Research on Scheme Selection of Large Screen Display System in Traffic Emergency Monitoring Center Based on Cloud Service

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Abstract: with the Rapid Development of National High-Grade Highway Construction and the Progress of Science and Technology, the Screen Display System Has Been Fully Applied in the High-Grade Highway Monitoring System. Cloud Service is the Integration of Distributed Computing, Network Technology and Large-Scale Resource Management Technology. According to the Requirement of High Integration of Urban Traffic Automation System and the Problem That the Performance and Structure of Traditional Integrated Monitoring System Are Difficult to Meet, the Large Screen Display System Scheme of Urban Traffic Emergency Monitoring Center is Proposed by Analyzing the Key Technologies and System Architecture of Cloud Service. the Aim is to Realize the Functions of Dynamic Monitoring of Dangerous Parameters of Running Vehicles, Comprehensive Early Warning and Accurate Positioning, to Ensure That They Can Respond Quickly When Accidents Occur, and to Provide a Reference for the Current Emergency Rescue Work of Urban Traffic Accidents.

1. Introduction

At Present, the Number of Road Traffic Accidents in Our Country is the Highest in the World Almost Every Year and the Death Toll is High. the Safety Situation is Very Grim [1]. as Far as the Current Emergency Rescue System in Our Country is Concerned, Although We Have Accumulated Some Experience and Formed Some Effective Mechanisms in Our Long-Term Work, There Are Still Many Problems in the Current Emergency Rescue System. Cloud Service Can Put Traffic Emergency Alarm, Emergency Rescue Response, Rescue Resources, Rescue Plan and Rescue Command System on the Network. in the Process of Emergency Rescue, Rescue Personnel Use Different It Equipment to Connect to the Cloud At Any Time and Place [2]. to Complete the Monitoring of the Operation of the Line Traffic, and Closely Combine with the Urban Rail Transit Management System to Form a Set of Traffic Command, Train Operation Management, Equipment Monitoring, Communication Management and Maintenance Management. the Large Screen Display System is Organically Connected with the Computer Network System and the Video Image Monitoring System, and Various Information Can Be Comprehensively Displayed, Thus Playing an Increasingly Prominent Role in the Expressway Monitoring System [3]. through the Data Center to Fully Mine and Share Data between Different Systems, the Control Strategy is Automatically Optimized for Different Environments, and Multi-System Integrated Intelligent Operation Control is Realized to the Maximum Extent.

2. Selection of Large Screen Display System

2.1 Area Requirement

The System Controller and Control Software Can Be Used on the Large Screen to Realize the Comprehensive Display of Video Image Signals, Computer Signals, Electronic Maps and Various Computer Graphic Information [4]. the Selection of Large Screen Display Information and Display Area for Expressway Monitoring Needs to Be Determined According to Specific Conditions. We Can Use Mature Splicing Technology to Solve the Display Area Requirements. Brightness

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Determines the Visual Effect. At Present, Dlp Display Units Mark the Lumens of Projector Light Output, Which is Generally 800-1000 Lumens. If the Brightness Value is Changed, the Actual Front-Screen Brightness of Dlp Display Units of about 67 Inches Should Be 20c0-3c0cd/M2, the Front-Screen Brightness Value of Liquid Crystal Display Units is 700 Cd/M2, and the Front-Screen Brightness of High-Definition Small-Pitch Digital Led Display Systems Can Be as High as I 200 Cd/M2. in Case of Natural Disasters and Traffic Emergencies, the on-Site Voice and Image Shall Be Timely and Accurately Transmitted to the Emergency Command Center to Provide Real First-Hand Information for Rescue Leaders and Experts for Remote Consultation and Improve the Emergency Response Ability. from the Perspective of Space, Only Lm Space Needs to Be Reserved Behind the Tv Wall of Plasma Splicing Display Technology and Lcd Splicing Display Technology, While the Projection Display System of Dlp Technology is Related to the Brand of Projector, Which Generally Requires 2-3m Darkroom Space.

2.2 Economy and Maintainability

The first consideration in the scheme selection is the cost-performance ratio, which requires reliable performance quality and the overall cost does not exceed the budget. Secondly, the selected scheme should be put into practice, the operation and maintenance cost should be low after delivery, and timely and convenient technical support can be provided [5]. Due to the wide color gamut of LED lamps used in the high definition and small spacing digital LED display system, the screen can experience very good color restoration effect when displaying various pictures and video programs, and can perfectly reproduce the gorgeous colors of the real world. All kinds of schemes and systems have mature and reliable equipment suppliers. The cost can be effectively controlled. In terms of performance, the characteristics of each system are also very distinct. Here we try to consider the requirement of monitoring function and discuss the feasibility of scheme selection from the aspect of maintenance. The traffic emergency communication system should be able to timely and reliably report the disaster situation to the leading department in case of traffic accidents, disasters, etc.; At the same time, command orders concerning emergency rescue, disaster relief and accident treatment shall be timely and accurately transmitted to the scene of the accident [6]. In terms of processing, the emergency command system can be regarded as a special information system based on the traffic monitoring system's data collection, traffic guidance information release and communication system. It shares some infrastructure, including databases, with the traffic monitoring system. According to the current application situation, plasma splicing display technology has a tendency to replace rear projection display system in highway applications.

2.3 System Reliability

With the gradual strengthening and emphasis on the importance of “supervision” and “control” in the operation and management of high-grade highways, the requirements for large-screen display systems should be characterized by stable and reliable operation, and the continuous working capability of the systems should be ensured. The high definition and small spacing digital LED display system adopts pixel-level point control technology, thus realizing the state control of brightness, color reducibility and unity of the pixel unit of the display screen [7]. The information channel is the feedback mechanism of the control system, and then the monitoring information is obtained through the early warning organization or personnel, and the actual situation of the early warning indicators is fed back to the early warning management personnel through the information channel, which provides the reference basis for the early warning management personnel to implement the pre-control countermeasures. The arrangement of traffic information collection and traffic guidance instruction issuing equipment for each road section and the formulation of the specific control scheme depend on the position and traffic volume characteristics of each road section in the expressway network. Practice tests show that the plasma splicing technology display system is in the leading position in terms of reliability, with its service life of about 60,000 hours or more, the LCD splicing technology display system's service life of about 50,000 hours, and the DLP technology rear projection display system's continuous working capacity is average, and is related to the life of light bulbs, which need to be replaced regularly in 2000-4000 hours.

3. System Design

3.1 Overall Structure

The architecture of the traffic accident emergency rescue system based on cloud real-time monitoring is shown in Figure 1. the system consists of a cloud platform, a user end, an equipment end and a network access layer providing the user end and the equipment end with internet access. the equipment forms a communication network by establishing connection with the cloud platform. The first layer is the hardware infrastructure layer, which selects servers with better performance as the hardware entity resources of the platform. The second layer is the virtualization layer, which abstracts the infrastructure of the first layer to form virtual resources and manage virtual machines at the same time. Realize the rapid detection and confirmation of traffic emergency events, the rapid determination of rescue accident levels, the rapid deployment of rescue materials and personnel, and the rapid and comprehensive release of rescue information.

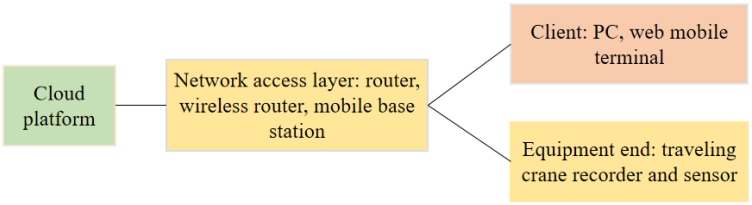

Fig.1 Traffic Accident Emergency Rescue System Architecture Based on Cloud Real-Time Monitoring

Cloud platform is a data service center that provides unified terminal management, mass data storage, remote instant messaging, high-performance computing and analysis services for the system. Cloud platform can realize effective terminal management and provide terminal registration and authorization management. Data of all kinds of business logic applications and access subsystems will be analyzed and processed in the cloud service center, and all electromechanical specialties and traffic and operation information management will be accessed through all user terminals.

3.2 Information Acquisition Subsystem

The information acquisition subsystem needs to acquire acceleration information of the running vehicle, vehicle inclination angle and video during running. The sensor data are analog signals that cannot be recognized and need to be converted into digital signals for easy processing. Each professional application software applies to the cloud data center for corresponding computing, storage and network resources and makes corresponding deployment. The STM32 chip is used to acquire sensor signals, which are sent to ESP8266 WIFI module through UART serial port communication, and then uploaded to the cloud platform server through WIFI forwarding via router. Accident detection in this system is mainly divided into two modes: accident alarm with equipment arranged at the accident site and manual accident alarm. Accident alarm information is uploaded to the cloud through network communication, and after receiving the information, the cloud sends the alarm information to the terminal equipment of relevant personnel to urge them to confirm the accident. After comparing the feedback actual effect information with the early warning index standard, the management personnel will find out the gap between the two, correct the standard, improve the measures, and restart a new round of early warning control process. Traffic monitoring center and emergency command center are set up in the whole network to complete traffic monitoring, emergency event handling and management coordination between the sub-centers for road section monitoring in the expressway network.

3.3 Information Transmission Subsystem

The information transmission subsystem needs to transmit the data collected by the triaxial acceleration sensor and the gravity sensor and the video of the traveling crane recorder to the cloud platform in real time, and at the same time to realize the transmission of the alarm short message to

the mobile device and the remote access of the video of the cloud platform server when an accident occurs [8]. Application logic realizes relevant application layer logic and application services according to monitoring application requirements; The user interface provides an application interface for monitoring users. The logical structure of the integrated automation system is shown in Figure 2.

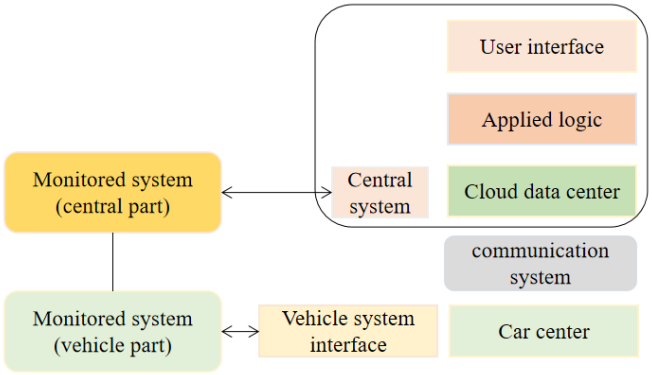

Fig.2 Logic Structure of Integrated Automation System

When the virtual machine fails or the memory is insufficient, the automatic migration and expansion technology of the cloud platform can realize the expansion in a short time without affecting the system operation, thus ensuring the reliability of the system and saving the operation and maintenance cost. The original video data is compressed and encoded by H.264 compression and encoding technology in Hi3516 chip, and the data is packaged and transmitted to the mobile terminal under the support of RTP protocol. Traffic problems occurring in road sections that do not affect the overall situation shall in principle be handled by the road section monitoring sub-center and filed with the road network traffic monitoring center. The data server cluster system is responsible for quickly and correctly storing the input data stream into the real-time database and providing database functions such as querying, modifying, adding and deleting historical data.

4. Characteristic Analysis of Integrated Automation System

4.1 Highly Integrated

The cloud data center provides real-time data query, information monitoring and screening pretreatment by storing massive process data generated by all subsystems in real time after the cloud service platform is utilized to realize the convergence of all subsystems. In the cloud platform of the comprehensive early warning subsystem, the communication models of terminal access, rule-based heterogeneous data storage and historical data management, user-to-device communication and device-to-device communication are completed [9]. The members of the accident rescue command team receive the accident rescue request information from the cloud, and can view the information such as video monitoring of the accident scene through the terminal equipment they hold to understand the situation of the accident scene. The virtual machine export and import mechanism exports data to external storage in the form of files, which can quickly recover the data in the virtual machine and achieve safe backup. After the mathematical modeling and analysis optimization of the data center, the parameter configuration and implementation mode of the data cleaning and preprocessing unit are determined, and the scheduling strategy of the load balancing system is analyzed and optimized. It is necessary to set up a communication system for the normal operation and management of the expressway network. It provides telephone, data and video communication for daily operation. The network topology structure is a ring network and endless chain structure [10] extending to each road section with the provincial communication center as the headquarters. Periodic historical data replacement storage is carried out on the massive data received by the cloud platform to ensure the stable operation of the whole system.

4.2 Availability and Reliability of the System

The traditional urban traffic operation management system generally improves the availability and reliability of the system by means of dual-computer hot standby, so that the system can be switched to another server in time in case of failure, thus ensuring the continuous uninterrupted work of the system. The traffic accident emergency rescue system based on cloud real-time monitoring embedded in the new traffic recorder can notify the traffic police department at the same time when a traffic accident occurs. In the rescue project, the rescue site conditions and real-time rescue information fed back to the cloud by other rescue organizations can be viewed in real time, and the rescue work can be adjusted accordingly. The management, service and storage communication planes are independent in the cloud platform, which fundamentally guarantees the data security of the integrated monitoring system. If the main machine fails, the standby machine is upgraded to the main machine through a double-machine diagnosis mechanism to replace the original main machine for work. The section communication network of each section and the trunk communication network of the whole expressway connecting each section network; The communication network of each section is used to meet the communication requirements of each section, including digital optical fiber transmission network, private telephone network, data communication network, etc. When multiple data backups are needed, in the traditional integrated monitoring system, data redundancy follows the principle of mutual exclusion of business hosts and backup machines, while cloud platform can better provide data redundancy services.

4.3 Cloud Architecture Scalability

In the original system, the developed programs and architectures all depend on fixed resources and network structures, and the application programs run on fixed resource entities. The cloud records the information of each accident and forms an accident database. After a period of time, very valuable accident data resources will be formed. These data can be used to form various reports so that relevant staff can fully analyze traffic accidents. Through virtual mirroring, multiple virtual machines can be easily created, which saves a great deal of work in engineering installation and configuration, and ensures a highly consistent operating environment. After adopting the cloud architecture scheme, the system is quite flexible when facing expansion. As all kinds of resources in the system are integrated by the cloud platform as basic equipment, and the application and resources are directly decoupled, the resources required by the application program can be allocated and released by the cloud platform in a scalable manner. So as to provide services for management departments to make macro decisions and formulate accident prevention measures, provide materials for traffic safety publicity and education, and provide basis for road construction and formulation of traffic regulations, thus providing better services for accident rescue and accident prevention.

5. Conclusion

Cloud service has developed rapidly as a new information technology. Through analyzing and summarizing the application and research results in this field, and combining with the specific application of urban traffic intelligent operation management system, this paper puts forward the large screen display system scheme of urban emergency monitoring center based on cloud service. This system skillfully combines various mature technologies. In the current market, similar systems are still rare. This system is based on the concept development of cloud real-time monitoring, which can judge the occurrence of traffic accidents and automatically alarm, and has application value. The communication between each rescue team can quickly and unimpeded send rescue information to the corresponding personnel through the cloud, so that rescue work can be carried out quickly and orderly. The ultimate goal of the scheme selection for the large screen display system of the expressway monitoring center is to satisfy the users of the system, achieve the expected monitoring purpose, and is convenient to use and easy to operate. It is suggested that when selecting the scheme of large screen display system, it should be considered and demonstrated in many aspects in

combination with the actual situation of the project site.

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