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# Realization of Digital TV Network Management System based on WEB

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## Abstract

**With the rapid progress and development of our country's digital, network, and communication technologies, digital TV is currently facing a more rapid scientific research and technological reform. Many countries are working hard to accelerate the development of digital TV and develop these new types. Digital TV work has gradually become an established strategy for many local governments to promote national informatization. This paper studies the web-based digital TV network management system. After analyzing the system requirements, the system is designed and tested. The test results show that the average response time of the system is 210ms, and the system response can be seen the time is still relatively short, and then the system pressure is tested, and the result is that when 30 users log in, the system login response time and operation response time are relatively stable.**

## Keywords

**Digital TV; Management System; System Design; Response Time.**

## 1. Introduction

With the development of our country's terrestrial digital TV business, the scale of terrestrial digital TV networks and the number of various types of equipment are increasing [1-2]. Relying only on traditional database systems to manage terrestrial digital TV networks and their operating conditions cannot meet the needs of current applications and future development[3-4], let alone scientific analysis, research and decision-making on their resource networks [5-6]. Therefore, it is necessary to improve the design and management of terrestrial digital TV networks with the help of advanced technology systems to improve production efficiency [7-8].

For network management research, some researchers have proposed that with the emergence of the Internet of Things (IoT), wireless sensor networks (WSN) have become more and more popular, and wireless sensor networks have become more and more widely used in the field of intelligence. Therefore, in order to ensure the Normal order and network efficiency, so a wireless sensor network management system with integrated functions is proposed. The system is developed using the SDN framework, which can centrally manage the entire wireless sensor network [9]. Some researchers have also proposed that traffic monitoring and anomaly detection are essential activities for computer network management because they provide relevant information about its current performance and help network control. Although there are many research results in this field, anomaly diagnosis is still a challenging problem, so in response to these problems, from the perspective of an expert system, a system that can actively monitor the network and detect abnormal events has been developed to reduce the possibility of manual errors [10]. Some scholars have conducted research on digital TV receiving systems. Some scholars have conducted research on digital TV receiving systems, including a first known data detector, a second known data detector, and a selector. The selector selects the

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position information with a larger correlation value detected by one of the first and second known data detectors [11]. In summary, there are still relatively few researches on digital TV network management.

This paper studies the digital TV network management system based on WEB, and has a general understanding of digital TV network management on the basis of related documents, then analyzes the system requirements, designs the system according to the system requirements, and finally designs the system conducts testing, and draws relevant conclusions through testing.

## 2. Research on Digital TV Network Management System

### 2.1 Demand Analysis of Digital TV Network Management System

(1) Configuration management

Once the managed devices on the network are identified and defined, the network management process can view network device information through the configuration management function to optimize network performance. Its typical functions include initializing or shutting down the managed device, collecting information about the current state of the managed device and detecting critical changes, and changing the configuration of the managed device.

(2) Fault management

Fault management is particularly important, because the failure of a specific component of the network may paralyze the entire network. It is necessary to quickly detect, detect, diagnose, and eliminate network errors to ensure the normal operation of the network. Generally speaking, non-serious network errors can be recorded in the error log from the perspective of the administrator, but in the case of a serious error, the administrator can be notified in time through the error alert mechanism. This error handling minimizes the impact on the network. Common troubleshooting steps include: obtaining device error information, analyzing the cause of the error, fixing the error, recording the troubleshooting process, and checking the scan results.

### 2.2 Application of Web Technology in Digital Tv Network Management System

(1) Dynamic display page technology

If the web applications you publish are all static pages (that is, traditional web server development), as your business grows, more and more HTML page programs will make it very troublesome to maintain your code later and expose new information. It will be more difficult. Therefore, it is very important to create a dynamic Web application. It can return different visit information for different visitor requests, that is, for different services. You can also directly publish and modify information through the back-end management page. No need to change the page schedule or add page schedules to create dynamic web application schedules to provide customers with timely information and differentiated services to meet the needs of different customers and dynamically return a variety of on-demand information.

(2) CGI realizes the dynamic generation of the page

The dynamic output cgi program is executed on the server side, and a corresponding html page is output according to various client requests. The web server will then respond to the client and provide this static page to the browser[12]. First, the user must select the url you want to use in the address bar of the browser or click a link to call a corresponding cgi. For example, the client connects to a server host with the domain name www.aaa.com on the network through url, calls and runs programs in the CGI directory through the web server, and exports dynamically generated HTML pages. Finally, the Web server returns the created HTML page to the client through the network.

### 2.3 Encryption Algorithm

Hamming distance between sequences WW(u): A DNA sequence u, V, WW (u,) of length n represents that the smallest H(u, v,) in all DNA sequences is greater than or equal to d.

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$$WW(u) = \min_{1 \le j \le n} \{H(u,v)\} \ge d \tag{1}$$

Among them, {H(u,v,)} represents the Hamming distance between sequence u and v.

Among them, the chaotic sequence used is generated by the Logistic-dimensional chaotic system. Logistic mapping formula, as shown in formula (2):

$$X_{k+1} = \mu X_k (1 - X_k) \tag{2}$$

Among them, μ represents the bifurcation parameter, 0<μ≤4, k=0, 1, 2, ....n, X∈(0,1).

## 3. Design of Web-based Digital Tv Network Management System

### 3.1 Overall System Architecture

This article studies the WEB-based digital TV network management system. After analyzing the system requirements, the overall architecture of the system is proposed, including user management, network management, and fault analysis management.

### 3.2 User Management

Before logging into the TV network management system, the user must first obtain a valid user ID. This applies to user registration. After the user completes registration and obtains a valid user ID, he establishes a connection with the server, requests a program from the LDAP server, receives program information from the streaming media server, and watches video programs. If the user needs to exit after watching the video, the client first sends a message to the streaming server to notify the streaming server to stop sending video information, and then sends an exit request to the SNMP server, and then exits and outputs to the system. When a new user joins the system or starts the system, the system-wide network topology and LDAP user information will change. This requires network administrators to make changes to LDAP and streaming media servers, maintain and update data information.

### 3.3 Network Management

(1) Scan the real-time operating status of each device and analyze the network coverage status accordingly. The result is displayed on the screen terminal. The interface view is a combination of map, tree structure and table. It can be intelligently switched to the appropriate view according to whether the user selects a sub-network, node or device within the node.

(2) Monitoring personnel use the map and node combination view displayed on the display terminal to input instructions through the network manager to add or delete network nodes such as subnets, frontiers, relay stations, and overlay stations, and edit them. In the network node, you can edit, add and delete devices, set device operating parameters, and set the signal direction and topological relationship between nodes and devices. The above-mentioned network analysis unit and network management unit may be integrated circuit chips such as a central processing unit, a digital signal processor (DSP), or a board card, or may be devices equipped with these chips as the core and other auxiliary electronic components.

### 3.4 Fault Analysis and Management

Fault handling collects alarm information from the managed equipment through the alarm collection process, and completes functions such as error location, fault analysis, error statistics, and error recording. Through the analysis and processing of alarm information, stable operation is guaranteed.

(1) The alarm collection process provides a fault management function database, which is mainly responsible for receiving the alarm information sent by the cable TV equipment, as well as the

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received information received and tracked through the built-in alarm information processing model of various versions of the SNMP protocol.

(2) After the fault processing module receives the alarm information processed by the alarm collection unit, it first extracts the geographic coordinates of the equipment from the local database through the interface provided by the data module according to the alarm information, and then sends the geographic coordinates and alarm information to the GIS at the same time part.

### 3.5 System Security

This system has designed a corresponding security mechanism for the confidentiality of user information and video programs. The security mechanism of the TV management system is functionally divided into different parts of the encryption system: three parts corresponding to the user.

### 3.6 System Implementation

Nowadays, SOA technology is widely concerned and widely used in the software development industry, and it has become a hot topic in the IT industry. In fact, SOA is a model based on the design, development and management of discrete logic units in a computing environment. This is a business method of IT infrastructure structure, rather than a complete off-the-shelf technology. In the form of services, SOA can provide end users with numerous application functions. The SOA framework can effectively improve the sustainability and scalability of the system. The platform uses the user layer, business application layer, and data layer as the key foundation to connect components and divide the three-level structure of the system into smaller levels.

## 4. Web-based Digital Tv Network Management System Test

### 4.1 System Response Time Test

This article tests the response time of the WEB-based digital TV network management system, and calculates the average response time with every 10 GetRequest requests as a group. A total of 60 GetRequest requests are sent, and the experiment is repeated 3 times, and the system response time is recorded. Related data results are shown in Table 1:

**Table 1.** System response time test

| | 1 | 2 | 3 |
|---|---|---|---|
| 10 | 212 | 206 | 203 |
| 20 | 347 | 400 | 401 |
| 30 | 211 | 204 | 205 |
| 40 | 214 | 210 | 211 |
| 50 | 215 | 212 | 208 |
| 60 | 213 | 208 | 210 |

It can be seen from Figure 1 that after calculation, the average response time of each value operation is about 240ms. It can be seen from the figure that the average response time of 10 times is between 100ms and 500ms, which indicates that the collection performance of the system is affected by the network environment.

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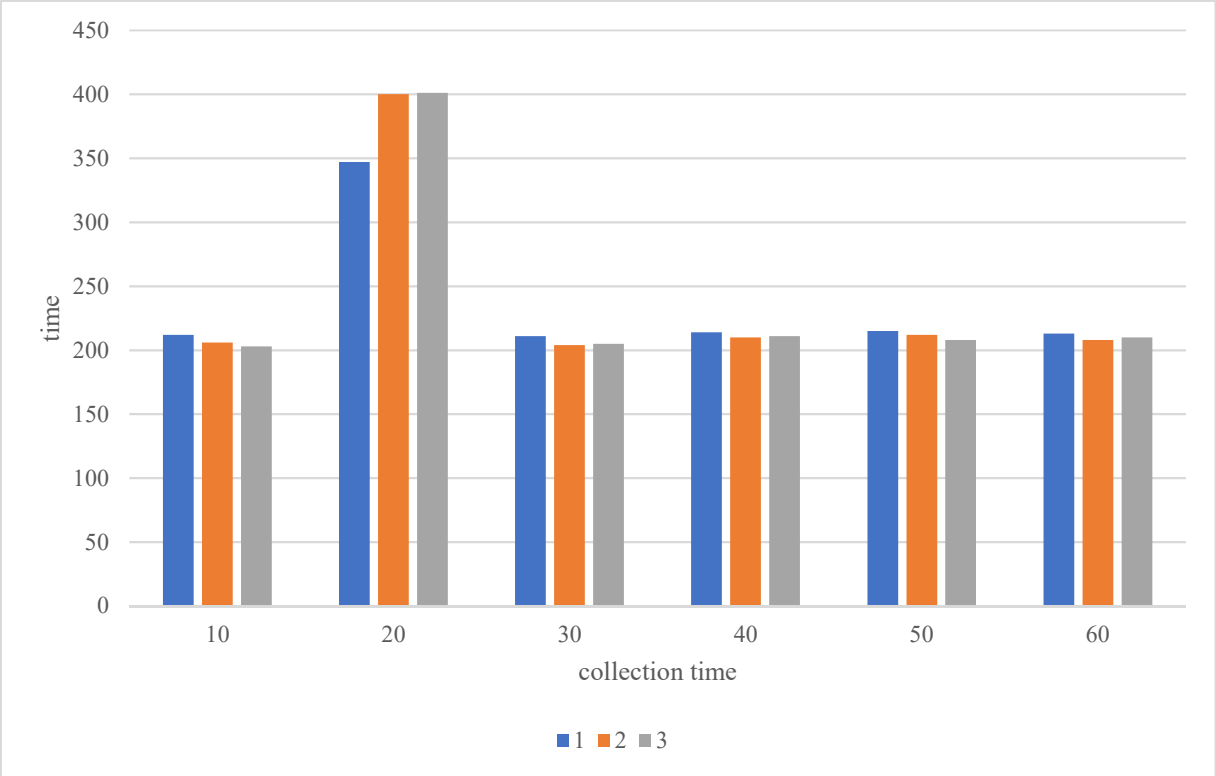


**Figure 1.** System response time test

## 4.2 System Stress Test

This article tests the pressure of the WEB-based digital TV network management system. 30 users log in through the software at the same time, read the values from the local database synchronously, stop the test software after execution, and record the system response time. The relevant data is shown in Table 2:

**Table 2.** System stress test

| | system login | System operation |
|---|---|---|
| 0.5 | 32 | - |
| 1 | 33 | - |
| 1.5 | 34 | 30 |
| 2 | 34 | 45 |
| 2.5 | 33 | 16 |
| 3 | 35 | 17 |

As can be seen from Figure 2, the green curve represents the response time when the user clicks the login system homepage, and the red curve represents the response time from the beginning to the end of the user running the same login test. The figure shows that the transaction response time of the 30 user login test tasks is very stable, and the response time is about 30 seconds.

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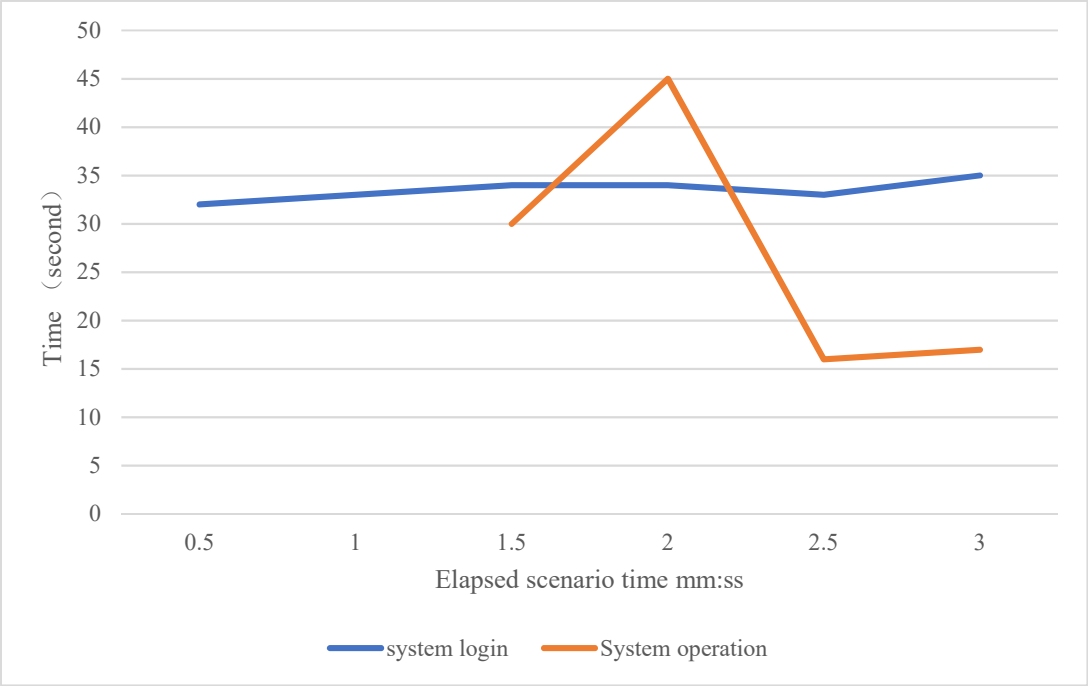


**Figure 2.** System stress test

## 5. Conclusion

This paper studies the web-based digital TV network management system. After analyzing the system requirements, the system is designed and the designed system is tested. The main task is to test the response time of the system and the pressure of the system. The result is The response time of the system is 240ms, which is relatively short. According to the results of the system stress test, the system login response time is relatively stable when 30 users log in and operate.

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