

The Digital Signage System Supporting Multi-Resources Schedule on an Elevator

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Abstract

With the evolution of the IT convergence environment, IT industry is expanding in various convergence services. Digital Signage market is increasingly expanding into more diverse areas such as way finding, place making, exhibitions and public installations. And also, the system for an elevator is required for a comprehensive and flexible digital signage environment which can accommodate a wide variety of content, devices and machine notification. In this paper, we propose an integration digital signage platform supporting a various contents and devices based on open framework structure. And we will apply the system to an elevator environment. It includes a schedule and service method for various devices and resources on an elevator. It will be able to make the system flexible and efficient for various market, contents and devices.

Keywords: *Digital Signage, Multi-Resources, Integration, Contents, Scheduler, Elevator, Smart Service, Lift*

1. Introduction

With the development of IT convergence technology, a connection structure of the conventional systems has been attempted in various ways. In one of these approaches, Digital Signage system is used diverse areas such as way finding, place making, exhibitions, public installations, marketing and outdoor advertising etc. And the system display content such as images, video, streaming media and information in public spaces, museums, stadiums, retail stores and restaurants so on[1]. So the system is required for a comprehensive and flexible digital signage environment which can accommodate a wide variety of content and devices. But this system can be implemented depending on the particular manufacturer. And also the system is needed to display various contents with flexibility. For this, in this paper, we propose an integration digital signage platform supporting a various contents and devices for an elevator based on open framework structure. We show the design structure for multi contents and device and present the schedule and play methods for an elevator. It will be able to make the system flexible and efficient for various market, contents, devices and machine notification.

The remaining parts of the paper are organized as follows, In Section 2, we discuss the related technology for the digital signage. In Section 3, we propose the integrated digital signage component and relation for multi resources. Section 4 presents the technique of the Digital Signage System supporting multi-resources on an elevator environment. In Section 5, we propose the implementation model of the proposed system. And last, Section 6 concludes this paper.

2. Related Works

2.1. IT Convergence of the Digital Signage

Digital Signage industry is rapidly evolving in different environments, and the applications are also being expanded in many areas. Generally, a digital signage system use content management system, media distribution system and schedule management system so on. And also, the system is available through real-world interfaces such as touch screens, movement, detection and image capture for user interaction [2]. Some related studies exist. out-of home advertising show the technique to display video content, advertisements and message to specific locations and consumers at specific times[3]. And in the digital signage screen area, various studies using 3D technique have been conducted such as holographic display and water screens *etc.*, [4, 5].

Contents for the Digital signage system includes text, images, animations, video, audio, streaming media so on. And the contents have to useful and efficient to a user to produce a return on investment because it more expensive system than static signage system [6]. The Digital signage system relies on various hardware and includes display screens, media players, a content management server. So the system need to a comprehensive and flexible digital signage environment which can accommodate a wide variety of content and devices.

3. Components of the Digital Signage System Supporting Multi Resources

3.1. The Multi-Resources of the Digital Signage System

First, we define multi-resources of the digital signage system for an elevator. For the flexible digital signage system for various resources, it needs to design structure to support a wide range of resources. Generally, the digital signage system has elements such as media board, signage server, content server and events that can occur in a variety of environments. And these elements have various resources such as contents, devices so on. Figure 1 show the relation between the digital signage components with various resources. Basically, Media Board has a different display environment, and Signage Server contains components for managing the environment for this system, and Content Server manages various content information required for the digital signage services these components need to be operated at the right time according to the event based on schedule There are three devices that are a signage server, a content server and a media board for a digital signage system. Those devices are composed of a variety of forms. First, the content server includes various service contents available in the digital signage.

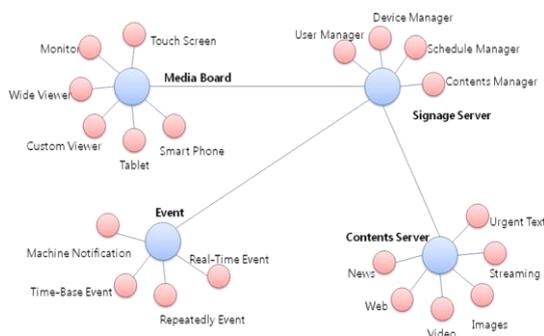


Figure 1. The Elements for the Digital Signage with Resources

It is required effective configuration to control those contents. Second, Media Board display contents with various display configurations included wide bar, custom screen, tablet and smart phone so on. It also needs to control this screen efficiently. And the signage server has four components to control those contents and devices. Those components are user management, device management, contents management and schedule management. Figure 2 show the relations of the server components.

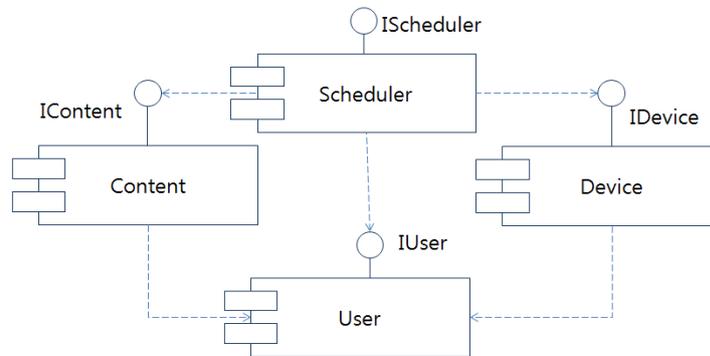


Figure 2. The Components for the Digital Signage Server

In the signage server components, User Management component is used for the access control according to the user level. It manages security level for user who can register and manage contents in the contents server. Device management component is used to register devices for digital signage service and monitors each device status. And also it includes device specification. Content management component manages various contents registered in the content server. It has functions such as new contents registration, monitoring contents and modification of contents configuration. Schedule management component organize multi device configuration and efficient distribution policies of advertising based on resources specification. It provides functions such as generating scheduling information for each device and transmission of resources to the media board.

4. The Techniques of the Digital Signage System Supporting Multi Resources for an Elevator

This chapter deals with the techniques of schedule generation scheme and media board supporting multi resources that are the core elements of the digital signage platform design for an elevator.

4.1. Scheduler Service Supporting Multi Resources

We define the type of events that could occur in digital signage for an elevator. The event types are divided into repeated type event, time oriented type event, real time event and machine notification event. And also, Contents defined in the schedule have a variety of formats. In addition, those contents arranged to be operated smoothly by the needs of the user. It can be separated into repeated content type, time-oriented content type and urgency content type according to the schedule types. Figure 3 shows repeated and time-oriented content type concepts. Repeated content is serviced by schedule provided with cycle data repeatedly. The contents are given content type and display time in the schedule and should be arranged smoothly. In this paper, this type of service is called a Data Service. Time-oriented content , as a method to service it by streaming media, is started at a certain time and is stopped when the end time event occur.

Contents Types

Repeated Contents – Data Service

Image	Video	Image	Image	Web	Web	News	Video	Image	Web
I	V	I	I	W	W	N	V	I	W
5sec	0	3sec	5sec	7sec	7sec	60sec	0	5sec	5sec

Time-Oriented Contents – Streaming Service

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
							kbs	news										notice					

Event-Driven Contents – Event Service

Event A	Event B	Event C	Event D	Event E
I	V	T	I	T
5sec	20sec	10sec	5sec	7sec

Figure 3. Repeated and Time-Oriented Content Concepts

The time-oriented content service has higher priority than repeated content service. When the time-oriented content service needs to show the content, repeated content is stopped and then the service is started. After the time-oriented content service terminates, the repeated content service is restarted. Urgency content service is operated independently when the content needs to be known instantly. The service has the highest priority. Contents defined in the schedule have a variety of formats such as video, image, text, streaming video, system information and web data, so on. And the contents have three model types. Repeated Type content, Time-Oriented Type Contents and Event-Driven Type Contents. Repeated type content is serviced by schedule provided with cycle data repeatedly. The contents are given content type and display time in the schedule and should be arranged smoothly. Time-oriented type content is started at a certain time in the scheduler and is stopped when the end time event occurs. And last Event-Driven type Contents occur when the system makes specific events to know the situation of the system such as building, office and elevator situation, so on.

4.2. The Schedule Structure for a Multi Content Service

Figure 4 shows the schedule structure for a multi content service. The schedule structure has a device id, a model type and created date. The device id and the model type are used as a factor in determining the method of the display. play_order attribute contains repeated contents in order. Each repeated-content has content name, type, order, duration time. time_player attribute contains time-oriented contents. And also the time-oriented contents has name, start time and end time. machine_player attribute contains machine event contents that can occur in the elevator machine such as warning, building fire, so on. Urgent attribute has real time urgent text and transfer the text to Media Board. The urgency attribute has urgent message and created time. Contents attribute contains specific information about the content used in play_order, time_player, machine_player and agent. It manages various types of content such as news, video, image, web, stream, etc. By separating the content and schedule information, the schedule data has a structure easy to incorporate various content information on various events.



Figure 4. The Schedule Structure for a Multi Content Service

4.3. The Operating Media Board for Multi-Resources

Media Board operation method can be operated in a variety of formats depending on the content type and device models. Figure 5 shows the relationship among those components that is required for the operation of the media board. Boot Receiver is a component that carries out the Signage Service at the same time as the device started. The Signage Service is components that perform a central role in the Digital Signage Services. It acts an update management, an environment management and a content display. The Configure component manages the setup information needed to perform a Media Board such as media type and server information etc. Check Updater connected to the Digital Signage Server has the information update check function. When changing the schedule from the server, Check Update stops the current playing service, and then it starts a new changed service in accordance with the schedule after downloading the relevant content with the Loader component. Schedule Loader, Video Loader, Image Loader and Text Loader include the ability to download content corresponding to themselves. Signage Player executed by the Signage Service provides schedule-based content display service using the respective Task. Each type of content is served with a separate Task. Time Task manage streaming of the time base and generates an event at a given time by the scheduler to stop the current display task and start stream service. Repeat Task manage repeated data such as Web Task, News Task, Image Task, Video Task so on. Event Task manage machine notification event and real time urgent message. Those methods can give efficient approach through a variety of contents service based on schedule.

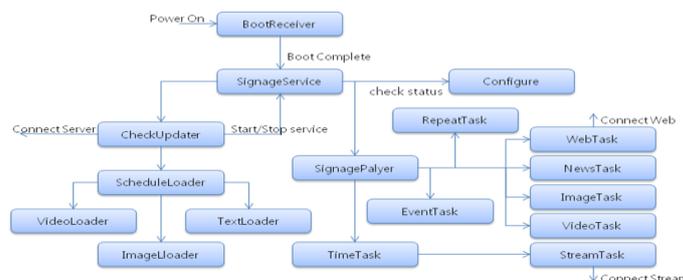


Figure 5. The Relationship among Media Board Components

5. Implementation of the Digital Signage Platform supporting Multi resources for an Elevator

The Implementation of the Digital Signage platform for the various resource environments includes management of contents based on web and media service based on Android system. This chapter shows the overall system implementation model and software architecture for the media board.

5.1. The Implementation Model For The Overall Digital Signage System

Implementation model for the service is shown in Figure 6. Web-based management tool provides registration modification and management of the information such as user, device, schedule and content. User Management Tool can manage user level that can use the signage server and also control contents access permission. The Device Management Tool can monitor the media device status and also manage device profile information simultaneously. Through The profile information, this tool can manage display type on the device and the elevator-related information. Schedule Management Tool makes the schedule data that can be translate to the Media Server. Schedule data is consisted of repeated type, time oriented type, real time type and machine signal type that was defined in Chapter 4. This Data depending on the type of events has associated structure with the Content Server. Content Management Tools, through registration, modification, deletion process of contents, manage content pool for a wide variety of content that is used in the schedule data. The Contents server used to the scheduling by using the registered content in the contents server has a function of managing a variety of content sources. We applied various contents such as news, video, audio, image, web page, streaming video and game.



Figure 6. User Control Flow of Registration, Entrance and Exiting

Android based Media Board display various contents through various devices based on the schedule provided by the Web-based Digital Signage server. Elevator-related event signal is generated from the elevator control panel; the generated signal is transmitted to the media board. At this time, the media board performs a registered event process in the scheduler and passes that information to the digital signage server. So the digital signage server can recognize the situation rapidly.

5.2. The Software Architecture of the Digital Signage Server

Figure 7 shows the Digital Signage Software Overall Architecture. We designed the server system based on web service.

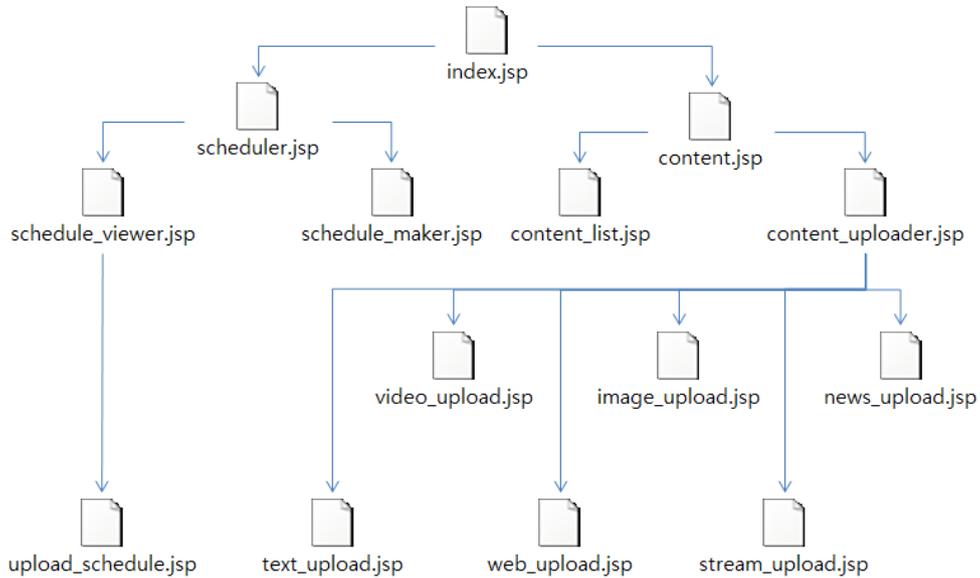


Figure 7. Digital Signage Server Software Components

The Server system divides into scheduler and content parts. Content part has content_list and content_uploader component. The content_uploader component uploads various contents such as video, image, news, text, web, stream so on. The content_list component show the registered content information with service types. This content_list component is used to schedule_maker component when the scheduler_maker make the schedule information. The scheduler component has function schedule_viewer and schedule_maker. The schedule_viewer component checks the schedule that made by schedule_maker. And schedule_maker make the schedule data that we defined at Scheduler Service Supporting Multi Resources in Chapter 4.

5.3. Software Architecture of the Media Board

Figure 8 shows the basic software class diagram of the Media Board for the multi contents. The main Activity of the software is Signage Service Activity. The Signage Service Activity initiated through Boot Loader make Schedule Data Object and operates the related content based on the schedule. The download classes are used for the specific content download. And also Update status information is managed by Update Time download class. Each of the content is controlled by the Task.

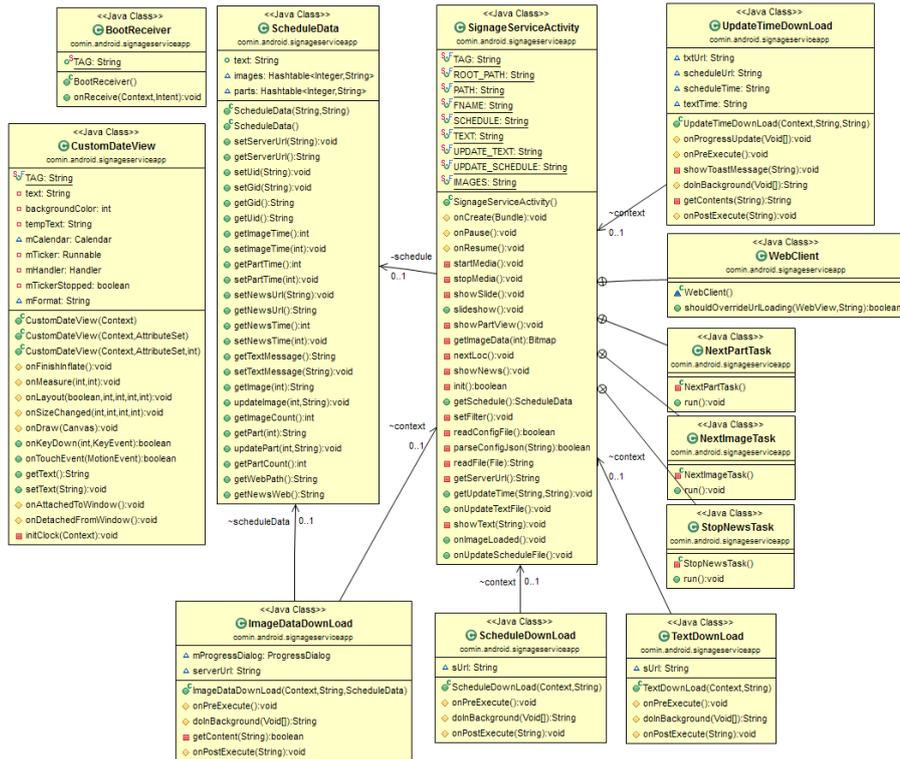


Figure 8. The Basic Class Diagram for Media Board Supporting the Multi Contents

Boot Receiver class has an on Receive method that can start when the system is completed booting service. Custom Data View class determines the shape and structure of the main screen. Size and shape of the screen represented by the device profile information, and on the basis of an elevator information, the class is used to determine the service type of the system. Schedule Data class instantiated to manage the date of the schedule information transmitted from the Digital Signage server. The content information and the representation method of the each event are associated in this class. Signage Service Activity class service is Digital Signage main control module. First, the class defines the main environment via the device information, and determines the expression method by Custom Data View class, and also it checks the latest information of the server and updates the schedule information when changing. In addition, this class provides the required information at the right time through the control action on the events that occur. In addition, by the process of the media data playback and stop functions and the event information generated in the elevator, the class manages a life cycle between the overall digital signage controls. Update Time download class is used to check current version of schedule. If it schedule is not current schedule version, it download latest schedule information by using Schedule download class. Image Data download, Video Data download, and Text download classes are used to download offline data that is saved in the local storage. And also each Task class controls the each content.

5.4. System Architecture of the Digital Signage Supporting Multi-Resource in the Elevator System

Figure 9 shows the IT convergence elevator system architecture that we want to build. The red circle part shows the digital signage system components in the elevator system.

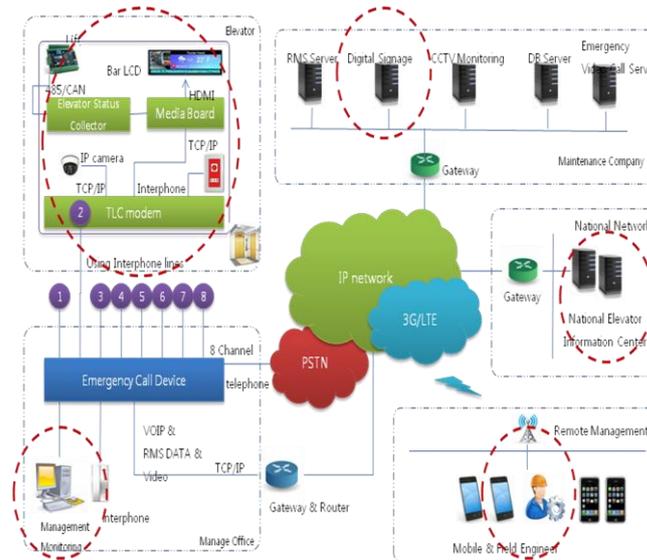


Figure 9. The Digital Signage Component in the Elevator System

For the Digital Signage System in an elevator, Network environment is made through the intercom line modem using Telephone Line Carrier because It cannot used to the other external lines in the elevator. In the elevator car, there are Elevator Status Collector, Media Board, Display Device and TLC(Telephone Line Carrier) modem for the Digital Signage System. Elevator Status Collector monitoring the elevator status through the elevator control panel and generates a status event for transmission to the media board Rapidly when the problem situation caused by the elevator control panel. Media Board display the Advertisement to the display device based on the schedule that transmitted by the Digital Signage Server. This communication is achieved through the emergency call system within the Management Office. In the Management Office, There is a monitoring system that can check the elevator status and the playing status of the Digital Signage System. The maintenance company manages a variety of elevator-related systems such as RMS, Digital Signage, CCTV, elevator-related database, Emergence Call System etc. They each have the converged structures. This structure is also provided the associated environment with the National Elevator Information Center. It can serve a variety of information of the elevator to the digital signage system. And also we can control the system by mobile device.

We made an integrated structure with RMS, Digital Signage, Emergency Video Call, and CCTV in the elevator with integrated structure of the national elevator information center. They are required to the elevator for safety and convenience. So its solution can manage the elevator efficiently with IT convergence.

5. Conclusions

With the growing of the Digital Signage market, there are a variety of content and device. This situation requires the digital signage platform suitable in a specific environment that has a more flexible and natural configurations. In this paper, we proposed the construction method of the Digital Signage platform for supporting various resources in the elevator system. This approach includes techniques such as a display device software structure to provide more flexible services structure and the architecture of the scheduling, event processing, digital signage system hardware architecture for the elevator environments and content management based on various resources and devices. And we presented a scheduling method and a schedule structure based on event types for the effective use of multi-resources. And also we proposed the media server and the

media board structure that can express our various resources based on our approach. And last we show the implementation model of the Digital Signage system for an elevator. In addition, we apply the proposed digital signage system for an elevator supporting multi-resource to the integrated system of the elevator. The efficient resource scheduling can be possible through a combination of a repeated model, a time-based model, real time model and machine notification model so on. By doing this, It could be able to build a more efficient elevator service model applied to various devices using various contents.

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