information
DisasterInfo	Element of DisasterRelatedInfo Disaster information which is displayed

BarrierFreeDisasterInfo	Element of DisasterRelatedInfo Disaster information for barrier free presentation
DisplayType	Type of display mode
EmergencyExitRouteInfo	Container to include the emergency exit or shelter information
ExitRouteInfo	Element of EmergencyExitRouteInfo Exit route related information
Direction	Element of EmergencyExitRouteInfo Direction of emergency exit or shelter
ShelterInfo	Element of EmergencyExitRouteInfo Shelter related information
ShelterLocation	Element of EmergencyExitRouteInfo Location of Shelter
ShelterDistance	Element of EmergencyExitRouteInfo Distance of Shelter

VI. CONCLUSIONS

We consider how the digital signage service should operate during the disaster situation. In this paper, we describe to define functional architecture and information flows to provide disaster alerting service which satisfied the requirements defined in H.DS-DISR. We also describe the message and data structure, information flows for disaster alerting service among related functions.

These considerations are proposed in ITU-T SG16/Q.14 standardization meeting.

ACKNOWLEDGMENT

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REFERENCES

- [1] ITU-T SG16/Q.14, <http://www.itu.int/en/ITU-T/studygroups/2013-2016/16/Pages/default.aspx>.
- [2] ITU-T H.DS-ARCH, "Digital signage: Functional architecture", 2013.05.
- [3] ITU-T H.DS-DISR, "Digital signage: Requirements of disaster information services", 2013.07.



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