Design and Implementation of Elevator WeChat Public Supervision System based on SOA

Jie Chen
370 Lubin Road, Cangshan District, Fuzhou City, Fujian Province, China.
Email: 30613687@qq.com

Abstract. A WeChat public supervision system for elevator maintenance was designed aimed at the problems of elevator maintenance status monitoring and elevator safety supervision. Combined with ”Internet +” and big data supervision, aiming at the loose coupling characteristics of the system, using the unified development technology system (J2EE), introducing the concept of SOA layered and distributed system architecture, and finally the unified application service management platform was established. On this basis, the unified management of the elevator application management system was realized. The elevator information supervision system has the characteristics of public participation supervision, traceability of maintenance records, and benigh interaction between supervision and the public, which will contribute to the further development of intelligent elevator supervision.

1. Introduction
As a kind of special equipment which brings great convenience to people's work and life, the safety condition of elevator also affects the social nerve all the time. With the continuous growth of elevator ownership along with the deepening of industrialization, the number of serious safety accidents caused by sudden failure of elevators, mainly due to improper maintenance, resulting in casualties and heavy property losses, has also been on the rise, and social attention has also begun to focus on the safety status of elevators.

As a component model, service-oriented architecture (SOA)[1-2] can encapsulate and publish different business function modules through service interfaces and integrate them into the final application. The interface defined in a neutral way is completely independent of the hardware platform, operating system and programming language, which makes the services in the system represent good compatibility and interaction. SOA architectures are characterized by reusable, loosely-coupled, well-defined interfaces, stateless service design, and open standards[3-7] so systems based on SOA architectures show good adaptability to situations where business is changing rapidly[8-11].

The public supervision system for elevator maintenance quality is still in a blank stage in China. System architecture based on SOA to WeChat public platform as the carrier, will the elevator running status and maintenance mechanism of information for centralized management, realize the basic information and routine maintenance the real-time update and release of information, to ensure the public's right to know and participate, form the public on the elevator running status and the effective supervision of maintenance quality, the promotion of social work in the elevator safety.

2. Demand and Business Analysis of WeChat Public Supervision System for Elevators
In this paper, a system is developed to improve the quality of elevator maintenance and improve the level of elevator safety supervision. The concept of ”Internet +” is integrated into the supervision of
big data, so as to realize the informatization supervision of elevators with public participation, traceability of maintenance records and benign interaction between supervision and the public.

2.1. System Demand Analysis
Elevator supervision department (quality supervision department) can obtain the status information of elevator inspection and maintenance in its jurisdiction in real time through this platform, and provide scientific and efficient data support for legal supervision. Through the extensive collection of public evaluation and complaints on the use of the elevator, the conclusion of big data analysis is formed, which provides a powerful basis for the quality credit rating of the elevator maintenance units in the district.

The public can participate in the supervision of elevator safety through WeChat, a widely used Internet social tool, and elevator maintenance information can be presented to elevator users openly and transparently. When the elevator maintenance is found not standard, abnormal operation, etc., the public can complain and report through the system, so as to realize the strong supervision of the public on the maintenance unit, and make up for the lack of supervision of the superior regulatory department.

The elevator maintenance unit can dispatch the work order of maintenance tasks online and upload the work information of maintenance through the system, so as to improve work efficiency and reduce work omissions. At the same time, its maintenance behavior is always under the strong supervision of the public, which can prompt the maintenance unit to strictly implement the safety responsibility and fulfill the maintenance obligations agreed in the contract. The specific system structure is shown in Figure 1.

2.2. System Business Analysis
The system is based on mobile Internet information technology and a set of service oriented elevator WeChat public supervision and management system, which can simultaneously monitor the maintenance unit, maintenance personnel and the insured elevator. The elevator maintenance status and elevator safety supervision information are released to the public in real time to meet the public's right to know about elevator public safety and improve the participation of the public. Through the construction of the system, the multi-party information communication bridge is established to promote the elevator safety co-construction.

3. Design of WeChat Public Supervision System of Elevator based on SOA Architecture

3.1. Design Scheme based on SOA Architecture
This system takes The Web Service as the means, adopts the SOA architecture, the application, the network, the hardware each platform can realize the interactive call with the application as the medium.
3.1.1. System logic architecture. The logic process of critical business operation of elevator WeChat public supervision system includes data acquisition and analysis, data storage, data use (call), review and authorization, external release, etc., and the specific logic architecture is shown in figure 2.

![Data acquisition diagram](image1)

**Figure 2.** Data acquisition diagram

The business objects of this project system can be divided into two categories: data acquisition objects and data use objects. The data collection object is the data source of the system, mainly the construction personnel who upload the elevator maintenance information. Some basic data can be called from the business system of relevant government departments. Data usage object refers to the person who has the right to call business data after the system development is completed. Various types of business data will be published as standard data interfaces, and organizations or departments that need to use this interface need to apply for review and authorization. At the same time, the collected data can be collated and audited and released to the public.

3.1.2. Physical architecture of the system. The whole system is deployed in the Internet regional environment of the local government affairs cloud platform, connected to the Internet, and deployed in the server space of the Internet region of the government affairs outer network. The specific architecture is shown in Figure 3.

![Physical structure of the system](image2)

**Figure 3.** Physical structure of the system
3.2. System Function Design
Elevator WeChat public supervision system includes three parts: elevator safety supervision subsystem, maintenance APP subsystem and elevator WeChat public platform subsystem. Figure 4 describes the core business process of elevator WeChat public supervision system. Maintenance information flows from formation to circulation, forming a complete data transmission link between maintenance personnel, maintenance units and the public.

Elevator safety supervision subsystem, the function module includes elevator basic information, elevator claim management, maintenance information management, safety inspection and supervision and data synchronization update. Maintenance APP subsystem provides maintenance operation management, maintenance information input and other functions for elevator maintenance units. Figure 5 depicts a data flow diagram of maintenance information. The elevator WeChat public platform subsystem is based on the huge user base of WeChat client and takes the WeChat public platform application development interface as the carrier to extend various fast user interaction functions. It mainly includes elevator fault information and complaint uploading, elevator maintenance information publicity and directional push, public evaluation and consultation on maintenance service, elevator one-click rescue and so on. Figure 6 shows the process of the public inquiring the elevator maintenance information.

![Figure 4. System business process](image)

![Figure 5. Maintenance data flow chart](image)
4. Realization of WeChat Public Supervision System in Elevator

In order to verify the scientific nature and feasibility of the system, the following is the implementation of the soa-based WeChat public supervision system for elevators proposed in this paper.

4.1. System Development and Application Environment

Aiming at the loose coupling characteristics of the system, the idea of SOA layered and distributed system architecture is introduced to establish a unified application service management platform and realize the unified management of the entire application management system. Unified development technology system (J2EE) is adopted to meet the requirements of Windows operating system application environment. Support a variety of application middleware, such as Apache Tomcat, etc. Relational database is used for data storage, and Oracle database is used as a unified data storage system. Web Service technology is used to realize data docking acquisition of application support layer. XML is adopted as the data transmission format of the data exchange process. According to the system design requirements of this paper, the principle of "separation of data and application deployment" is adopted for the host and storage system, and the balanced integration between host services is realized. Performance indexes of main host and storage system parameters are shown in Table 1.

| Serial number | Device name | Parameter specification |
|---------------|-------------|-------------------------|
| 1             | Database server | CPU: More than 2.5 GHZ, 8core  
Use: Data deployment, adopt application and data separation deployment mode, improve security and response performance. |
| 2             | AS(Application Server) | CPU: More than 2.5 GHZ, 8core  
Memory: DDR3 More than 8 GB  
Hard Disk: More than 500 GB  
Use: Application deployment, one deployment public number system, one deployment maintenance APP background and PC background. |
| 3             | File server | CPU: More than 2.0GHZ, 4core  
Memory: DDR3 More than 8GB  
Hard Disk: More than 6T  
Use: Deployment and maintenance of picture information storage |
4.2. System Implementation

Figure 7 is the general structure diagram of the software application part of the system, indicating the user access entrance, application content and other components of information. Figure 8, figure 9 and figure 10 are respectively the elevator safety supervision subsystem, the elevator maintenance subsystem APP and the WeChat public platform subsystem.

- Maintenance personnel record the specific elevator maintenance process through the maintenance APP and upload the maintenance records to the elevator safety supervision subsystem.
- through the elevator safety supervision subsystem, the maintenance unit realizes a series of daily management work such as dispatching of maintenance tasks and hiring and managing of maintenance personnel, and publishes the elevator maintenance process information to the elevator WeChat public platform subsystem.
- Supervisory departments realize unified supervision and management of elevator maintenance business, maintenance units and maintenance personnel through elevator safety supervision subsystem.
- after the public pays attention to the elevator b WeChat public platform through WeChat, they can bind the elevator identification code they follow to regularly get the push of elevator maintenance information and upload comments and feedback.

![Figure 7. Overall structure diagram of system software](image)

![Figure 8. Elevator safety supervision subsystem](image)
5. Conclusion

Through the system construction based on mobile information technology and SOA architecture, the daily maintenance of elevator can be uniformly managed, and the maintenance process can be data-oriented and standardized. At the same time, it can provide the elevator maintenance unit with convenient internal task management tools, which can realize the maintenance scheduling and dispatching quickly. Operation of the system can realize the elevator regulators, maintenance units, maintenance construction personnel and the public more closely linked to the level of social role, promote the society to build the elevator safety management, improve the safety management consciousness, greatly reduce the elevator safety hidden danger and accident rates, to ensure the safety of the people's life and property.

6. References

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