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HSQL Database

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ABSTRACT

HSQLDB (Hyper SQL Database) is one of database application commonly use for management system in Java. It offers memory and this based on table. As a database, HSQLDB offers a small and quick database that provides server mode and embedded mode. In HSQLDB distribution provided additional tools such as a mini web server,tools for query and management, as well as some examples of the use HSQLDB.

1. Introduction

In this 21st century people use computer to save almost of the data, and now data is in the computer and of course many type of data are using in this century. Every single data almost important to the user. Many data means that we need an application to manage it so the data can be more efficient and more easy to find if sometimes we need the data. One of the application is HSQL Database, this application allow you to manage the data the way you want and it's making for the user to save the data, edit the data and delete a data.

These day RDBMS application has many variant to support our needed and our data manage and of course many of them still under development to completing our needed. HSQL Database is the one RDBMS application that still under development. To support our needed, many RDBMS application can be operate in many operating system to make user easier to get the application without change or make another additional the OS they have. Currently the data is in every computer and the world becomes an age of the data, so the application like HSQL Database is needed to making data storage more efficient and more easy to use.

2. Literature Review

This research is a research that makes HSQL Database. In this study, there are several data collection methods used, namely:

A. Database Management System (DBMS)

A database is an organized collection of data. It is thecollectionof schemes, tables, queries, reports, views and other objects. The data is typically organized to model aspects of reality in a way that supports processes requiring information, such as modelling the availability of rooms in hotels in a way that supports finding a hotel with vacancies.

From the earliest days of computers, storing and manipulating data have been a major application focus. The first general-purpose DBMS was designed by Charles Bachman at General Electric in the early 1960s and was called the Integrated Data Store. It formed the basis for thenetwork data model, which was standardized by the Conference on Data Systems Languages (CODASYL) and strongly influenced database systems through the 1960s. Bachman was the rst recipient of ACM's Turing Award (the computer science equivalent of a Nobel prize) for work in the database area; he received the award in 1973.

A database management system (DBMS) is a collection of interrelated data and a set of programs to access those data. This is a collection of related data with an implicit meaning and hence is a database. The primary goal of a DBMS is to provide a way to store and retrieve database information that is both convenient and efficient. A general-purpose DBMS is designed to allow the definition, creation, querying, update, and administration of Databases.Well-know DBMS include MySQL, PostgreSQL, Microsoft SQL server, Oracle, Sybase and IBM DB2. A database is not generally portable across different DBMs, but different DBMS can interoperate by using standarts such as SQL and ODBC or JDBC to allow a single application to work with more than one DBMS.

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Database Management System are often classified according to the database model that they support and the most popular database systems since the 1980s have all supported the relation model as represented by the SQL language. Sometimes a DBMS is loosely referred to as a Database. The purpose of DBMS to handle difficulties of typical file-processing systems supported by conventional operating systems Data redundancy and inconsistency, Difficulty in accessing data, Data isolation – multiple files and formats, Integrity problems, Atomicity of updates, Concurrent access by multiple users, Security problems.

B. Relational Database Management System (RDMS)

RDBMS stands for Relational Database Management System. RDBMS data is structured in database tables, fields and records. Each RDBMS table consists of database table rows. Each database table row consists of one or more database table fields. RDBMS store the data into collection of tables, which might be related by common fields (database table columns). RDBMS also provide relational operators to manipulate the data stored into the database tables.

Most RDBMS use SQL as database query language.The most popular RDBMS are MS SQL Server, DB2, Oracle and MySQL.The relational data model is the most widely used data model, and a vast majority of current database systems are based on the relational model.The relational model was designed by the IBM research scientist and mathematician, Dr. E.F.Codd.Two of Dr.Codd's main focal points when designing the relational model were to further reduce data redundancy and to improve data integrity within database systems.Many popular databases currently in use are based on the relational database model. RDBMSs are a common choice for the storage of information in new databases used for financial records, manufacturing and logistical information, personnel data, and other applications since the 1980s.

3. Research Methodology

A. Research Object

The object of research was conducted at the HSQL Database.

B. Research Methods

1) Literature study of HSQL Database.
2) Making a list of database factor variables.
3) Database Security.
4) Feature in HSQL Database.
5) Evaluate the results of filling in the HSQL Database.

4. Results and Discussion

A. HSQL Database

HSQLDB (Hyper SQLDatabase) is a relational database management system written in Java. It has a JDBC driver and supports a large subset of SQL-92 and SQL:2008 standards. It offers a fast, small (around 1300 kilobytes in version 2.2) database engine which offers both in-memory and disk-based tables. Both embedded and server modes are available for purchase.

HSQLDB is available under a BSD license. It is used as a database and persistence engine in many open source software projects, such as OpenOffice Base, LibreOffice Base, the Standalone Roller Demo, and the Jitsi VOIP and video-conference client since version 2.6. It is also used in commercial products, such as Mathematica and InstallAnywhere (starting with version 8.0).

Each HyperSQL database is called a catalog. There are three types of catalog depending on how the data is stored

Types of catalog data:

1) mem: stored entirely in RAM - without any persistence beyond the JVM process's life.
2) file: stored in filesystem files.
3) res: stored in a Java resource, such as a Jar and always read-only.

All-in-memory, mem:catalogs can be used for test data or as sophisticated caches for an application. These databasesdo not have any files. The properties file contains a few settings about the database. The script file contains the definition of tables and otherdatabase objects, plus the data for non-cached tables.

The log file contains recent changes to the database. The datafile contains the data for cached tables and the backup file is a compressed backup of the last known consistent stateof the data file. All these files are essential and should never be deleted. For some catalogs, the test.data and test.backupfiles will not be present. In addition to those files, a HyperSQL database may link to any formatted text files, such as CSV lists, anywhere on the disk.

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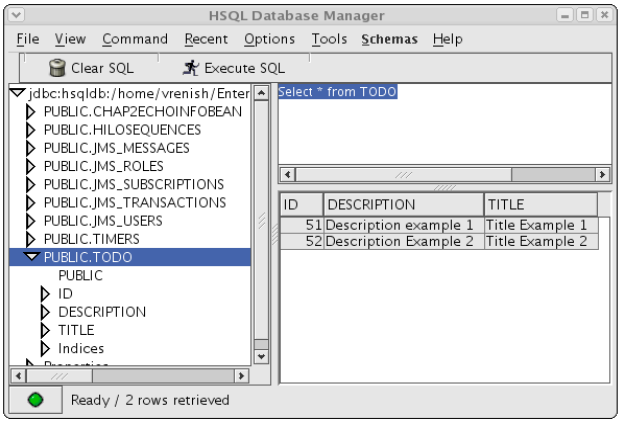

Fig 1. HSQLDB Application

A res: catalog consists of the files for a small, read-only database that can be stored inside a Java resource such as a ZIP or JAR archive and distributed as part of a Java application program.

1) Java Stored Procedure and Function

HyperSQL supports schema-based stored procedures and functions written entirely in JAVA. Polymorphism is supported.

2) Data Types

BLOB, INTERVAL according to the SQL Standards. TIME can now have a fractional second part. TIME WITH TIME ZONE and TIMESTAMP WITH TIME ZONE are supported. The full range of combinations of datetime and interval types is supported. Support for DOMAIN objects with constraints and DISTINCT types.

3) Other SQL Feature

Supports column level SELECT, INSERT and UPDATE access rights, with GRANT and REVOKE on individual columns of tables, including WITH GRANT OPTION. GRANT SELECT(A, D) ON X TO U.

4) Compatibility Features

Supports several syntax and operation compatibility flags to ease testing and porting applications written against a different database engine. These include PostgreSQL, MySQL, Oracle, MS SQL Server and DB2.

B. Features in HSQL Database

In HSQL Databasethere may feature that can be use by user it is depend the user how they want to use it. Developer of HSQL Database offer us many feature that user can use, even still young HSQL DATABASE has almost same feature like other DBMS for common feature. These are the feature summary that user can use in HSQL Database:

1) Scalability

Massive high performance LOB store for BLOBs and CLOBs up to multi-gigabyte size, with total storage capacity of 64 terabytes.

2) Query Optimization

All query conditions, whether in a JOIN or WHERE clause, are now allocated to an index if possible. IN queries are now optimised to use an index if possible. Conditions with OR are optimised if indexes can be used. MAX(), MIN() and ORDER BY with or without LIMIT and OFFSET expressions can use indexes. All indexes can be used in reverse order for these operations. Indexes on multiple columns are used efficiently. All subquery and view access is optimized.

3) SQL Stored Procedure and Function

HyperSQL supports schema-based stored procedures and functions written entirely in SQL. Procedural SQL language includes WHILE loops, IF, CASE WHEN, and exception handling statements. Recursive functions are supported.

C. Database Security

HyperSQL has extensive security features which are implemented at different levels and these are some of the database security that available in HSQL Database :

1) The server can use SSL and IP address access control lists.

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2) User can define a system property to stop the database engine accessing the Java static functions that are on theclasspath, apart from a limited set that user allow.
3) User can define a system property to allow access to files on the file system outside the database directory and its children. This access is only necessary if user use TEXT tables
4) The database files can be encrypted.
5) Within the database, the DBA privileges are required for system and maintenance jobs.
6) User can define users and roles and grant them access on different database objects. Each user has a password andis granted a set of privileges.
7) User can define a password complexity check function for new and changed passwords.
8) User can use external authentication instead of internally stored password to authenticate users for each database.

HyperSQL security is multi-layered and avoids any loopholes to circumvent security. It is however the user's responsibility to enable the required level of security.

5. Conclusions

HSQLDBis a pure-Java embedded relational database server that user can use in stand-alone mode (using direct file access) or in client/server mode, accepting many concurrent users. Although not as powerful and not as popular as MySQL, HSQLDB can satisfy the needs of a wide range of Java applications, because of its extensibility and low memory/processor requirements.

HSQLDB is a convenient Java development database because it features a rich subset of Structured Query Language (SQL), and because Java programmers won't need to install a processor, memory, and disk-hungry database server into their development workstation. HSQLDB can use statements statement of data. HSQLDB many function and features and this application HSQLDB have code syntax in the process.

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