Intelligent University Laboratory Management System on Internet of Things Based on ThinkPHP

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Abstract. The traditional university laboratory management methods cannot meet the needs of students and teachers for automated management. In this paper, used the university laboratory Internet platform as an example, described a more functional information management system platform which based on ThinkPHP to build the main function. With the development of cloud server, this paper developed the B/S architecture, which runs the platform in the cloud and enhances the experience of teachers and students. The use of "Apache + PHP + MySQL" combination, the development of B/S architecture information management system, using the popular ThinkPHP framework, the code uploaded to the cloud server. With the analysis of the cloud platform, this paper in the platform to build at the same time, to achieve the interaction with the database template, the experimental device measurement device communication interface and short message type and other major functions. This platform is stable, friendly, easy to maintain, easy to expand, to meet the needs of university laboratories, with strong research and promotion value.

Introduction

The core and foundation of the Internet of Things is still the Internet, which is an extension and extension of the Internet based network. Its client extends and extends to any item and thing, for information exchange and communication. Internet of Things data center is a kind of sensor equipment, monitoring data, and business data and other resources to collect, gather, manage and support the application of the construction of the Internet infrastructure. The data center is the "nerve center" of the Internet of Things, which is responsible for managing and maintaining data from all walks of life and places in the city. The Internet of Things data center needs to be able to allow users to log on their own web pages through the data center to check the status of the corresponding matter. How does the data center communication data format specify how the data center is to analyze and deal with these arrays is studied in this paper.

Existing problems in the existing Internet of Things management system
1) High Cost. 2) Privacy Issues. 3) Security Issues. Thus, in order to break through the bottleneck of the development of things, the need for a similar middleware platform, through the definition of a unified standard, standardize the various levels of data format and access to the sensing device sharing and reuse support.

System Related Technology

Ali Cloud Server

The design uses Ali cloud server, cloud server is an important part of cloud computing services, is for all types of Internet users to provide integrated business capabilities service platform. The platform integrates the three core elements of the Internet application in the traditional sense: computing, storage, network, and user-supplied Internet infrastructure services. Cloud server is a processing capacity can be flexible telescopic computing services, its management is more simple and efficient than the physical server. Cloud servers help to build more stable and secure applications, reduce the difficulty of delivery and the overall cost, and focus more on core business innovation.
**PHP + Apache + MySQL**

The combination has become one of the preferred combination of web development. Compared with other programming languages, the program is embedded in the implementation of the program, the work efficiency than the other will be much higher than the way to generate a mark. In addition, it can also execute the compiled program code, the compiler is designed to achieve the role of encryption and coding to optimize the operation of the role of the code to perform more efficient. But also to achieve universal gateway interface functions, and support most of the popular database and operating system. The workflow is:

1) First, PHP code passed to the PHP package, and then request the PHP package to parse it.
2) The server according to the PHP program code request information to connect and read the database file.
3) PHP engine program will be sent over the server to scan the file, and according to the database operation command, a good completion of the interaction with the database.
4) PHP engine from the database to the corresponding data, the dynamic generation of the corresponding page, and the generated page back to the Apache server, Apache server and then return the page to the client browser.

**System Design**

Combined with the characteristics of Internet of things, the system combines the computer network system, automated control systems, network communications technology in one of the intelligent laboratory management system. It builds an intelligent software and hardware management system that provides a real-time connected trusted network environment that allows users of various rights to break through time and space boundaries and monitor or acquire the status of lab devices at any time via the network. Server, when the lab administrator wants to control the laboratory equipment, log in from the server to obtain the laboratory equipment CMU (central management components, through the radio frequency operation equipment) and EPC code and CMUIP after the HTTP request to log and control the CMU Thus controlling the laboratory equipment. Therefore, how to design a practical and scalable Internet of things intelligent laboratory equipment data center is the focus of system design.

**Background Database Operation Flow**

In the entire Internet of things intelligent laboratory management system, the data center registration, the user login mobile terminal control equipment, are related to the background database operations, including: connecting the database, select the database, query data, insert data, update data. In PHP, the general use of MySQL provided by the API library on the database related operations, through mysql connect (servername, username, password) to create a link to connect to the database.

Laboratory management information under the first menu contains laboratory management, staff management, teacher management, student management, laboratory equipment management, experimental resource management six two menu. We can in the secondary menu corresponding to the three-level menu-related information to add or delete operations, so as to complete our management of the module information and maintenance.

**System key Technology**

**User Division and Registration**

Internet of things intelligent laboratory management system users are divided into three, super administrators, system administrators and ordinary users, there are three ways of authority. Super administrators have the right to manage all lab data and user rights, and to manage system administrators. And the system administrator can only manage his responsible laboratory data and the
lab's teachers and students. Teacher users after registration, through the system administrator to assign permissions, you can log on the web and mobile phone equipment to control the equipment. If the user is a new user of the intelligent laboratory management system of the Internet of Things, the user should enter the registration page to complete the user registration, register and complete the login network to operate the equipment in the laboratory. The new user must have a valid CMU ID to register, the CMU ID and the campus network ID number consistent, or can not register. Since there is only one CMU in a lab, the perceived ID must be unique in the relevant table. Here the ID number management, you can import the existing campus network registration user database information to ensure the effectiveness and security of data to prevent illegal users intrusion.

**MD5 Encryption**

MD5 is the most commonly used cryptographic encryption algorithm in web application. It is an irreversible encryption algorithm. The MD5 function is used to calculate the ciphertext. The original algorithm can not be obtained by the inverse algorithm. The use of encrypted text is to prevent the password stored in the database from being obtained. Large-capacity information is "compressed" into a confidential format before using the digital signature software department, which uses a hash function to turn a string of arbitrary length into a long integer. PHP built-in MD5 function will be a variable length of information into 128bit information digest. The hash feature is not obtained by analyzing the hash information, because the structure after the hash has no dependency on the original content. Even changing only one character in the plaintext string will cause the hash algorithm to compute a distinct result. In order to ensure the safety of user registration and login, we first user registration password $password to encrypt, to prevent data leakage in the database, the password is cracked. Encryption of the irreversible, will let us in the Internet of things the password is very safe. The specific code is: $passwd = md5($POST[password]);

**User Login Timeout Processing**

Intranet intelligent laboratory management system, when the administrator login and related operations, due to leave for a long time without operation, there may be a lower authority through the operation of the web side and misuse of some laboratory equipment, so that Changes in equipment status can even cause confusion. In order to avoid this situation, we set the user on the page side timeout, when the user does not operate the page for 20 minutes, the page automatically returns to the login page. The specific code is as follows:

```php
Session start();
$t=mktime();
if($t-$SESSION[times]>'1200'){
    echo "<script>location.href='login.php';</script>";
    session_destroy();
    else
    $SESSION[times]=mktime();
}
```

**MVC Mode**

The original HTML + PHP mixed mode, whether it is in the development stage or maintenance stage management are more difficult, more difficult to manage the future, more people involved in the project after the division of labor chaos. MVC development model, the original mixed mode file is split into three separate files, to prepare and maintain. Each file has its own task. Model model, refers to the data table model, and is mainly responsible for the completion of the data table to delete or delete operations.
V: view view, responsible for the final display to the user to browse the web interface.
C: Controller controller, according to different conditions, the introduction of different models, access to different data, according to different conditions into different views to display.

The use of MVC development model, the front and back of the division of labor is clear, the front desk programmer to complete the development of part V, and the background programmer to complete the M and C part of the program development.

For example: read the data in the Lab_Machine table, the current operable device in tabular form on the page
1) Model: Machine.class.php
2) Controller: Machine Controller.php
3) View: Machine view.php

ThinkPHP Framework

Planning our project in MVC mode, each with a fixed storage location for easy maintenance. Framework will be built a large number of class functions, simplify the development framework has better security and stability. ThinkPHP framework is the top of the company in 2006 development, January 1, 2007 officially named ThinkPHP.

Advantage:
1) Relative to the other framework is relatively simple, it is easier to get started
2) Powerful, basically to meet the general development of web applications
3) The use of a wide range, out of the north of the Shenzhen-Shenzhen ThinkPHP occupy the vast majority of the market.
4) Chinese help manual, Chinese community discussion area

This project uses ThinkPHP framework, the specific directory results shown in Figure 1.:

![System framework directory structure.](image)

Where the index.php entry profile code is as follows:

```php
<?php
header ('Content-Type: text/html; charset=utf-8');
define ('APP_PATH', './application/');
define ('APP_DEBUG', true);
include_once 'ThinkPHP/ThinkPHP.php';
```

The core principle of ThinkPHP is to receive the name of the controller class to be instantiated from the URL address field and the method name to be called, and then invoke the controller's instantiation and method in the index.php (unique entry file).
User Management Functions

(1) Using ThinkPHP in the paging technology: class location in ThinkPHP/library/Think/Page.class.php, paging program can be split into two parts: page data display, paging navigation bar.

Core sql statement: select * from Lab_user limit ($pageon-1) * $pagesize, $pagesize
Page (page number, number of pages per page)

(2) Highcharts chart in the use of the project: Highcharts chart is a jquery based on the chart, this project uses this plug-in to draw the use of experimental equipment line chart, the number of students and students login line chart.

The process of using this Highcharts is:
1) Copy the core package of the highcharts plugin into the project;
2) Create a controller, call the view, so that the view is displayed properly. Copy the view file from the example directory to the project folder, where you copy the index.html in the line-basic folder of the line chart;
3) Prepare the data to be drawn in the controller;
4) Assign the data to the view and display it.

Summary

This paper studies the background, development status, development prospect and existing problems of the Internet of Things. Network data center has been analyzed and studied, the design of the data center communication message format, the use of PHP language design and implementation of the Internet of Things data forwarding interface, registration interface and login interface three interfaces. Build the platform, configure the development environment, and simulate the various functions of the user's web site registration and landing process, the registration process, and the analysis of which the process was studied.

The disadvantage is that the Internet of things data center interface function is not perfect, need to add more interfaces to improve the function. Function to be expanded. So that more experimental equipment information, such as switches, routers, etc., can automatically upload to the data center, so that the data center as the entire Internet of things can better manage the entire system. The laboratory supporting the software, courseware materials, extracurricular reference materials for teachers and students at any time to use. Internet security is not perfect, data center protection measures are not advanced. Internet of things data center has not been a large amount of data access test, there may be some hidden problems. To further strengthen the stability of the entire Internet of things system.

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References

