



HSQldb

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About the Tutorial

HyperSQL Database is a modern relational database manager that conforms closely to the SQL:2011 standard and JDBC 4 specifications. It supports all core features and RDBMS. HSQLDB is used for the development, testing, and deployment of database applications.

In this tutorial, we will look closely at HSQLDB, which is one of the best open-source, multi-model, next generation NoSQL product.

Audience

This tutorial is designed for Software Professionals who are willing to learn HSQL Database in simple and easy steps. It will give you a great understanding on HSQLDB concepts.

Prerequisites

Before you start practicing the various types of examples given in this tutorial, we assume you are already aware of the concepts of database, especially RDBMS.

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1. HSQLDB – INTRODUCTION

HyperSQL Database (HSQLDB) is a modern relational database manager that conforms closely to the SQL:2011 standard and JDBC 4 specifications. It supports all core features and RDBMS. HSQLDB is used for development, testing, and deployment of database applications.

The main and unique feature of HSQLDB is Standard Compliance. It can provide database access within the user's application process, within an application server, or as a separate server process.

Features of HSQLDB

- HSQLDB uses in-memory structure for fast operations against DB server. It uses disk persistence as per user flexibility, with a reliable crash recovery.
- HSQLDB is also suitable for business intelligence, ETL, and other applications that process large data sets.
- HSQLDB has a wide range of enterprise deployment options, such as XA transactions, connection pooling data sources, and remote authentication.
- HSQLDB is written in the Java programming language and runs in a Java Virtual Machine (JVM). It supports the JDBC interface for database access.

Components of HSQLDB

There are three different components in HSQLDB jar package.

- HyperSQL RDBMS Engine (HSQLDB)
- HyperSQL JDBC Driver
- Database Manager (GUI database access tool, with Swing and AWT versions)

HyperSQL RDBMS and JDBC Driver provide the core functionality. Database Managers are general-purpose database access tools that can be used with any database engine having a JDBC driver.

An additional jar called sqltool.jar, contains Sql Tool, which is a command line database access tool. This is a general purpose command. Line database access tool that can be used with other database engines as well.

2. HSQLDB – INSTALLATION

HSQLDB is a relational database management system implemented in pure Java. You can easily embed this database to your application using JDBC. Or you can use the operations separately.

Prerequisites

Follow the prerequisite software installations for HSQLDB.

Verify Java Installation

Since HSQLDB is a relational database management system implemented in pure Java, you must install JDK (Java Development Kit) software before installing HSQLDB. If you already have JDK installation in your system, then try the following command to verify the Java version.

```
java -version
```

If JDK is successfully installed in your system, you will get the following output.

```
java version "1.8.0_91"  
Java(TM) SE Runtime Environment (build 1.8.0_91-b14)  
Java HotSpot(TM) 64-Bit Server VM (build 25.91-b14, mixed mode)
```

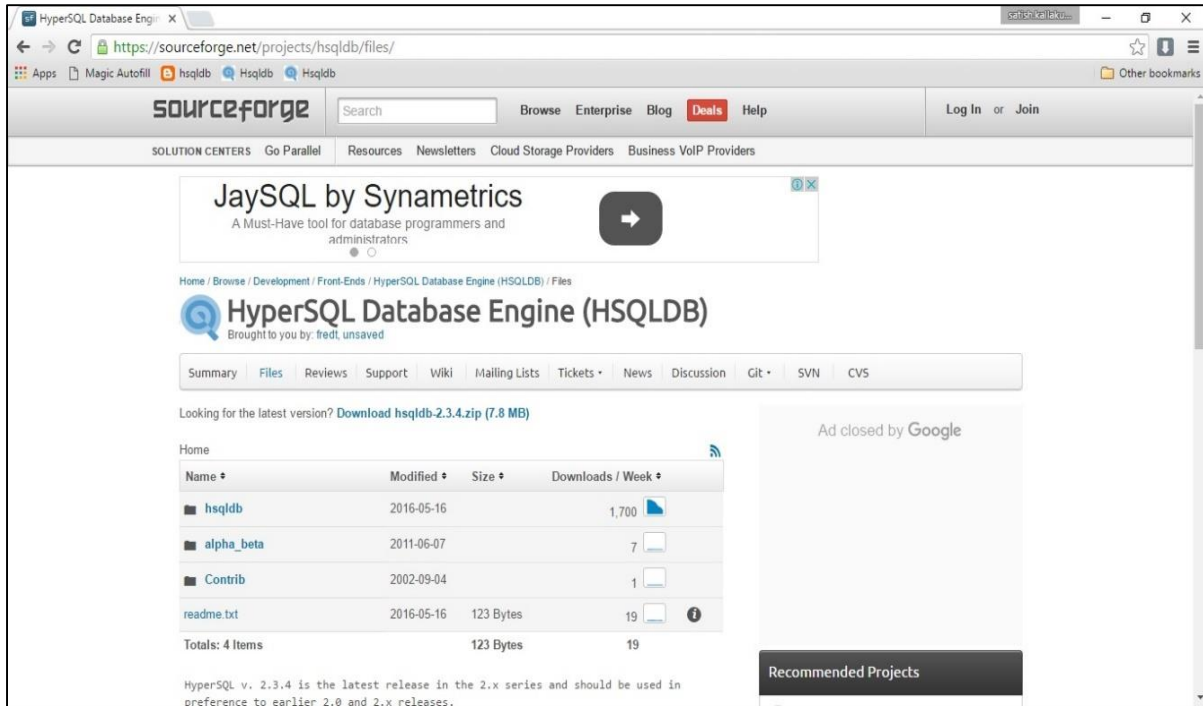
If you don't have JDK installed in your system, then visit the following link to [Install JDK](#).

HSQLDB Installation

Following are the steps to install HSQLDB.

Step - 1: Download HSQLDB bundle

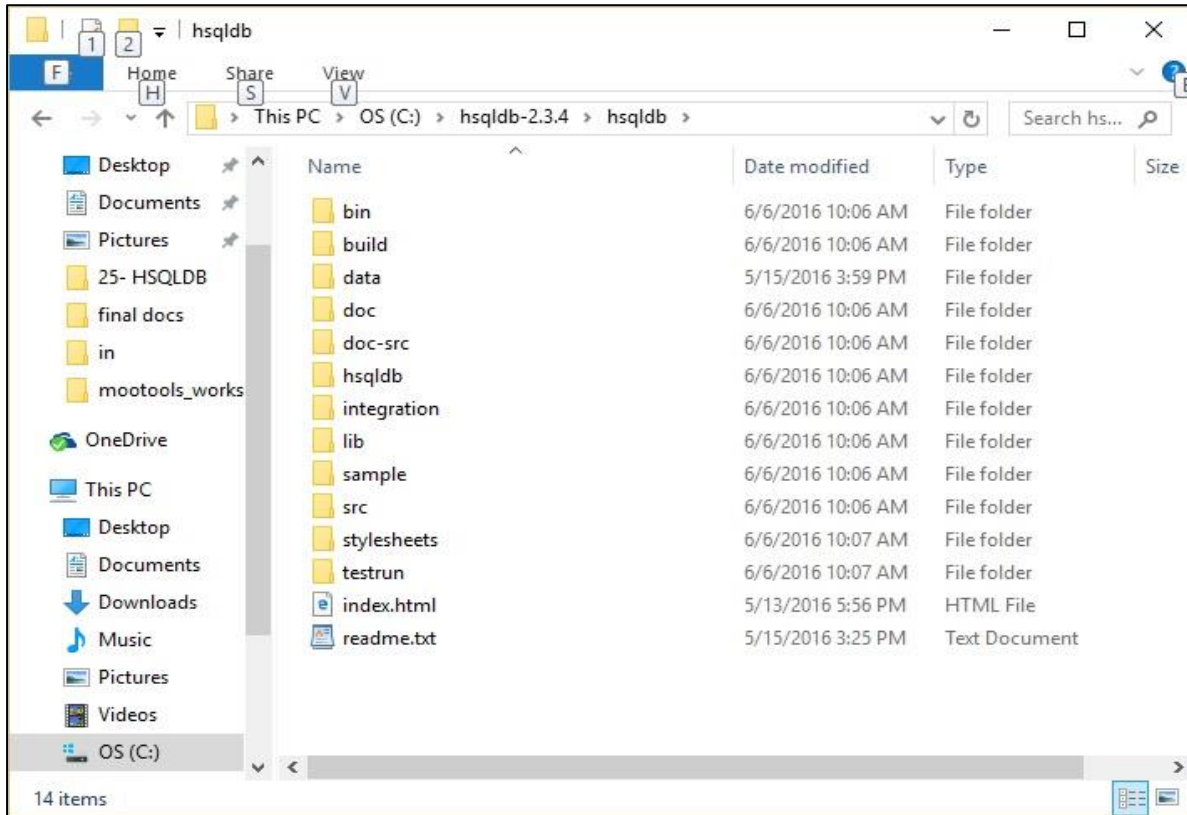
Download the latest version of HSQLDB database from the following link <https://sourceforge.net/projects/hsqldb/files/>. Once you click the link, you will get the following screenshot.



Click HSQLDB and the download will start immediately. Finally, you will get the zip file named **hsqldb-2.3.4.zip**.

Step - 2: Extract the HSQLDB zip file

Extract the zip file and place it into the **C:** directory. After extraction, you will get a file structure as shown in the following screenshot.



Step - 3: Create a default database

There is no default database for HSQLDB, therefore, you need to create a database for HSQLDB. Let us create a properties file named **server.properties** which defines a new database named **demodb**. Take a look at the following database server properties.

```
server.database.0 = file:hsqldb/demodb
server.dbname.0 = testdb
```

Place this server.properties file into HSQLDB home directory that is **C:\hsqldb-2.3.4\hsqldb**.

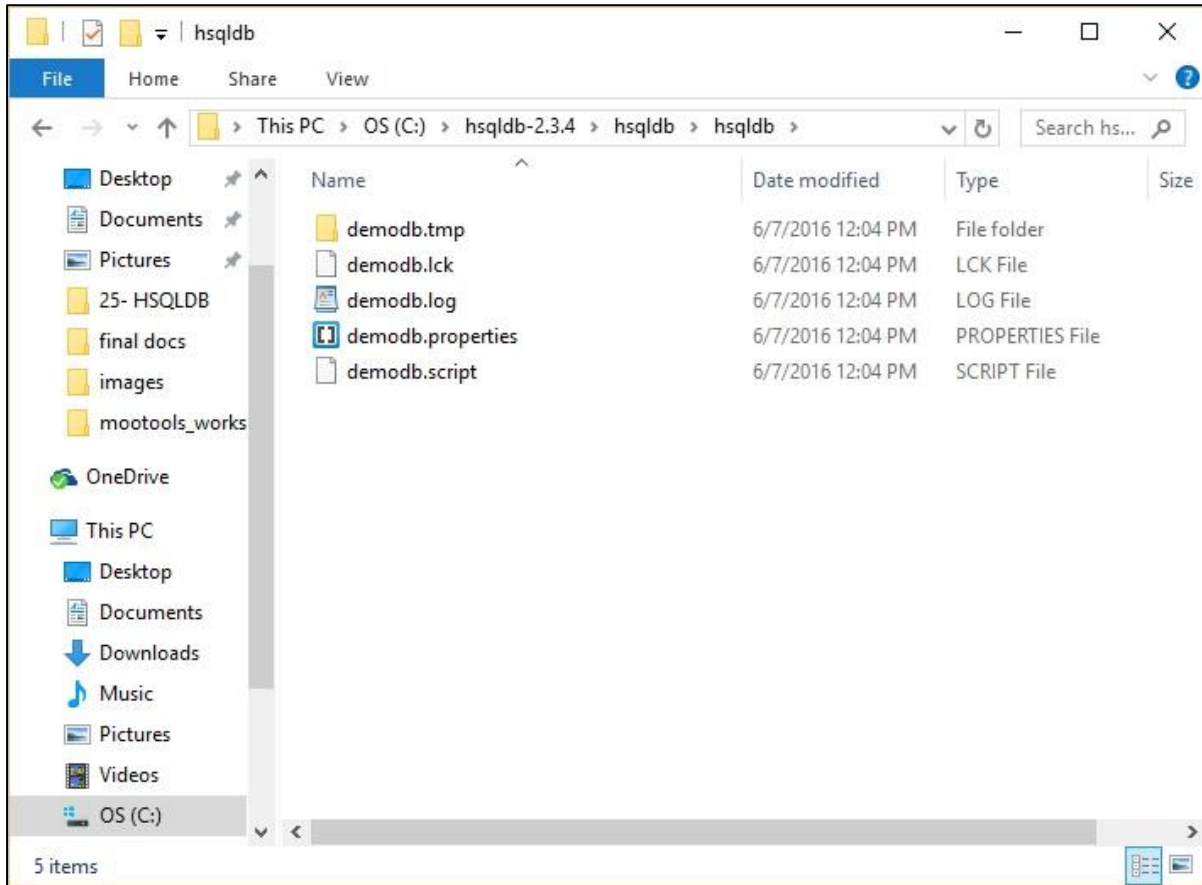
Now execute the following command on command prompt.

```
\>cd C:\hsqldb-2.3.4\hsqldb
hsqldb>java -classpath lib/hsqldb.jar org.hsqldb.server.Server
```

After execution of the above command, you will receive the server status as shown in the following screenshot.

```
C:\WINDOWS\system32\cmd.exe - java -classpath lib/hsqldb.jar org.hsqldb.server.Server
.server.Server
[Server@2f92e0f4]: [Thread[main,5,main]]: checkRunning(false) entered
[Server@2f92e0f4]: [Thread[main,5,main]]: checkRunning(false) exited
[Server@2f92e0f4]: Startup sequence initiated from main() method
[Server@2f92e0f4]: Loaded properties from [E:\work\25- HSQLDB\hsqldb-2.3.4\hsqldb\server.properties]
[Server@2f92e0f4]: Initiating startup sequence...
[Server@2f92e0f4]: Server socket opened successfully in 63 ms.
[Server@2f92e0f4]: Database [index=0, id=0, db=file:hsqldb/demodb, alias=testdb]
opened successfully in 656 ms.
[Server@2f92e0f4]: Startup sequence completed in 719 ms.
[Server@2f92e0f4]: 2016-06-07 12:04:38.838 HSQLDB server 2.3.4 is online on port
9001
[Server@2f92e0f4]: To close normally, connect and execute SHUTDOWN SQL
[Server@2f92e0f4]: From command line, use [Ctrl]+[C] to abort abruptly
```

Later, you will get to find the following folder structure of the hsqldb directory in the HSQLDB home directory that is **C:\hsqldb-2.3.4\hsqldb**. Those files are temp file, lck file, log file, properties file, and script file of demodb database created by HSQLDB database server.

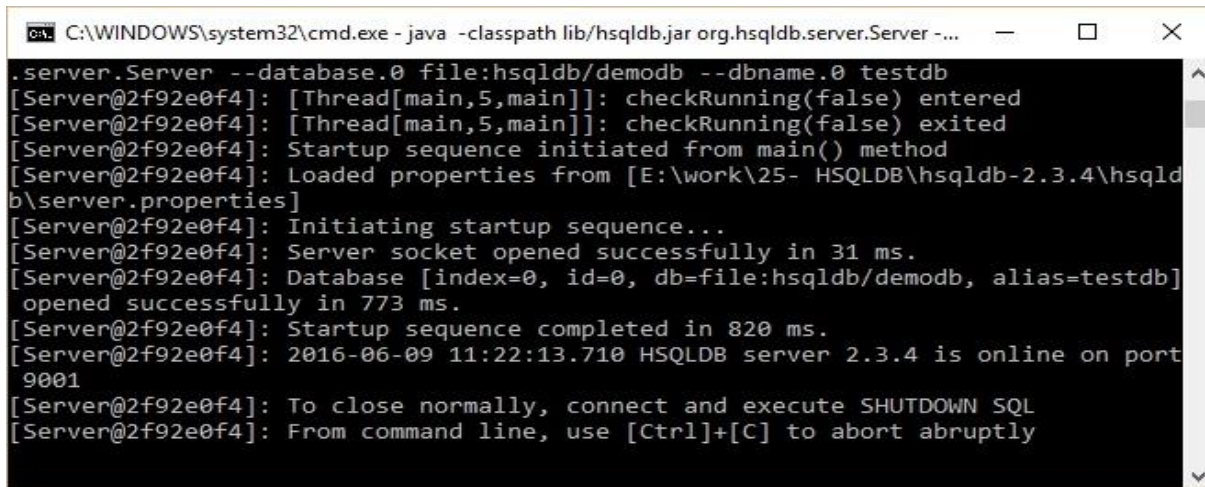


Step - 4: Start the database server

Once you are done creating a database, you have to start the database by using the following command.

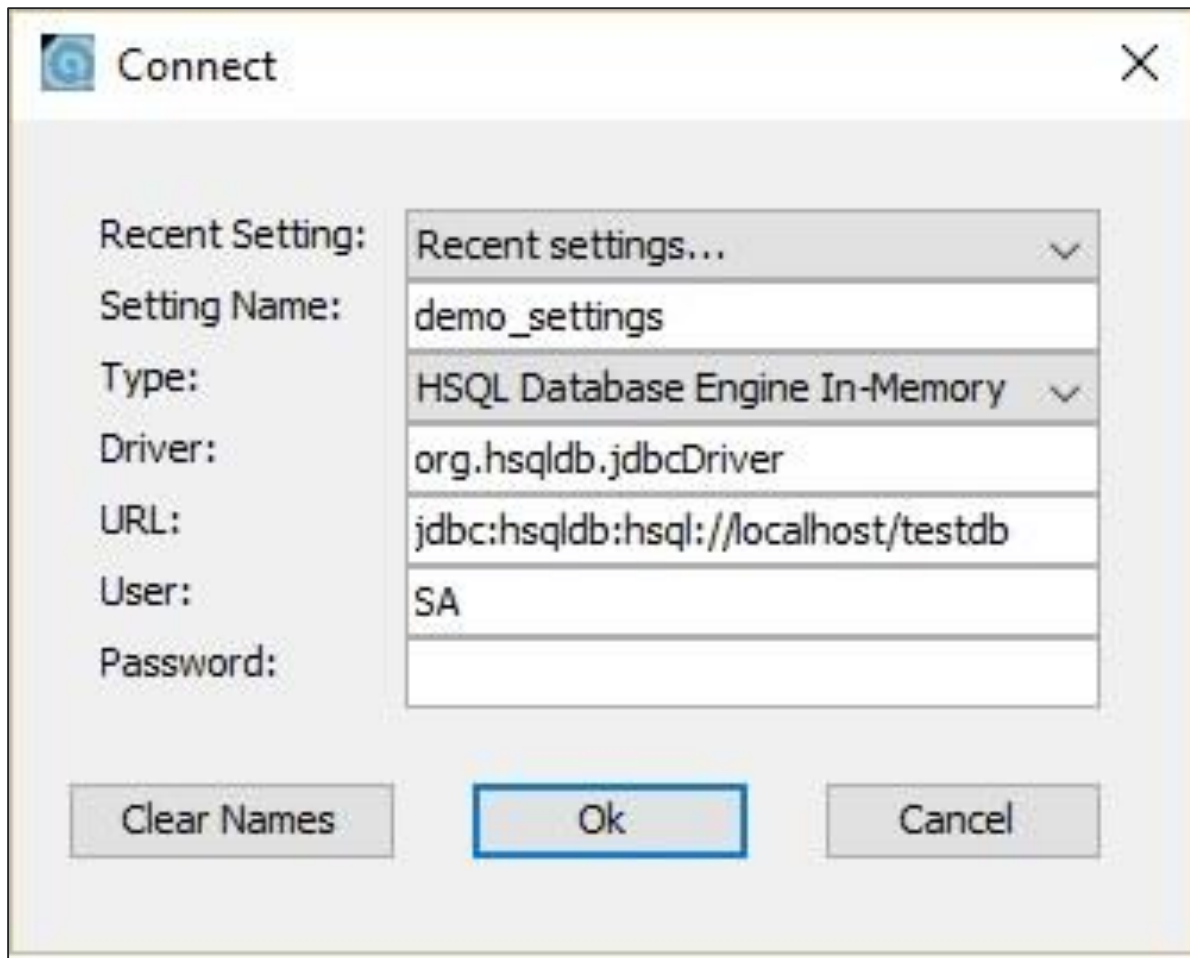
```
\>cd C:\hsqldb-2.3.4\hsqldb  
hsqldb>java -classpath lib/hsqldb.jar org.hsqldb.server.Server --database.0  
file:hsqldb/demodb --dbname.0 testdb
```

After execution of the above command, you get the following status.

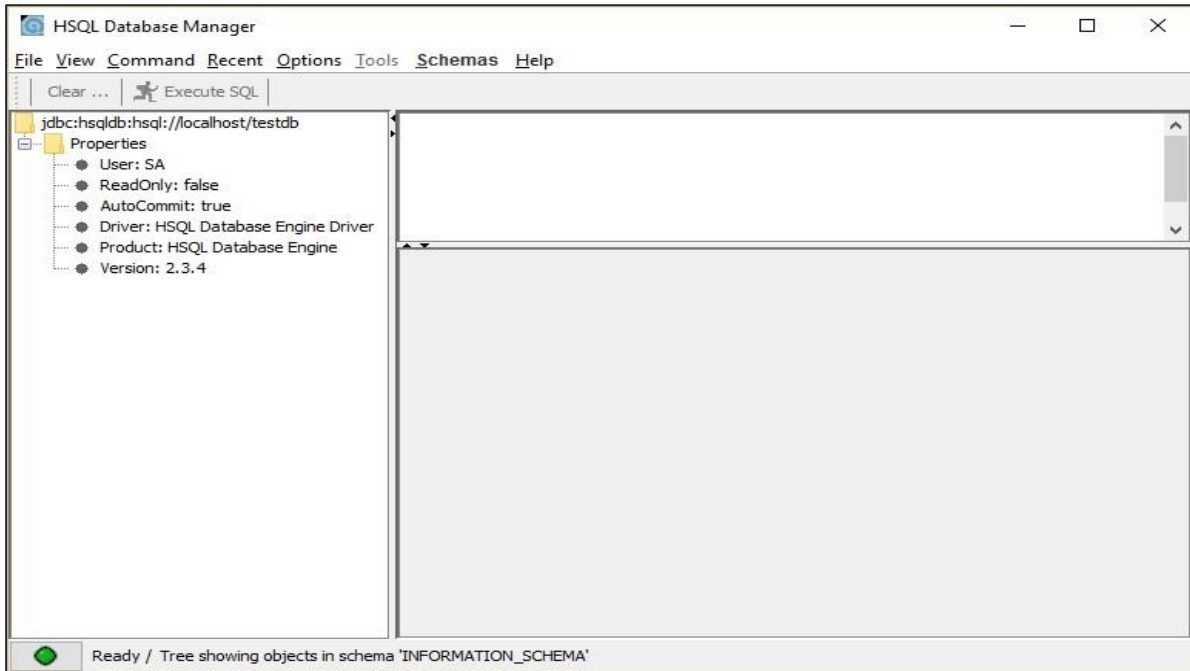


```
C:\WINDOWS\system32\cmd.exe - java -classpath lib/hsqldb.jar org.hsqldb.server.Server -...
.server.Server --database.0 file:hsqldb/demodb --dbname.0 testdb
[Server@2f92e0f4]: [Thread[main,5,main]]: checkRunning(false) entered
[Server@2f92e0f4]: [Thread[main,5,main]]: checkRunning(false) exited
[Server@2f92e0f4]: Startup sequence initiated from main() method
[Server@2f92e0f4]: Loaded properties from [E:\work\25- HSQLDB\hsqldb-2.3.4\hsqldb\server.properties]
[Server@2f92e0f4]: Initiating startup sequence...
[Server@2f92e0f4]: Server socket opened successfully in 31 ms.
[Server@2f92e0f4]: Database [index=0, id=0, db=file:hsqldb/demodb, alias=testdb]
opened successfully in 773 ms.
[Server@2f92e0f4]: Startup sequence completed in 820 ms.
[Server@2f92e0f4]: 2016-06-09 11:22:13.710 HSQLDB server 2.3.4 is online on port
9001
[Server@2f92e0f4]: To close normally, connect and execute SHUTDOWN SQL
[Server@2f92e0f4]: From command line, use [Ctrl]+[C] to abort abruptly
```

Now, you can open the database home screen that is **runManagerSwing.bat** from **C:\hsqldb-2.3.4\hsqldb\bin** location. This bat file will open the GUI file for HSQLDB database. Before that it will ask you for database settings through a dialog box. Take a look at the following screenshot. In this dialog box, enter the Setting Name, URL as shown above and click Ok.



You will get the GUI screen of HSQLDB database as shown in the following screenshot.



3. HSQLDB – CONNECT

In the installation chapter, we discussed how to connect the database manually. In this chapter, we will discuss how to connect the database programmatically (using Java programming).

Take a look at the following program, which will start the server and create a connection between the Java application and the database.

Example

```
import java.sql.Connection;
import java.sql.DriverManager;

public class ConnectDatabase {
    public static void main(String[] args) {
        Connection con = null;
        try {
            //Registering the HSQLDB JDBC driver
            Class.forName("org.hsqldb.jdbc.JDBCDriver");

            //Creating the connection with HSQLDB
            con = DriverManager.getConnection(
                "jdbc:hsqldb:hsqldb://localhost/testdb", "SA", "");
            if (con!= null){
                System.out.println("Connection created successfully");
            }else{
                System.out.println("Problem with creating connection");
            }
        } catch (Exception e) {
            e.printStackTrace(System.out);
        }
    }
}
```

Save this code into **ConnectDatabase.java** file. You will have to start the database using the following command.

```
\>cd C:\hsqldb-2.3.4\hsqldb  
hsqldb>java -classpath lib/hsqldb.jar org.hsqldb.server.Server --database.0  
file:hsqldb/demodb --dbname.0 testdb
```

You can use the following command to compile and execute the code.

```
\>javac ConnectDatabase.java  
\>java ConnectDatabase
```

After execution of the above command, you will receive the following output:

```
Connection created successfully
```


4. HSQldb – DATA TYPES

This chapter explains the different datatypes of HSQldb. HSQldb server offers six categories of data types.

Exact Numeric Data Types

Data Type	From	To
bigint	-9,223,372,036,854,775,808	9,223,372,036,854,775,807
int	-2,147,483,648	2,147,483,647
smallint	-32,768	32,767
tinyint	0	255
bit	0	1
decimal	$-10^{38} + 1$	$10^{38} - 1$
numeric	$-10^{38} + 1$	$10^{38} - 1$
money	-922,337,203,685,477.5808	+922,337,203,685,477.5807
smallmoney	-214,748.3648	+214,748.3647

Approximate Numeric Data Types

Data Type	From	To
float	$-1.79E + 308$	$1.79E + 308$
real	$-3.40E + 38$	$3.40E + 38$

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