JDBC driver

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A **JDBC driver** is a software component enabling a Java application to interact with a database.[1]

To connect with individual databases, JDBC (the Java Database Connectivity API) requires drivers for each database. The JDBC driver gives out the connection to the database and implements the protocol for transferring the query and result between client and database.

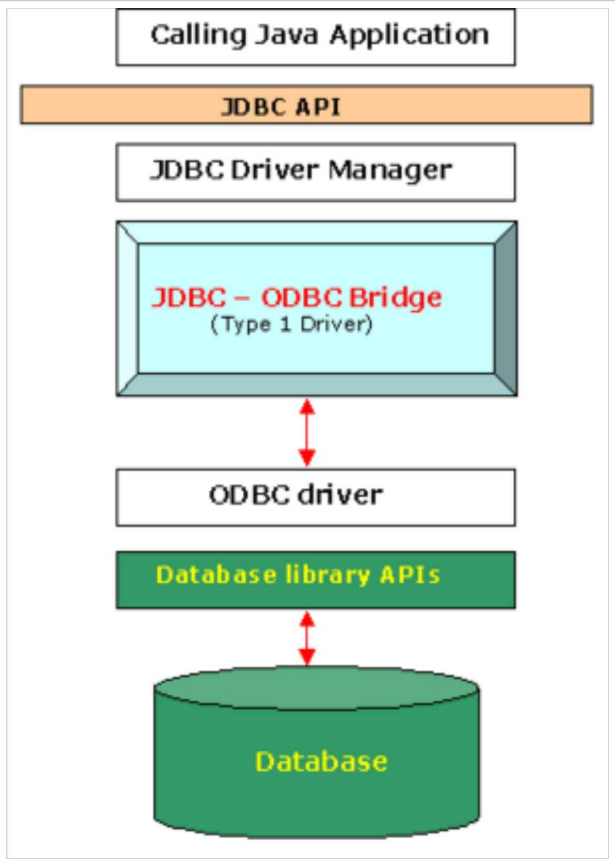
JDBC technology drivers fit into one of four categories. [2]

Contents

Type 1 Driver - JDBC-ODBC bridge

The JDBC type 1 driver, also known as the JDBC-ODBC bridge, is a database driver implementation that employs the ODBC driver to connect to the database. The driver converts JDBC method calls into ODBC function calls.

The driver is platform-dependent as it makes use of ODBC which in turn depends on native libraries of the underlying operating system the JVM is running upon. Also, use of this driver leads to other installation dependencies; for example, ODBC must be installed on the computer having the driver and the database must support an ODBC driver. The use of this driver is discouraged if the alternative of a pure-Java driver is available. The other implication is that any application using a type 1 driver is non-portable given the binding between the driver and platform. This technology isn't suitable for a high-transaction environment. Type 1 drivers also don't support the complete Java command set and are limited by the functionality of the ODBC driver.



Schematic of the JDBC-ODBC bridge

Functions

- Translates query obtained by JDBC into corresponding ODBC query, which is then handled by the ODBC driver.
- Sun provides a JDBC-ODBC Bridge driver. sun.jdbc.odbc.JdbcOdbcDriver. This driver is native code and not Java, and is closed source.
- Client -> JDBC Driver -> ODBC Driver -> Database

Advantages

- Easy to connect.
- Directly connected to the database.

Disadvantages

- Performance overhead since the calls have to go through the JDBC overhead bridge to the ODBC driver, then to the native db connectivity interface.
- The ODBC driver needs to be installed on the client machine.
- Considering the client-side software needed, this is not suitable for applets.
- Compared to other driver types it's slow.
- The Sun driver has a known issue with character encodings and Microsoft Access databases. Microsoft Access may use an encoding that is not correctly translated by the driver, leading to the replacement in strings of, for example, accented characters by question marks. One workaround is to avoid reading strings directly, but rather to read the raw bytes and then translate these into a string, specifying the correct source encoding:

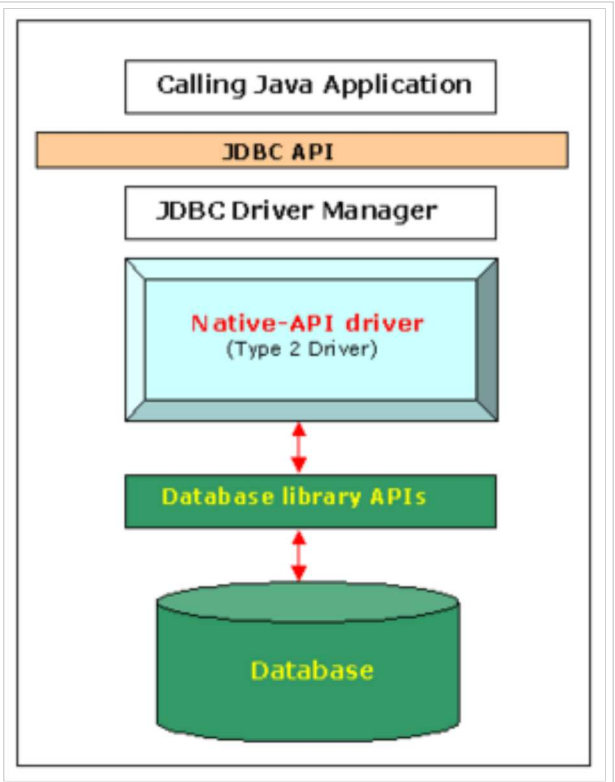
```
byte[] rawBytes = row.getBytes("COLUMN_NAME");
String columnValue = new String(rawBytes, "Windows-1252");
```

Type 2 Driver - Native-API Driver specification

The JDBC type 2 driver, also known as the Native-API driver, is a database driver implementation that uses the client-side libraries of the database. The driver converts JDBC method calls into native calls of the database API.

The type 2 driver is not written entirely in Java as it interfaces with non-Java code that makes the final database calls. The driver is compiled for use with the particular operating system. For platform interoperability, the Type 4 driver, being a full-Java implementation, is preferred over this driver.

- The vendor client library needs to be installed on the client machine.
- Not all databases have a client side library
- This driver is platform dependent
- This driver supports all java applications except Applets

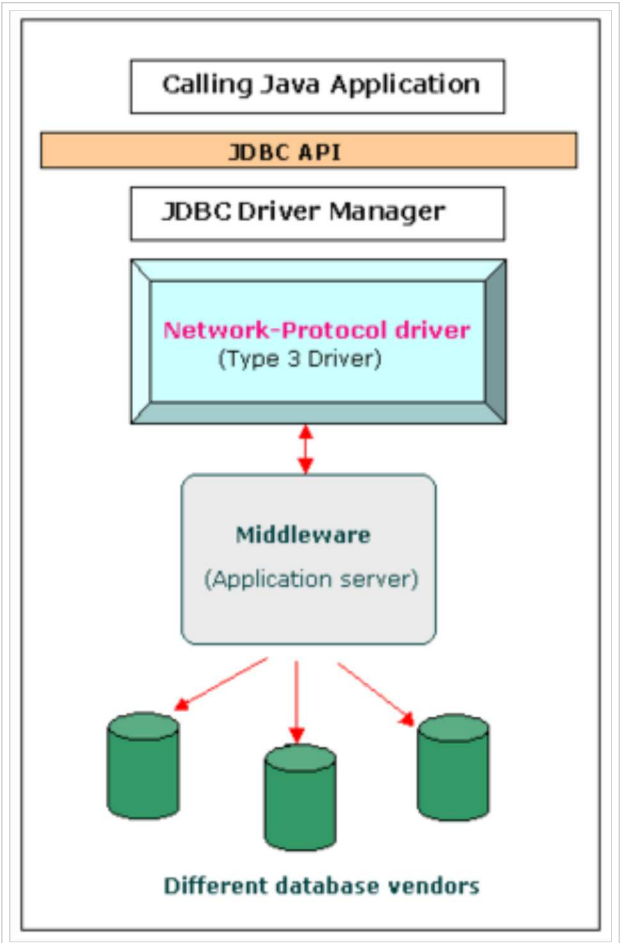


Schematic of the Native API driver

Type 3 Driver - Network-Protocol Driver

The JDBC type 3 driver, also known as the Pure Java Driver for Database Middleware, is a database driver implementation which makes use of a middle tier between the calling program and the database. The middle-tier (application server) converts JDBC calls directly or indirectly into the vendor-specific database protocol.

This differs from the type 4 driver in that the protocol conversion logic resides not at the client, but in the middle-tier. Like type 4 drivers, the type 3 driver is written entirely in Java. The same driver can be used for multiple databases. It depends on the number of databases the middleware has been configured to support. The type 3 driver is platform-independent as the platform-related differences are taken care by the middleware. Also, making use of the middleware provides additional advantages of security and firewall access.



Schematic of the Network Protocol driver

Functions

- Follows a three tier communication approach.
- Can interface to multiple databases - Not vendor specific.
- The JDBC Client driver written in java, communicates with a middleware-net-server using a database independent protocol, and then this net server translates this request into database commands for that database.
- Thus the client driver to middleware communication is database independent.
- Client -> JDBC Driver -> Network-protocol driver -> Middleware-Net Server -> Any Database,...

Advantages

- Since the communication between client and the middleware server is database independent, there is no need for the vendor db library on the client machine. Also the client to middleware need not be changed for a new database.
- The Middleware Server (which can be a full fledged J2EE Application server) can provide typical middleware services like caching (connections, query results, and so on), load balancing, logging, auditing etc.
- Eg. for the above include jdbc driver features in Weblogic.
  - Can be used in internet since there is no client side software needed.
  - At client side a single driver can handle any database. (It works provided the middleware supports that database!)

Disadvantages

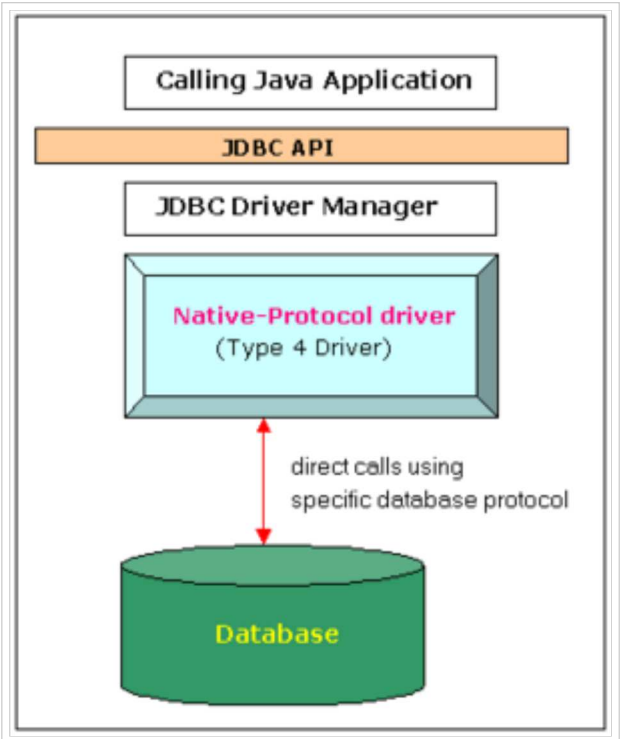
- Requires database-specific coding to be done in the middle tier.
- An extra layer added may result in a time-bottleneck. But typically this is overcome by providing efficient middleware services .

Type 4 Driver - Native-Protocol Driver

The JDBC type 4 driver, also known as the Direct to Database Pure Java Driver, is a database driver implementation that converts JDBC calls directly into a vendor-specific database protocol.

Written completely in Java, type 4 drivers are thus platform independent. They install inside the Java Virtual Machine of the client. This provides better performance than the type 1 and type 2 drivers as it does not have the overhead of conversion of calls into ODBC or database API calls. Unlike the type 3 drivers, it does not need associated software to work.

As the database protocol is vendor-specific, the JDBC client requires separate drivers, usually vendor-supplied, to connect to different types of databases.



Schematic of the Native-Protocol driver

Functions

- Type 4 drivers, coded entirely in Java, communicate directly with a vendor's database, usually through socket connections. No translation or middleware layers are required, improving performance.
- The driver converts JDBC calls into the vendor-specific database protocol so that client applications can communicate directly with the database server.
- Completely implemented in Java to achieve platform independence.
- This type includes (for example) the widely-used Oracle thin driver - oracle.jdbc.driver.OracleDriver which connects using a format configuration of jdbc:oracle:thin:@URL
- Client -> Native-protocol JDBC Driver -> database server

Advantages

- These drivers don't translate the requests into an intermediary format (such as ODBC), nor do they need a middleware layer to service requests. This can enhance performance considerably.
- The JVM can manage all aspects of the application-to-database connection; this can facilitate debugging.

==Disadvantages

- Drivers are database dependent.

This driver gives affective performance for every jdbc application. Since, there is no DSN. 2. Since, this driver is developed in java by database vendors, internally JVM need not to convert platform dependent to platform independent.

List of JDBC Drivers

- List of jdbc vendors registered with Sun (http://java.sun.com/products/jdbc/reference/industrysupport/index.html)
- List of drivers registered with Sun (http://developers.sun.com/product/jdbc/drivers/)
- Open Source Performance Benchmark (http://www.polepos.org/)

See also

- Open Database Connectivity(ODBC)
- Oracle Call Interface

References

1. ^ "Java SE Technologies - Database" (http://java.sun.com/javase/technologies/database/)
2. ^ Sun JDBC Overview (http://java.sun.com/products/jdbc/driverdesc.html)