

Efficient Contents Sharing Between Digital Signage System and Mobile Terminals

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Abstract— Digital signage is a Digital Information Display (DID) which expresses traditional advertisements of outdoor billboards by digital. In early digital signage was limited to provide contents consists texts, images and videos, but now it is combined with the network so contents can be installed, operated and replaced from a distance. Furthermore interaction with users and with user's mobile terminals is getting important. Thus, the transfer of contents between digital signage terminal and user's mobile terminals will occur frequently. In this paper, we suggest the structure of the digital signage system and the efficient method of content sharing through the diagram of the system structure and signal flow.

Keywords— Digital Signage, Contents Sharing, Transform, Multicast, Mobile Terminal

I. INTRODUCTION

Digital signage has become practical and widely used, allowing video and other information to be displayed over networks in a timely fashion on displays installed in various locations such as in stores, transportation facilities, hospitals or campuses [1]. Basically, electronic (i.e., digital) displays used for digital signage offer new opportunities and advantages compared to traditional 'static' signage. For instance, it allows to display information such as news or advertisements, in the form of dynamic multimedia presentations containing audio, video, and animations [2]. Many products are already on the market, and the digital signage market is expected to reach US\$3.5 billion in 2011 [3].

Digital signage service is commonly used to display advertisement of a store at fixed location or mobile terminals. For a fixed location, it normally uses a big screen TV combined with networked computer to display advertisement. It plays advertisement contents on a designated schedule coordinated by the shop manager. For mobile terminals, when a customer approaches the coverage of a store's POAs (Point of Access), the prepared advertisements are supplied to the connected customer [4].

The size of exchange data between digital signage and user's mobile terminal is small at present such as discount coupons or URLs. However, the demand of high quality and large size of multimedia data will increase in foreseeable future. For example, the users who are watching the

advertisement which is displaying on the digital signage terminal may want to get more additional information for the current advertisement or to watch the current or previous advertisement once more through their mobile devices.

In wireless network environment that has limited resources and many interactions with multi-user's mobile terminals simultaneously can cause the situation that can't provide seamless services because of the shortage of network bandwidth.

To resolve this problem, we suggest the efficient method about contents sharing between digital signage system and many mobile terminals. First, we can reduce the consuming network bandwidth by minify the size of multimedia data for mobile terminals. The display of mobile terminal is much smaller than the one of digital signage terminal. So, the high quality and large size of multimedia data is not necessary for the mobile terminal. We can transform the original data for digital signage into small size which is proper for mobile terminals and store to the digital signage terminal in advance. Second, using multicast to transfer the contents to mobile terminals can provide seamless service to multi-users with minimum network bandwidth.

In this paper, we suggest the architecture of the digital signage system for efficient contents sharing between digital signage system and mobile terminals in section II. In section III, we explain specific method of efficient contents sharing between digital signage system and mobile terminals through the diagram of signal flow.

II. ARCHITECTURE

In this section, we provide the architecture diagram of digital signage system, digital signage terminal and mobile terminal. Then we explain the role of each component in the sub sections.

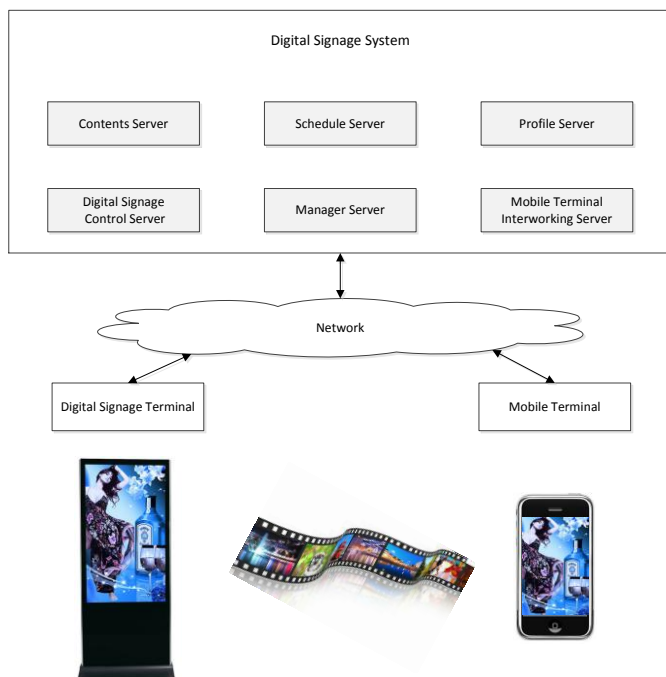


Figure 1. Architecture of digital signage system, digital signage terminal and mobile terminal

The architecture of digital signage system, digital signage terminal and mobile terminal is as shown in Figure 1. The digital signage system is consists of contents server, schedule server, profile server, digital signage control server, manager server and mobile terminal interworking server.

A. Manager Server

The manager server makes the contents for digital signage and schedule time to display. The advertisers can access for manager server to make contents and time scheduling by manager client or web. They can use contents making tool to work easily.

B. Contents Server

After finishing for making contents and schedule in manager server, the contents are uploaded to contents server. The contents server stores and manages all contents for digital signage and provides the URLs about the locations of the contents to digital signage terminal so it can obtain the contents through the URLs.

C. Schedule Server

Similar to the contents server, the schedules made in manger server are uploaded to schedule server. The schedule server stores and manages all schedules for digital signage and provides the URLs about the locations of the contents to digital signage terminal so it can obtain the contents through the URLs.

D. Profile Server

The profile server stores user's properties (User ID, Password, Authority, etc.) and digital signage terminal's properties (Terminal ID, Location, etc.) and provide the profile when any requests from other servers exist.

E. Digital Signage Control Server

The digital signage control server handles every work about digital signage terminals and performs the interface gateway to the other servers like a supervisor.

F. Mobile Terminal Interworking Server

The mobile terminal interworking server plays a role in handling every work about mobile terminals. The mobile terminal can access the digital signage system through the mobile terminal interworking server.

G. Digital Signage Terminal

The digital signage terminal is a Digital Information Display (DID) which displays the downloaded contents from contents server corresponding to the schedule that is obtained from schedule server. The user can watch advertisements or interact with the touch panel on the digital signage terminals.

H. Mobile Terminal

The mobile terminals can be any devices of user's such as smart phones, tablets or etc. The users can watch the current displaying advertisements or previous advertisements by web or applications in their mobile terminals.

III. SIGNAL FLOW

In this section, we explain the specific method for efficient contents sharing between digital signage system and mobile terminals using signal flow chart.

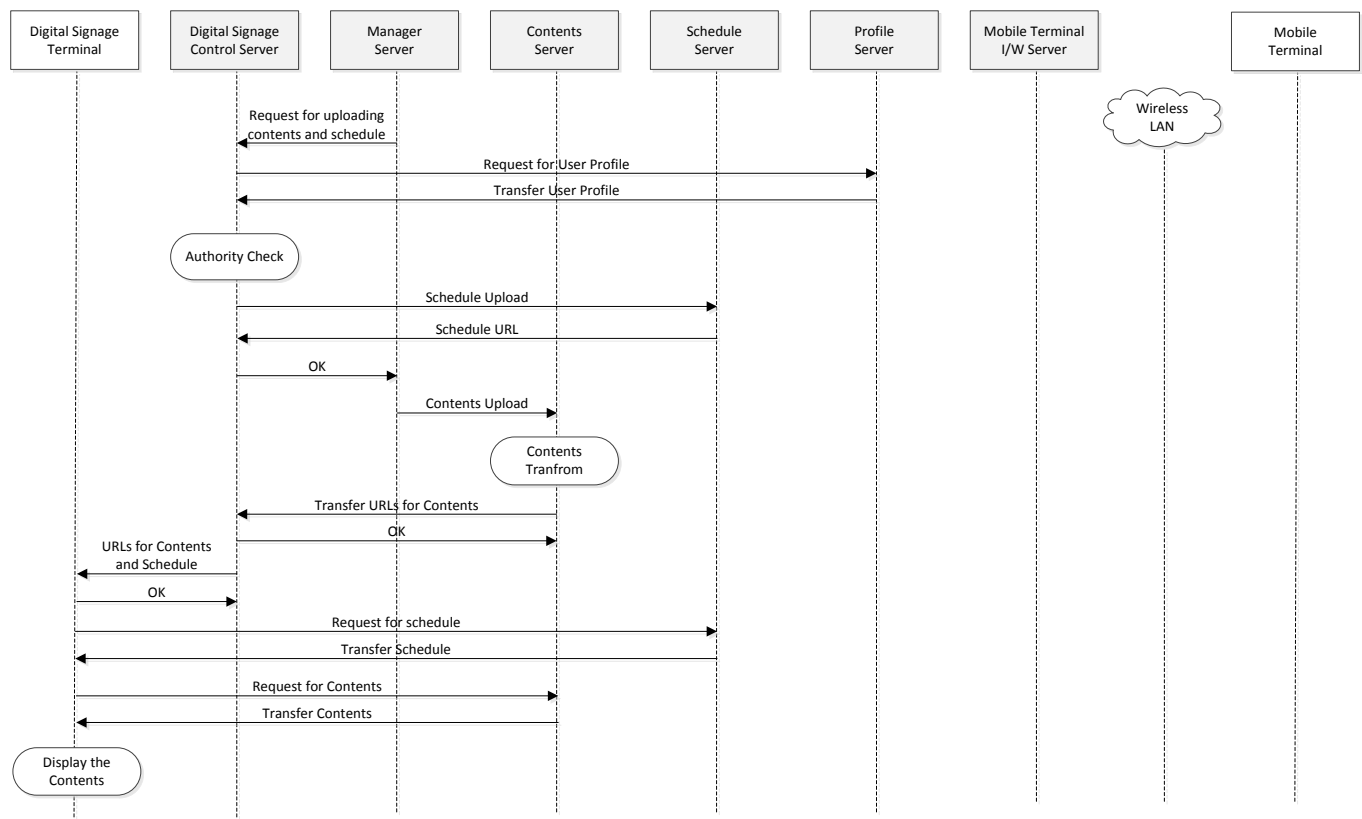


Figure 2. Signal Flow for Upload/Download of Contents and Schedule

The signal flow of uploading contents and schedule made from manager server and downloading the contents and schedule from digital signage terminal is shown in Figure 2.

After the contents providers make the contents and schedule by manager server, manager server requests for uploading the contents and schedule to digital signage control server. The digital signage control server obtains the user profile from profile server to check authority for upload contents. Then the digital signage control server uploads schedule to schedule server and contents to contents server each.

The contents server transforms the contents for digital signage terminal to contents for mobile terminals to minify the size of the contents for efficient contents sharing between digital signage system and mobile terminals. Then the contents server transfers the URLs to digital signage control server so that the digital signage terminals can download the contents.

The digital signage control server give the URLs for contents and schedule to digital signage terminal. And then

the digital signage terminal downloads and plays the schedule and contents by the URLs.

Figure 3 describes the process of contents sharing with mobile terminals.

The mobile terminal needs to log-in to the digital signage system for content sharing. The mobile terminal requests for log-in to mobile terminal interworking server with user ID and password. Then the mobile terminal interworking server checks the authority to access to digital signage system by comparing with the user profile obtained from the profile server.

After log-in, the mobile terminal can request for contents sharing about contents displayed currently or previously to mobile terminal interworking server. The digital signage control server delivers the request to digital signage terminal and the digital signage terminal transmits the contents made for mobile usage to networks by the multicast protocol. Then any mobile terminals which want the contents can obtain those by IGMP (Internet Group Management Protocol) JOIN message. By using the multicast protocol we can reduce the consuming network bandwidth to provide seamless service to multi-users with minimum network bandwidth in wireless network environment that has limited resources.

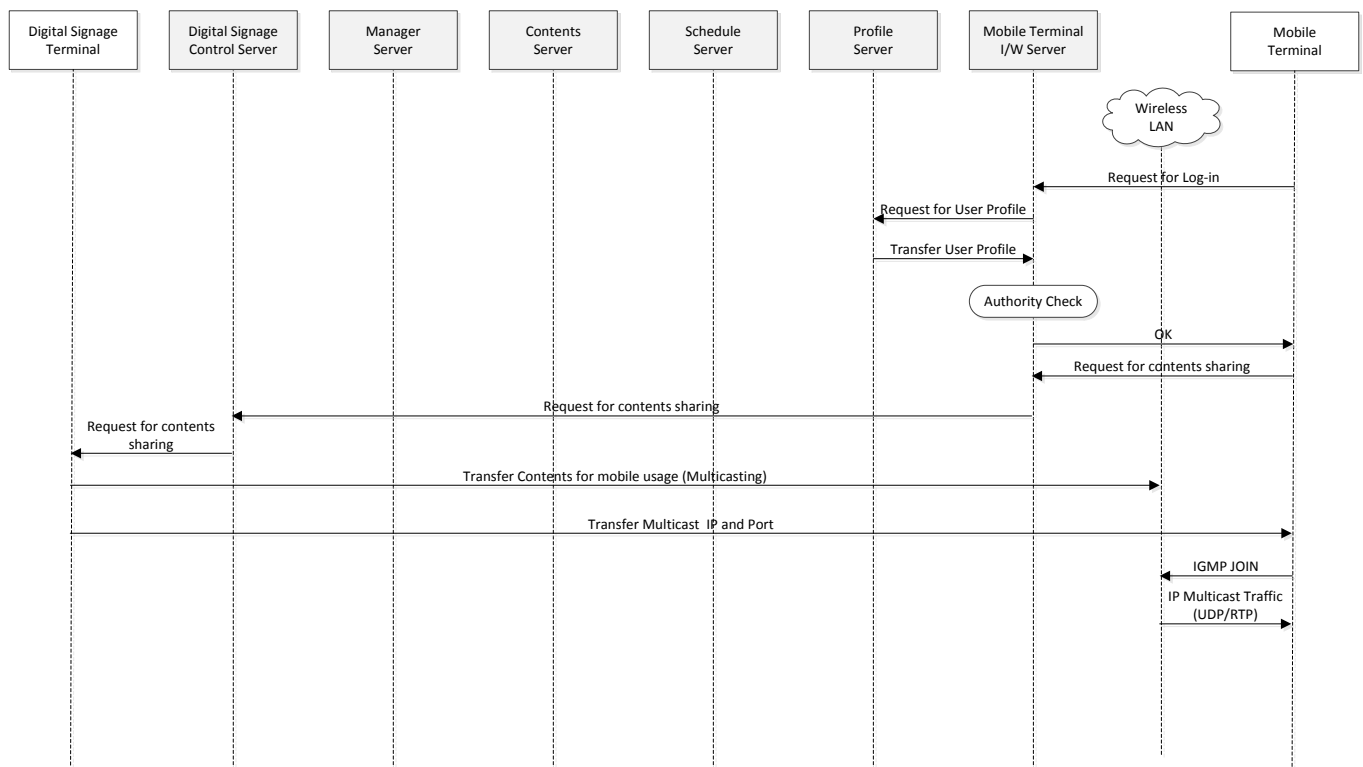


Figure 3. Signal Flow for Contents Sharing with Mobile Terminal

IV. CONCLUSIONS

Digital signage system is a display device that shows advertisement, information and other messages. As the interactions with user's mobile terminals become more important, the transfer of contents between digital signage terminal and user's mobile terminals occurs frequently.

There are issues related to networked digital signage systems such as real-time delivery of news signage, open formats of signage contents, efficient use of network bandwidth etc. [5]. Especially, because wireless network environment has limited resources, simultaneous interactions with multi-user's mobile terminals can cause the shortage of network bandwidth.

In this paper, we suggest the architecture of the digital signage system and the method for efficient contents sharing between digital signage system and mobile terminals through the diagram of architecture and signal flow. The key ideas of efficient contents sharing method are transformation of contents for mobile and transfer contents to mobile terminal through multicasting. This contents sharing method will be applicable to the disaster broadcast to the mobile terminals by using the digital signage terminals as relays.

For the future work, we can research for the optimization of the transformation of the contents for mobile terminal or we can consider the Dynamic Adaptive Streaming over HTTP method for contents sharing between digital signage terminal and user's mobile terminals [6].

ACKNOWLEDGMENT

This research was supported by the KCC (Korea Communications Commission), Korea, under the R&D program supervised by the KCA (Korea Communications Agency) [KCA-2012-12912-03001, Development of Context-Aware Tele-Screen System Technology]

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