

Tema 3. Bases de datos relacionales

1. Instalar SQL
2. Cargar driver JDBC Java
3. Conexión a la BBDD

Objetivos del Tema 3

- (1) Conocer las características fundamentales de las API (application programming interface) que proporcionan conectores a bases de datos y, en particular, de JDBC (Java Database Connectivity) para bases de datos relacionales.
- (2) Comprender el desfase objeto-relacional.
- (3) Abrir una conexión a una base de datos con JDBC utilizando un driver de JDBC para ella.
- (4) Escribir programas en Java utilizando JDBC para ejecutar todo tipo de sentencias
- (5) Utilizar sentencias preparadas para ejecutar sentencias de SQL de manera segura y eficiente.
- (6) Trabajar con transacciones para ejecutar atómicamente un grupo de sentencias de SQL.

Conceptos

Clave autogenerada. Columna numérica de una tabla que se define como clave primaria y para la que no se especifica valor cuando se inserta una nueva fila, de manera que el propio sistema gestor de bases de datos (SGBD) le asigna automáticamente un valor.

Conector. API que permite a los programas de aplicación trabajar con bases de datos.

Desfase objeto-relacional. Conjunto de dificultades que plantea el almacenamiento de objetos complejos en bases de datos relacionales, con estructuras de almacenamiento basadas en tablas.

Driver de JDBC. Biblioteca de software que proporciona una implementación para una base de datos particular de las interfaces definidas en la especificación JDBC, de manera que permite a JDBC interactuar con esa base de datos.

Iterador. Mecanismo que permite acceder a los resultados de una consulta. Tiene operaciones para navegar por el conjunto de resultados y para recuperar los resultados uno a uno.

JDBC (Java Database Connectivity). Conector a bases de datos relacionales para Java.

Instalar MySQL 8.0

<https://dev.mysql.com/downloads/installer/>

MySQL Community Downloads
MySQL Installer

Tenemos 2 opciones:

1. Versión online.
2. Versión sin conexión a internet más pesada pero más potente.



General Availability (GA) Releases Archives

MySQL Installer 8.0.34

Note: MySQL 8.0 is the final series with MySQL Installer. As of MySQL 8.1, use a MySQL product's MSI or Zip archive for installation. MySQL Server 8.1 and higher also bundle MySQL Configurator, a tool that helps configure MySQL Server.

Select Version:
8.0.34

Select Operating System:
Microsoft Windows

Windows (x86, 32-bit), MSI Installer (mysql-installer-web-community-8.0.34.0.msi)	8.0.34	2.4M	Download
Windows (x86, 32-bit), MSI Installer (mysql-installer-community-8.0.34.0.msi)	8.0.34	331.3M	Download

MD5: 01baf7b42e551d53efb557eed401ff91 | [Signature](#)

MD5: 59eaa511c39011a2f0264311a80b0228 | [Signature](#)

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MySQL.com is using Oracle SSO for authentication. If you already have an Oracle Web account, click the Login link. Otherwise, you can signup for a free account by clicking the Sign Up link and following the instructions.



No thanks, just start my download.

MySQL. Installer

Adding Community

Choosing a Setup Type

Select Products

Download

Installation

Installation Complete

Choosing a Setup Type

Please select the Setup Type that suits your use case.

- ☐ **Server only**
Installs only the MySQL Server product.
- ☐ **Client only**
Installs only the MySQL Client products, without a server.
- ☐ **Full**
Installs all included MySQL products and features.
- ☒ **Custom**
Manually select the products that should be installed on the system.

Setup Type Description

Allows you to select exactly which products you would like to install. This also allows to pick other server versions and architectures (depending on your OS).

Next >

Cancel

MySQL Installer

Adding Community

Choosing a Setup Type

Select Products

Download

Installation

Product Configuration

Installation Complete

Select Products

Please select the products you would like to install on this computer.

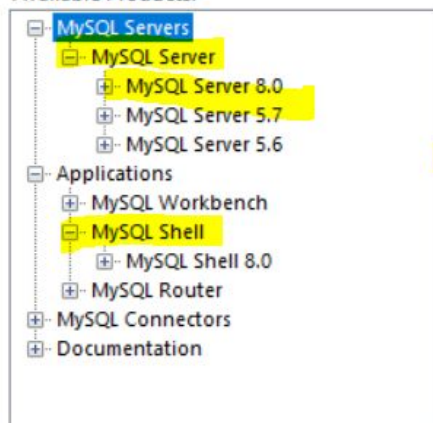


Filter:

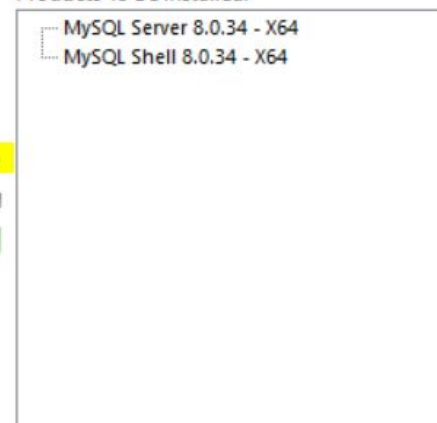
All Software, Current GA, Any

Edit

Available Products:



Products To Be Installed:



☐ Enable the Select Features page to customize product features

Published:

Release Notes:

< Back

Next >

Cancel

MySQL Installer

Adding Community

Choosing a Setup Type

Select Products




Installation

Product Configuration

Installation Complete

Installation

The following products will be installed.

Product	Arch	Status	Progress	Notes
  MySQL Server 8.0.34	X64	Installing	70%	
 MySQL Shell 8.0.34	X64	Ready to Install		

Show Details >

< Back

Execute

Cancel

MySQL[®] Installer

MySQL Server 8.0.34

Type and Networking

Authentication Method

Accounts and Roles

Windows Service

Server File Permissions

Apply Configuration

Type and Networking

Server Configuration Type

Choose the correct server configuration type for this MySQL Server installation. This setting will define how much system resources are assigned to the MySQL Server instance.

Config Type:

Connectivity

Use the following controls to select how you would like to connect to this server.

☒ TCP/IP Port: X Protocol Port:

☒ Open Windows Firewall ports for network access

☐ Named Pipe Pipe Name:

☐ Shared Memory Memory Name:

Advanced Configuration

Select the check box below to get additional configuration pages where you can set advanced and logging options for this server instance.

☐ Show Advanced and Logging Options

Next >

Cancel

MySQL[®] Installer

MySQL Server 8.0.34

Type and Networking

Authentication Method

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Server File Permissions

Apply Configuration

Authentication Method

☒ Use Strong Password Encryption for Authentication (RECOMMENDED)

MySQL 8 supports a new authentication based on improved stronger methods. It is recommended that all new MySQL Server installations use this method forward.



Attention: This new authentication plugin on the server side requires connectors and clients which add support for this new 8.0 de (caching_sha2_password authentication).

Currently MySQL 8.0 Connectors and community drivers which use lib this new method. If clients and applications cannot be updated to support this authentication method, the MySQL 8.0 Server can be configured to use the legacy MySQL Authentication Method below.

☐ Use Legacy Authentication Method (Retain MySQL 5.x Compatibility)

Using the old MySQL 5.x legacy authentication method should only be considered in the following cases:

- If applications cannot be updated to use MySQL 8 enabled Connectors and drivers.
- For cases where re-compilation of an existing application is not feasible.
- An updated, language specific connector or driver is not yet available.

Security Guidance: When possible, we highly recommend taking needed steps towards upgrading your applications, libraries, and database servers to the new stronger authentication. This new method will significantly improve your security.

**Escribe una
contraseña fácil o
apúntala!**

< Back

Next >

Cancel



MySQL[®] Installer

MySQL Server 8.0.34

Type and Networking

Authentication Method

Accounts and Roles

Windows Service

Server File Permissions

Apply Configuration

Windows Service

☒ Configure MySQL Server as a Windows Service

Windows Service Details

Please specify a Windows Service name to be used for this MySQL Server instance. A unique name is required for each instance.

Windows Service Name:

☒ Start the MySQL Server at System Startup

Run Windows Service as ...

The MySQL Server needs to run under a given user account. Based on the security requirements of your system you need to pick one of the options below.

☒ Standard System Account

Recommended for most scenarios.

☐ Custom User

An existing user account can be selected for advanced scenarios.

< Back

Next >

Cancel



MySQL Installer

MySQL Server 8.0.34

Type and Networking

Authentication Method

Accounts and Roles

Windows Service

Server File Permissions

Apply Configuration

Apply Configuration

The following configuration steps are being executed.

Configuration Steps

Log

- ☒ Writing configuration file
- ☒ Updating Windows Firewall rules .
- ☐ Adjusting Windows service
- ☐ Initializing database (may take a long time)
- ☐ Updating permissions for the data folder and related server files
- ☐ Starting the server
- ☐ Applying security settings
- ☐ Updating the Start menu link

Execute

Cancel

MySQL. Installer

Adding Community

Choosing a Setup Type

Select Products

Installation

Product Configuration

Installation Complete

Product Configuration

We'll now walk through a configuration wizard for each of the following products.

You can cancel at any point if you wish to leave this wizard without configuring all the products.

Product	Status
MySQL Server 8.0.34	Configuration complete.

Next >

Cancel

MySQL Installer

Adding Community

Choosing a Setup Type

Select Products

Installation

Product Configuration

Installation Complete

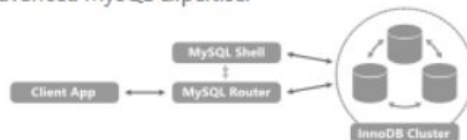
Installation Complete

The installation procedure has been completed.

Copy Log to Clipboard

☒ Start MySQL Shell after setup

The MySQL Shell is an advanced MySQL client application that can be used to work with single MySQL Server instances. Further, it can be used to create and manage InnoDB Cluster, an integrated solution for high availability and scalability of MySQL databases, without requiring advanced MySQL expertise.



Refer to the following links for documentation, tutorials and examples on MySQL Shell:

[MySQL Shell Documentation](#)

[Setting up a Real World Cluster Blog](#)

[The All New MySQL InnoDB ReplicaSet Blog](#)

[Changing Cluster Options Live Blog](#)

Finish

MySQL Shell

Una vez instalado...

Vamos a crear un usuario además de root y a darle privilegios en la BBDD.





C:\Program Files\MySQL\MySQL Shell 8.0\bin\mysqlsh.exe



MySQL Shell 8.0.34

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Type '\help' or '\?' for help; '\quit' to exit.

MySQL JS >

**Escribe los comandos de la siguiente
transparencia.
Vamos a crear un usuario para nuestra
BBDD.
Y a crear nuestra primera BBDD.**


```
MySQL JS > \connect mysql://root@localhost:3306
Creating a Classic session to 'root@localhost:3306'
Please provide the password for 'root@localhost:3306': ****
Save password for 'root@localhost:3306'? [Y]es/[N]o/[N]e[v]er (default No): y
Fetching schema names for auto-completion... Press ^C to stop.
Your MySQL connection id is 19
Server version: 8.0.34 MySQL Community Server - GPL
No default schema selected; type \use <schema> to set one.
```

```
MySQL localhost:3306 ssl SQL > create user 'libro_ad'@'localhost' IDENTIFIED BY '1234';
Query OK, 0 rows affected (0.0716 sec)
MySQL localhost:3306 ssl SQL > create database libro_ad;
ERROR: 1007 (HY000): Can't create database 'libro_ad'; database exists
MySQL localhost:3306 ssl SQL > grant all privileges on libro_ad.* to 'libro_ad'@'localhost';
Query OK, 0 rows affected (0.0386 sec)
MySQL localhost:3306 ssl SQL > show databases
-> ;

+-----+
| Database |
+-----+
| information_schema |
| libro_ad |
| mysql |
| performance_schema |
| sys |
+-----+
5 rows in set (0.0265 sec)
MySQL localhost:3306 ssl SQL >
```

En IntelliJ creamos un programa para conectar a la BBDD

```
package jdbc_connection;

import java.sql.DriverManager;
import java.sql.Connection;
import java.sql.SQLException;

public class JDBC_Connection {

    public static void muestraErrorSQL (SQLException e) {
        System.err.println("SQL ERROR mensaje: " + e.getMessage());
        System.err.println("SQL Estado: " + e.getSQLState());
        System.err.println("SQL código específico: " + e.getErrorCode());
    }

    public static void main(String[] args) {

        String basedatos = "libro ad";
        String host = "localhost";
        String port = "3306";
        String parAdic = "?useUnicode=true&useJDBCCompliantTimezoneShift=true&useLegacyDatetimeCode=false&serverTimezone=UTC" ;
        String urlConnection = "jdbc:mysql://" + host + ":" + port + "/" + basedatos + parAdic;
        String user = "libro ad";
        String pwd = "1234";

        //Class.forName("com.mysql.jdbc.Driver"); // No necesario desde SE 6.0
        //Class.forName("com.mysql.cj.jdbc.Driver"); // para MySQL 8.0, no necesario
        try (Connection c = DriverManager.getConnection(urlConnection, user, pwd)) {
            System.out.println("Conexión realizada.");
        } catch (SQLException e) {
            System.out.println("SQL mensaje: " + e.getMessage());
            System.out.println("SQL Estado: " + e.getSQLState());
            System.out.println("SQL código específico: " + e.getErrorCode());
        } catch (Exception e) {
            e.printStackTrace(System.err);
        }
    }
}
```

Añadir BBDD en IntelliJ

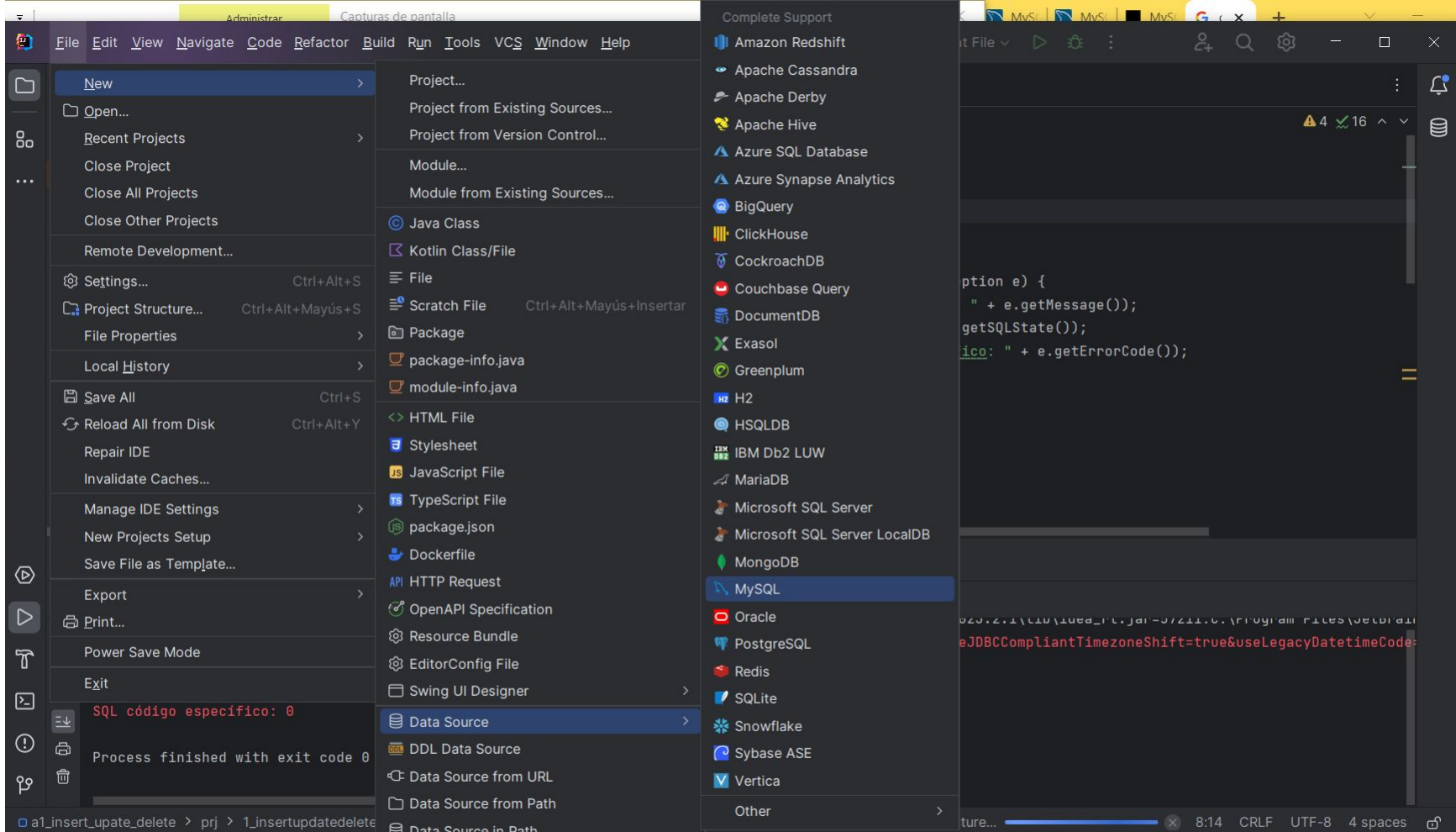
Vamos a

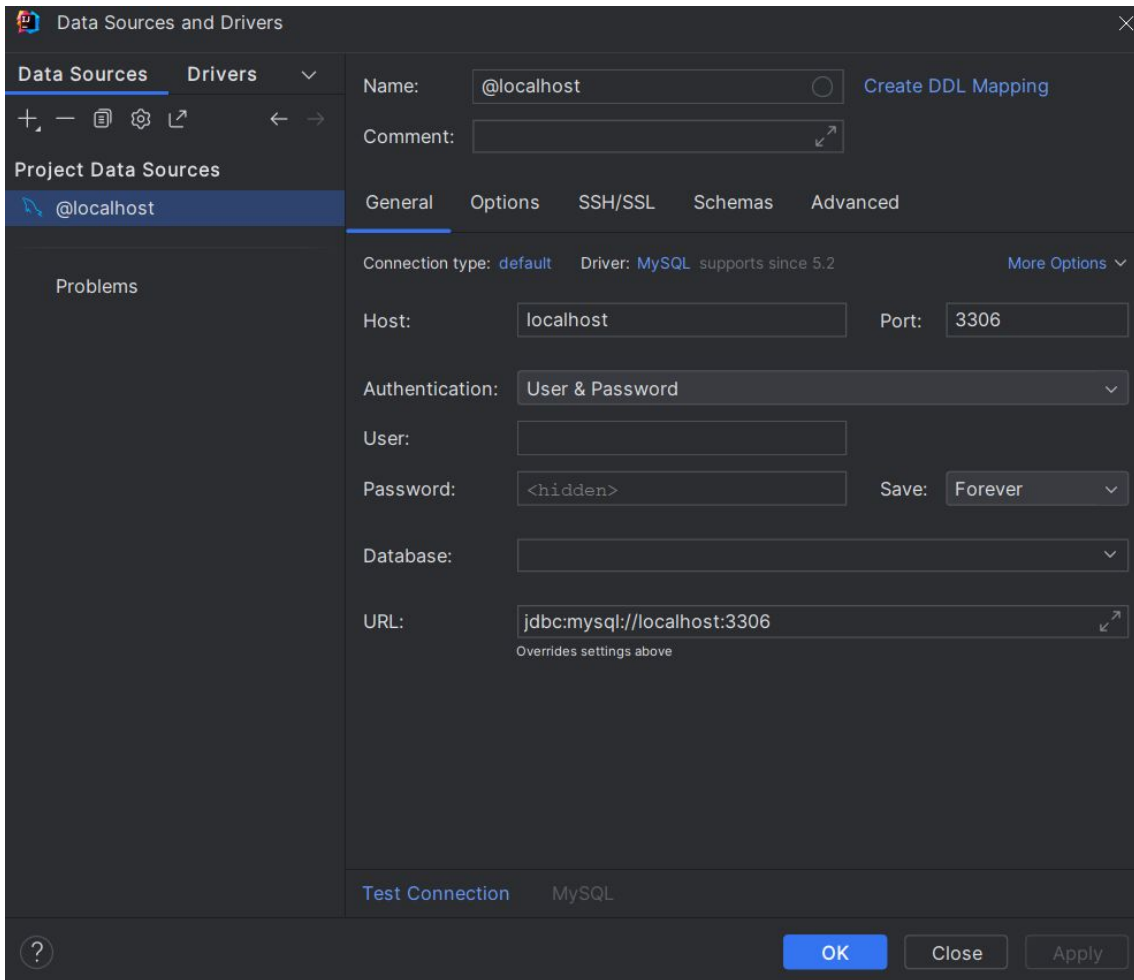
File

New

Data Source

MySQL





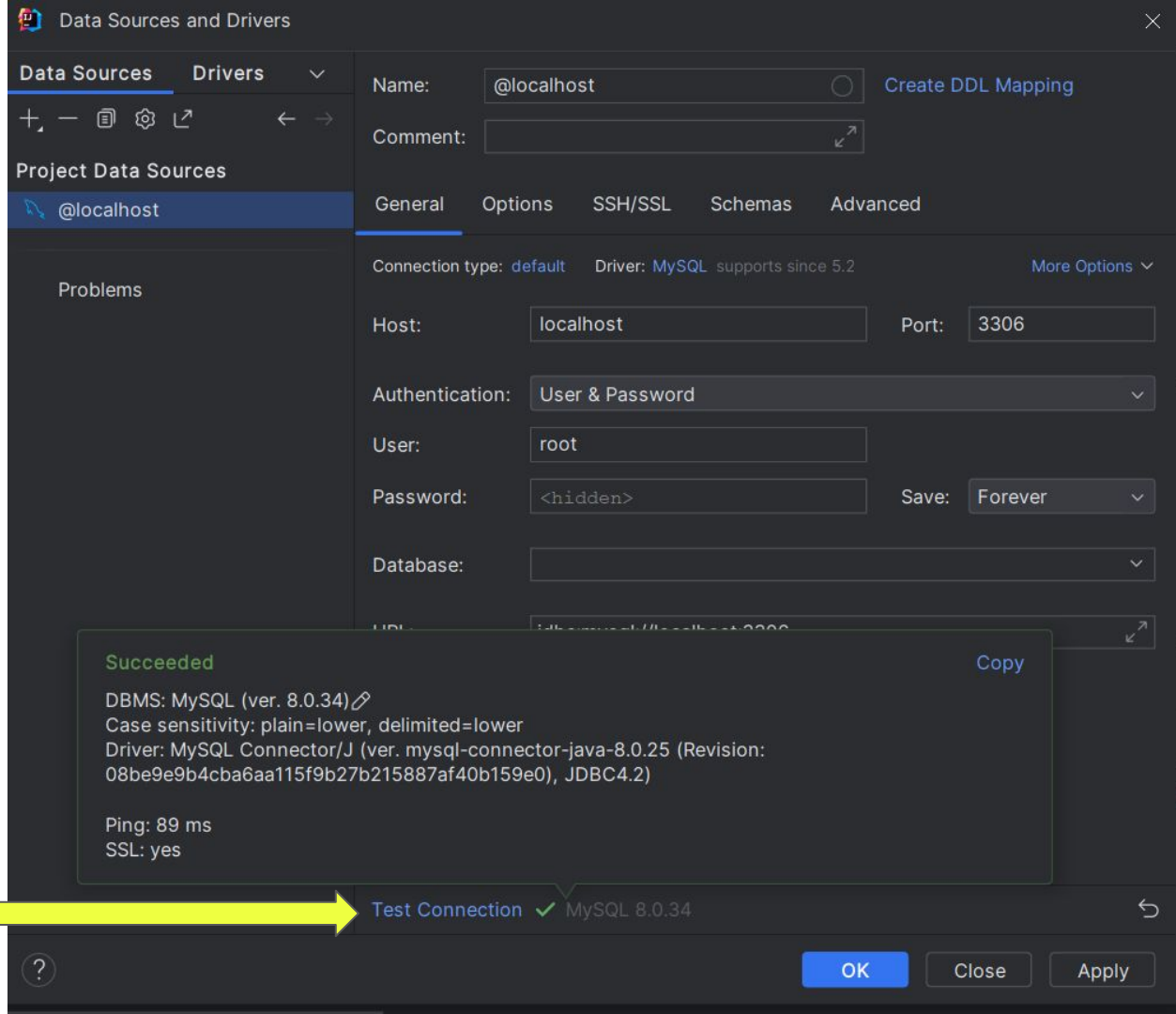
Hacemos un Test Connection.

Recuerda que el usuario es

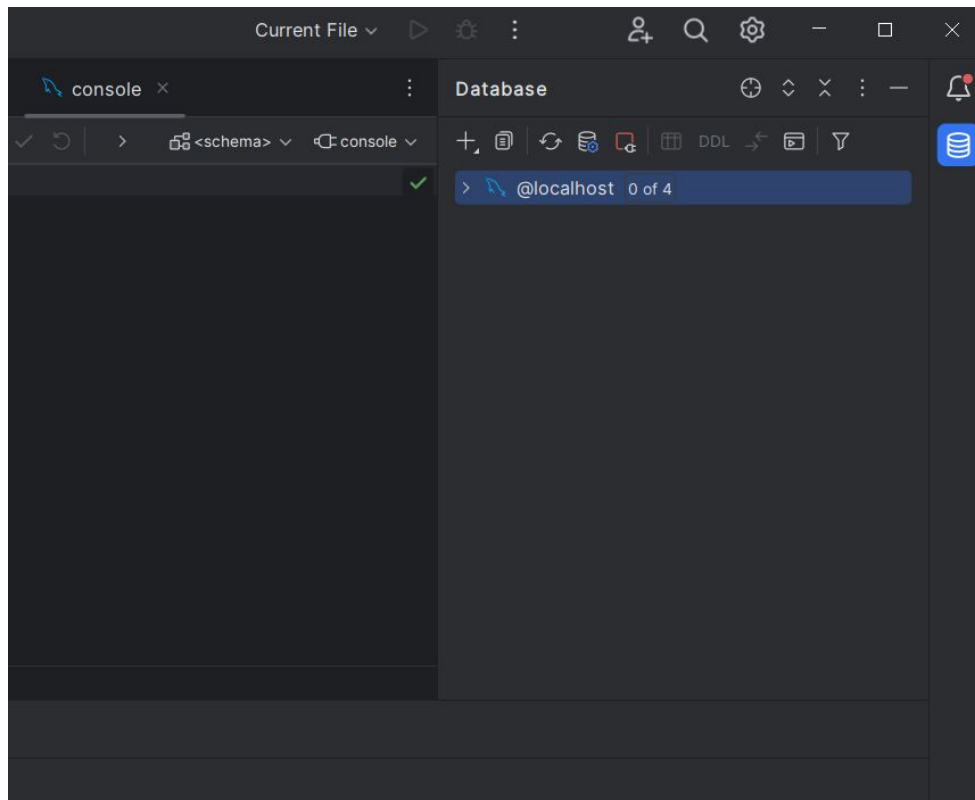
libro_ad

Y la **contraseña** la que pusiste en la transparencia 17

Le damos a **OK**



Se abre la BBDD en el IDE



JDBC

JDBC (Java Database Connectivity) es un API de Java que nos permite conectarnos con bases de datos y realizar operaciones sobre ellas utilizando instrucciones SQL desde una aplicación Java.

Con JDBC tenemos una interfaz para conectarnos con una base de datos sin tener que preocuparnos de si es una base de datos MySQL, Oracle, SQLServer o cualquier otro tipo de base de datos.

El único cambio que habría que hacer para cambiar el tipo de base de datos de una aplicación sería cambiar el driver específico de la base de datos en cuestión.

Driver JDBC

Vamos a descargar el driver para Java de MySQL:

<https://dev.mysql.com/downloads/connector/j/>

MySQL Community Downloads

Connector/J


General Availability (GA) Releases Archives

Connector/J 8.1.0

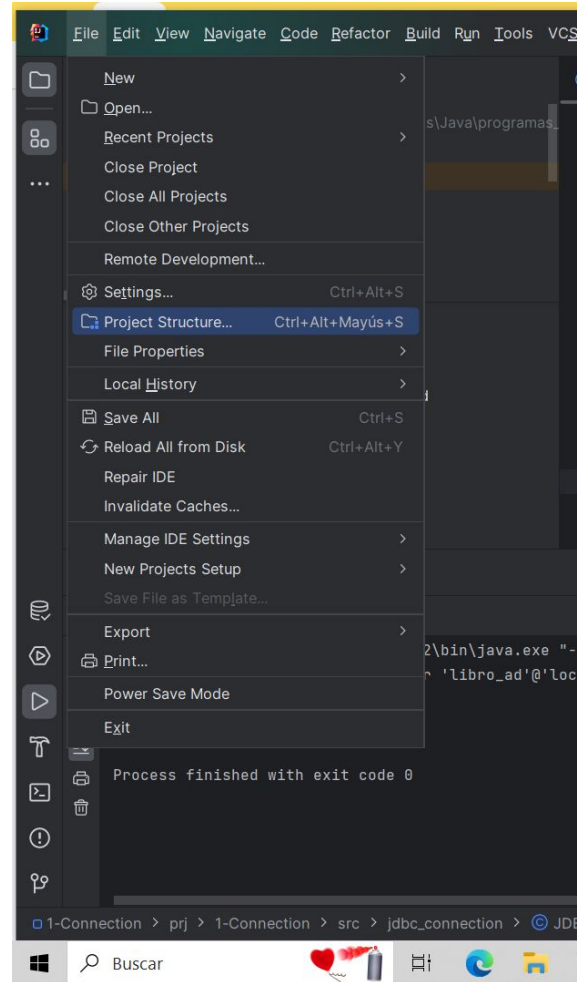
Select Operating System:

Platform Independent

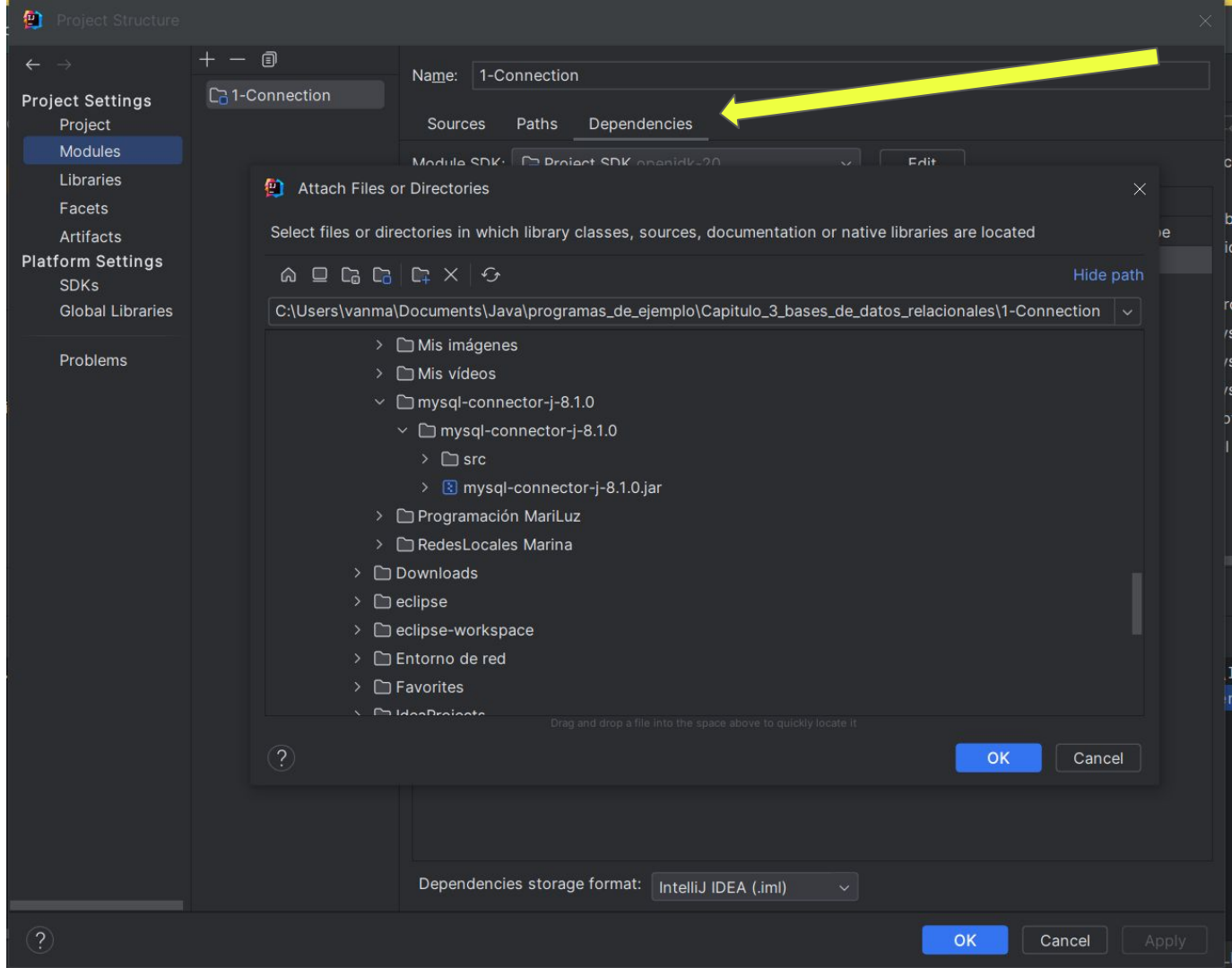
Platform Independent (Architecture Independent), Compressed TAR Archive (mysql-connector-j-8.1.0.tar.gz)	8.1.0	4.0M	Download
MD5: 4a95d62b0cfbad68b92ffc62ae7ee266 Signature			
Platform Independent (Architecture Independent), ZIP Archive (mysql-connector-j-8.1.0.zip)	8.1.0	4.8M	Download
MD5: d745362823ec4d37fa0607746d40a1b9 Signature			

 We suggest that you use the [MD5 checksums](#) and [GnuPG signatures](#) to verify the integrity of the packages you download.

Añadimos el
driver al
proyecto



Añadimos el
driver al
proyecto.



Project Structure

- ← →
- Project Settings
 - Project
 - Modules
 - Libraries
 - Facets
 - Artifacts
- Platform Settings
 - SDKs
 - Global Libraries
- Problems

- + - □
- 1-Connection

Name: 1-Connection

Sources Paths Dependencies

Module SDK: Project SDK openjdk-20 Edit

Exp...	Scope
openjdk-20 (Oracle OpenJDK version 20.0.2)	
<Module source>	
<input type="checkbox"/> mysql-connector-j-8.1.0.jar (C:\Users\vanma\Documents\mysql-connector-j-8.1.0\n Compile	

Añadir Driver en IntelliJ

Puedes seguir también este vídeo:

<https://www.youtube.com/watch?v=Aj5rhXQSEs4>

Conexión con la BBDD

Hay dos opciones para obtener una conexión:

La primera es crear una nueva conexión con la base de datos que será la que veremos en este ejemplo.

La segunda la otra es obtener la conexión de un pool de conexiones creado previamente que es una opción más eficiente porque no hace falta estar abriendo y cerrando conexiones continuamente ya que simplemente se cogen las conexiones cuando se necesitan y se dejan en el pool cuando ya no se necesitan para que puedan volver a usarse.

101-Connection ▾ Version control ▾

Project ▾
1-Connection C:\Users\vanma\Documents\Java\programas...
 > .idea
 > out
 > prj
 > 1-Connection
 > nbproject
 > src

Structure
JDBC_Connection
 muestraErrorSQL(SQLException): void
 main(String[]): void

JDBC_Connection.java x console

```
11 System.err.println("SQL Estado: " + e.getSQLState());  
12 System.err.println("SQL código específico: " + e.getErrorCode(),  
13 }  
14  
15 public static void main(String[] args) {  
16  
17     String basedatos = "libro_ad";  
18     String host = "localhost";  
19     String port = "3306";  
20     String parAdic = "?useUnicode=true&useJDBCCompliantTimezoneShift=true&useLegac  
21     String urlConnection = "jdbc:mysql://" + host + ":" + port + "/" + basedatos +  
22     String user = "libro_ad";  
23     String pwd = "1234";  
24  
25     //Class.forName("com.mysql.jdbc.Driver"); // No necesario desde SE 6.0  
26     //Class.forName("com.mysql.cj.jdbc.Driver"); // para MySQL 8.0, no necesario  
27     try (Connection c = DriverManager.getConnection(urlConnection, user, pwd)) {  
28         System.out.println("Conexión realizada.");
```

Database
libro_ad@localhost 1 of 5
 > libro_ad
 > Server Objects
 > collations 286
 > users 5
 libro_ad@localhost@%
 mysql.infoschema@localhost
 mysql.session@localhost
 mysql.sys@localhost
 root@localhost
 > virtual views 1

Run JDBC_Connection x

C:\Users\vanma\.jdk\openjdk-20.0.2\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2023.2.1\lib\idea_rt.jar=59132:C:\Program Files\JetBrains\IntelliJ IDEA 2023.2.1\bin\idea_rt.jar" -Dfile.encoding=UTF-8
Conexión realizada.
Process finished with exit code 0

1-Connection > prj > 1-Connection > src > jdbc_connection > JDBC_Connection > main 26:7 CRLF UTF-8 2 spaces*