CREATING DATABASE IOT FOR PRODUCT QUALITY CONTROL

LIU ZHENGHUA, U.A. VISHNIAKOU

Belarusian State University of Informatics and Radioelectronics, Republic of Belarus

Abstract. The structure of the IoT network for product quality control is presented. In the process of comparing database servers, the implementation of the SQL was selected to represent product quality indicators. The process of configuring the SQL server for use in such IoT network on a cloud platform is shown.

Keywords: product quality control, database, MySQL, cloud server.

Introduction

Product quality database programming, taking milk quality control as an example, mainly analyzes the advantages and disadvantages of several commonly used relational databases, such as MySQL, SQL Server, Oracle database [1], respectively, ease of use, flexibility, openness, security, and the use performance and other aspects are analyzed.

After the comparative analysis, the MySQL database is used to implement database programming. Next, it is introduced how to install the MySQL database on the server and how to use SQL statement to create a database, create data tables.

Comparative analysis of commonly used relational databases

1. MySQL.

The advantages of MySQL:

– small size, fast speed, low total cost of ownership, open source;

– support multiple operating systems;

– it is an open source database, and the provided interface supports connection operations in multiple languages.

The disadvantages of MySQL:

– does not support hot backup;

– the biggest disadvantage of MySQL is its security system, which is mainly complex rather than standard, and changes only when MySQL admin is called to reread user permissions;

– there is no Stored Procedure language, which is the biggest limitation for programmers accustomed to enterprise-level databases;

– the price of MySQL varies by platform and installation method. MySQL for Linux is free if installed by the user or a system administrator rather than a third party, and third-party options require a license fee. Unix or Linux self-installation is free; Unix or Linux third-party installation is charged.

2. SQL Server.

The advantages of SQL Server:

– ease of use, scalability suitable for distributed organizations, data warehouse functions for decision support, integration with many other server software, good price-performance ratio, etc.;

– brings flexibility to data management and analysis, allowing units to respond calmly in a rapidly changing environment to gain a competitive advantage.

The disadvantages of SQL Server:

– SQL Server can only run on Windows without any openness. Operating system stability is very important to databases. Windows9X series products are more focused on desktop applications. NT server is only suitable for small enterprises and Windows platform reliability, security and scalability are very limited. Unix-like is tried and tested especially for handling large databases;

– the parallel implementation and coexistence model of SQL server is immature, and it is difficult to deal with the increasing number of users and the limited scalability of data volumes;

– no security certificate obtained;

– performance: SQL Server performs well with multiple users;

– client support and application mode. Only C/S mode is supported, and the SQL Server C/S structure only supports ADO, DAO, OLEDB, and ODBC connections for Windows clients;

– SQL Server's complete rewrite of the code has undergone long-term testing, constant delays, and many features take time to prove not fully compatible with earlier products. Use requires certain risks.

3. Oracle.

The advantages of Oracle:

– Oracle can run on all mainstream platforms (including Windows), fully supports all industry standards, adopts a completely open strategy to enable customers to choose suitable solutions, and fully supports developers;

– Oracle's parallel server extends the capabilities of Windows NT by allowing a group of nodes to share work in the same cluster, providing a high-availability and high-scalability cluster solution. If Windows NT cannot meet the needs, users can move the database to UNIX. Oracle's parallel server has a high degree of integration for the clustering mechanisms of various UNIX platforms;

– Oracle is certified to the ISO standard at the highest level of certification. It provides multiple layers of security, including controls for assessing risk, preventing unauthorized data breaches, detecting, and reporting database activity, and implementing data access control in databases through data-driven security;

– Oracle is almost the highest performance relational database, maintaining the world record of TPC-D and TPC-C under the open platform;

– Oracle's multi-level network computing supports a variety of industrial standard network client connections such as ODBC, JDBC, and OCI;

– Oracle has a long development experience and is fully backward compatible. It has been widely recognized and applied, and the use risk is low.

The disadvantages of Oracle:

– high requirements for hardware;

– the price is relatively expensive;

– it is more troublesome to manage and maintain;

– the operation is more complicated and requires higher technical content.

Through the above analysis, MySQL is widely used in small and medium websites on the Internet. Because of its small size, high speed, low total cost of ownership, and especially open source, many companies use MySQL databases to reduce costs. The MySQL database can be regarded as one of the fastest running SQL language databases. In addition to having many features that other databases do not have, MySQL database is a completely free product, and users can download MySQL databases directly from the Internet without paying anything. In this paper, MySQL database is used for the management of milk quality database.

Database implementation

This project is aimed at the implementation of the Internet of Things product quality control database. The IoT architecture of this project is shown in Figure 1. This database is built on a cloud server. The implementation of the database can be performed through the command window of the cloud server through the creation of the database and the design of the corresponding table through SQL statements [2]. The process includes some steps.

Step 1. We configure the MySQL server on the cloud platform. Before connecting to the MySQL server remotely, we need to configure the MySQL server to listen on its internal IP address. Then, we create a non-root user account for the MySQL client to connect to the server [3].
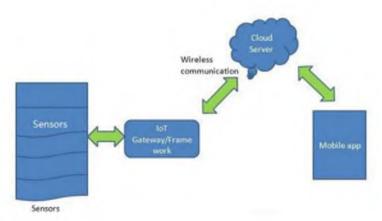
Figure 1. Product quality control IoT structure

Step 2. In Cloud Shell, we use SSH to connect to the my-server instance (see Figure 2).

Figure 2. Connect to database on server

Step 3. We update the /etc/mysql/mysql.conf.d/mysqld.cnf configuration file with the following information:

LOCAL_IP=$(curl http://metadata.google.internal/computeMetadata/v1/instance/network-interfaces/0/ip \ -H "Metadata-Flavor: Google") sudo sed -i "s|bind-address.*|bind-address = $LOCAL_IP|" /etc/mysql/mysql.conf.d/mysqld.cnf

Step 4. We restart the MySQL service to apply the changes to the running server:

sudo mysql --user=root -p[ROOT_PASSWORD] -e "show databases"

Step 5. We verify that the server is running locally. As shown in Figure 2 (connection to DataBase on Server) and Figure 3 (show databases) connect to the database and view the instance.

Figure 3. Show Database

Step 6. Create a database instance.

Step 7. Create product_information table.

Through the creation statement of the data table (see Figure 4) the milk quality indicates the database to which the table belongs, "milk_information" is the table name, the data type of MID (Milk

ID) is int, the data length is 255, NOT NULL is not empty, AUTO_INCREMENT is incremented by 1, the data type of CID (Cow ID) is int, "Fat", "Protein", "Lactose", "MUN" (Milk Urea Nitrogen), "SCC" (Somatic Cell Content), "BC" (Bacteria Content) data types are decimal, where the first value in parentheses indicates the total number of digits of the data, the second value indicates the number of digits after the decimal point, "GettingDate" is a date time type in the format (yyyy-MM-dd HH:mm:ss), PRIMARY KEY('MID'), indicating that "MID" is the primary key in the milk_information table [4].

Figure 4. Create table milk_information

Conclusion

By comparing the advantages and disadvantages of MySQL, Oracle, and SQL server databases, we concluded that MySQL, due to its small size, fast speed, low total cost of ownership, especially open source, makes the using MySQL databases to reduce costs. In addition to having many features those other databases do not have, MySQL database is a completely free product, and users can download MySQL databases directly from the Internet without paying anything. So, we chose MySQL database as our target database.

We introduce how to create our MySQL database on the server through the development documentation provided by the Google Cloud Platform. We create a database instance and related data tables by connecting to the database and using SQL statements.

References

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