

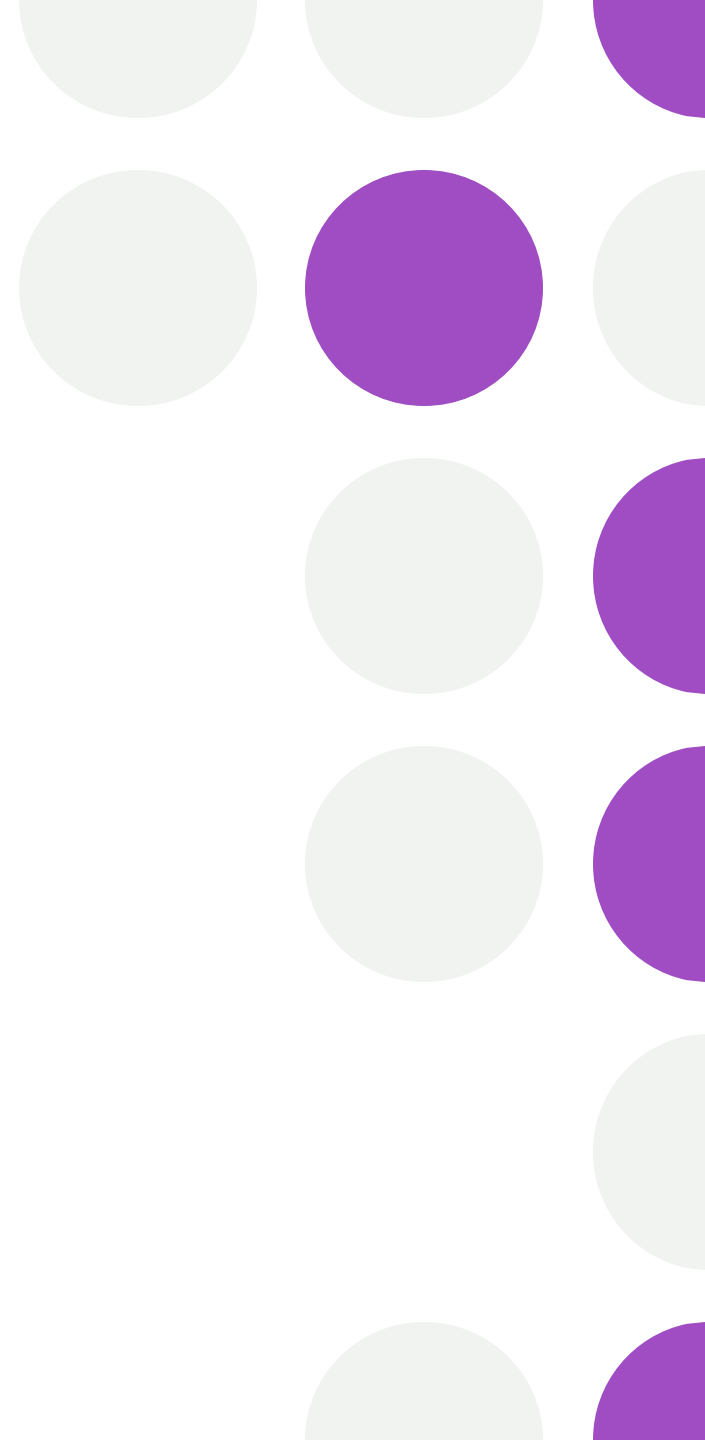
# Introduction to SQL for Data Analysis

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# What you will learn

- Install MySQL RDBMS
  - Create a Database
  - Selecting & Retrieving Data with SQL
  - Use SQL commands to filter, sort, and summarize data.
  - Modifying and Analyzing Data with SQL
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# Database

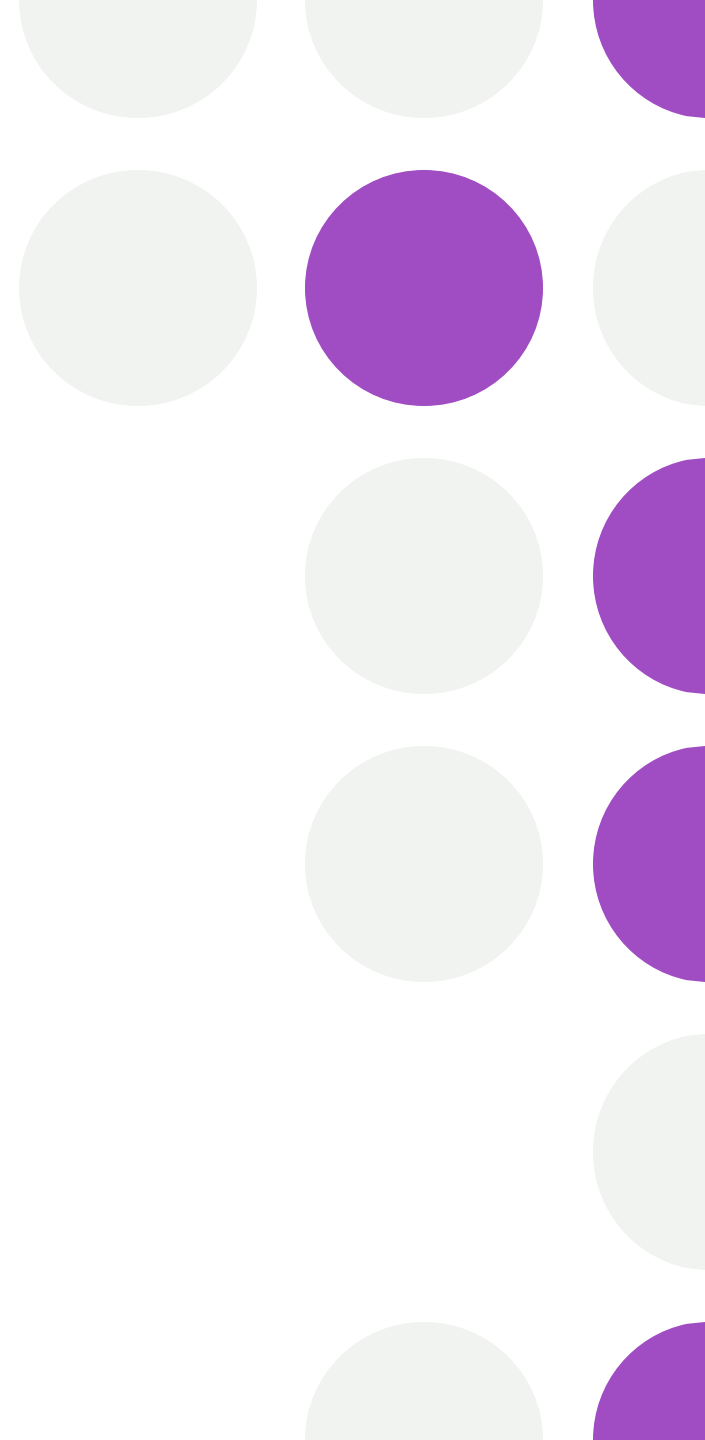
## What is Data?

In simple words, data can be facts related to any object in consideration. For example, your name, age, height, weight, etc. are some data related to you. A picture, image, file, pdf, etc. can also be considered data.

## What is Database?

A database is a systematic collection of data. They support electronic storage and manipulation of data. Databases make data management easy.

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# Database Management System

**Database Management System (DBMS)** is a collection of programs that enable its users to access databases, manipulate data, report, and represent data. It also helps to control access to the database.

## Relational databases

This type of database defines database relationships in the form of tables. It is also called Relational DBMS, which is the most popular DBMS type in the market. Database example of the RDBMS system include MySQL, Oracle, and Microsoft SQL Server database.

## What is SQL

SQL is the standard language for dealing with Relational Databases.

SQL is used to insert, search, update, and delete database records.

Out of all the relational databases, MySQL remains the most popular database for organizations.

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# Relational Database Concepts

Before we dive into SQL, there are a few relational database (RDBMS) concepts that will set the background for you.

## **Schema**

The database schema refers to the organization of data. It is a blueprint of how the database is constructed. In RDBMS, the database model is implemented by the schema. It is the Entity-relationship model.

## **Table**

One of the main units of the schema is the table. In RDBMS, tables are laid out and associated with each other in different types of relationships (one to one, one to many, many to many) relationships.

## **Columns**

The vertical partitions of tables are called columns. In RDBMS, a column is often also called an attribute.

## **Rows**

The horizontal partitions of tables are called rows. In RDBMS, a row is often also called a tuple.

## **Indexes**

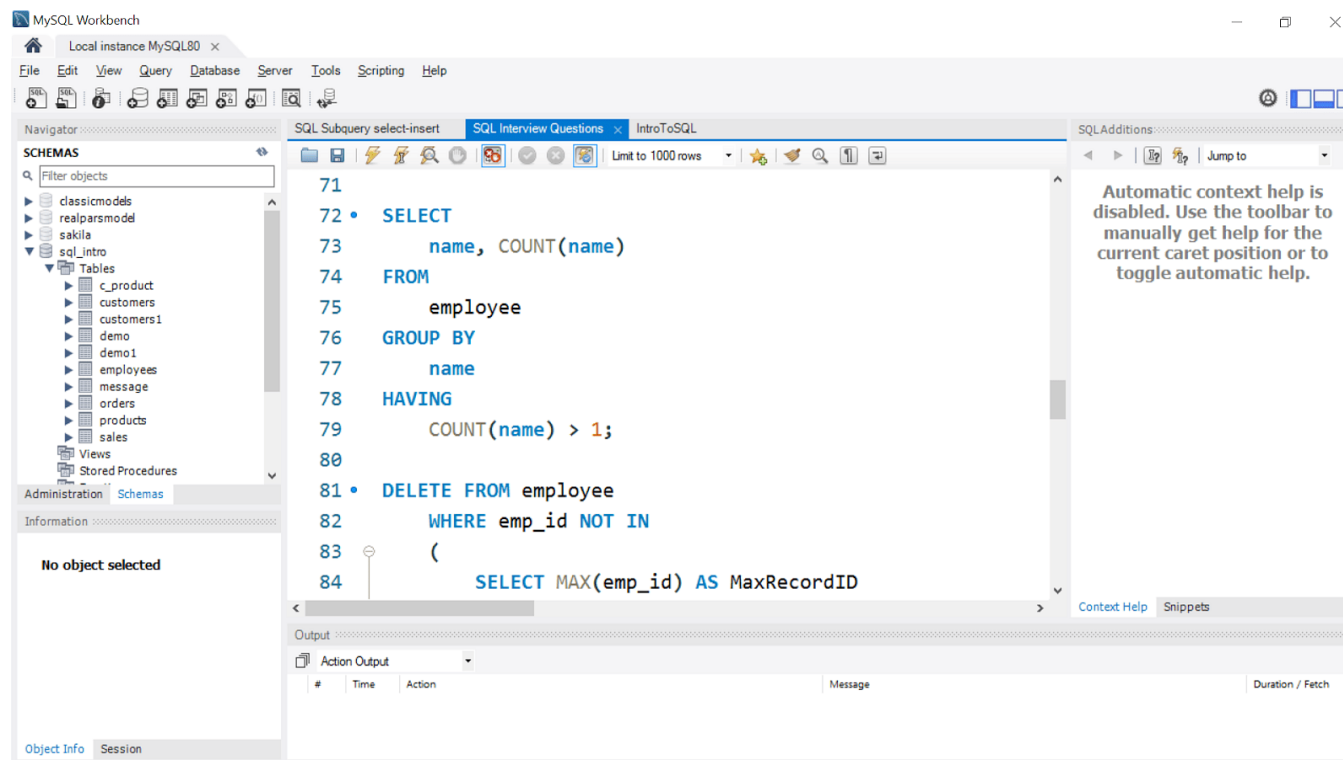
In RDBMS, the index is a data structure that improves the operation of the table by quickly locating the data.

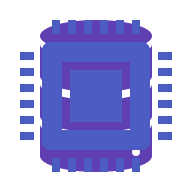
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# SQL Statements

SQL is the Structured Query Language for RDBMS databases. When you retrieve data, you typically use SQL statements to retrieve the data. You can join tables together to select out just the right types of data from different purposes using SQL statements.





# MySQL



MySQL is an open source relational database.

MySQL is cross platform which means it runs on a number of different platforms such as Windows, Linux, and Mac OS etc.

# Why MySQL

## Who Uses MySQL

- Huge websites like Facebook, Twitter, Airbnb, Booking.com, Uber, GitHub, YouTube, etc.
- Content Management Systems like WordPress, Drupal, Joomla!, Contao, etc.

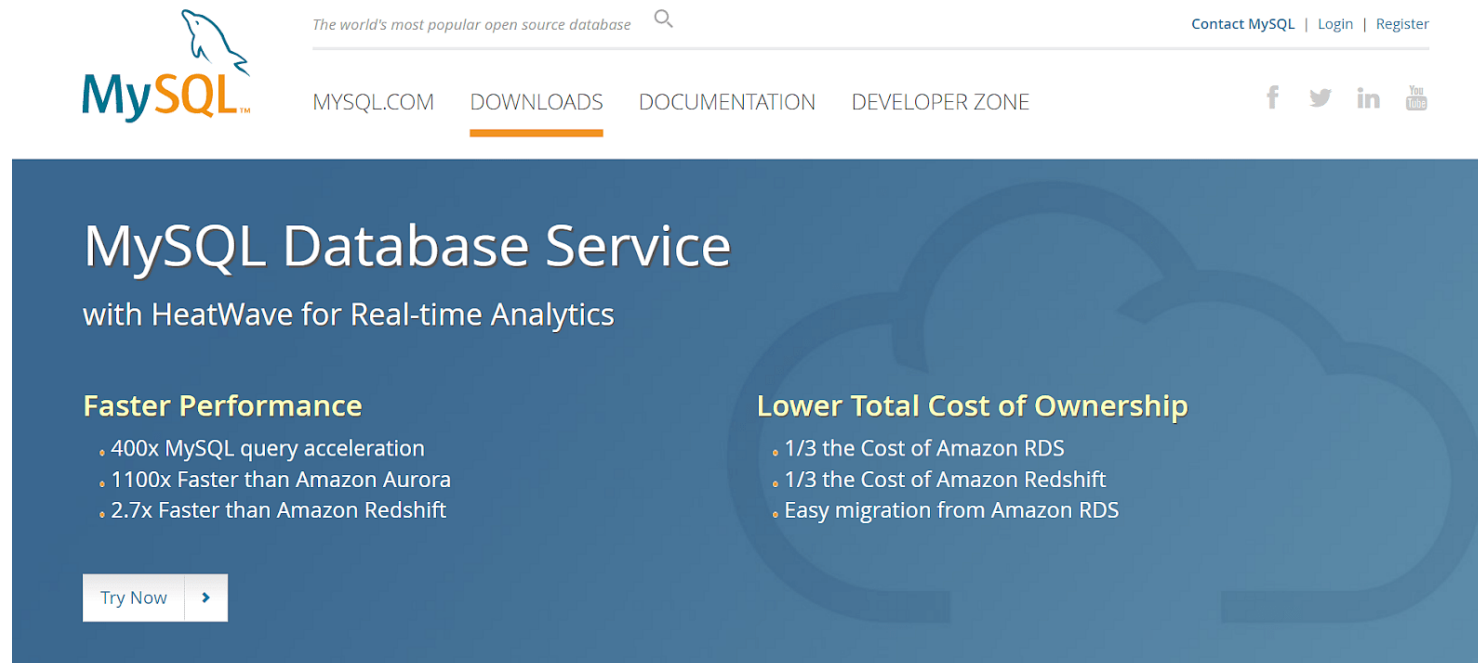
## Why MySQL?

- Open Source - MySQL is open-source software. You don't have to spend a single penny to access its services.
  - Cross-Platform - MySQL can run on Windows, Linux, Unix, and other operating systems.
  - High Availability - MySQL possesses a high processing system that makes MySQL process bulk queries and transactions while ensuring unique memory caches.
  - Reliability - SSH and SSL provide secure connections in MySQL. MySQL comes with features such as data encryption and data backup for recovery.
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# Installing MySQL

1. Open the MySQL website on a browser.
2. Select the **Downloads** option.



The screenshot shows the MySQL website homepage. At the top left is the MySQL logo with the tagline "The world's most popular open source database". To the right of the logo is a search bar. Further right are links for "Contact MySQL", "Login", and "Register". Below the logo and search bar is a navigation menu with "MYSQL.COM", "DOWNLOADS" (highlighted with an orange underline), "DOCUMENTATION", and "DEVELOPER ZONE". To the right of the navigation menu are social media icons for Facebook, Twitter, LinkedIn, and YouTube. The main content area has a dark blue background with the text "MySQL Database Service" and "with HeatWave for Real-time Analytics". Below this are two columns of benefits: "Faster Performance" and "Lower Total Cost of Ownership", each with a list of bullet points. At the bottom left of the main content area is a "Try Now" button with a right-pointing arrow.

The world's most popular open source database

Contact MySQL | Login | Register

MYSQL.COM **DOWNLOADS** DOCUMENTATION DEVELOPER ZONE

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## MySQL Database Service

with HeatWave for Real-time Analytics

### Faster Performance

- 400x MySQL query acceleration
- 1100x Faster than Amazon Aurora
- 2.7x Faster than Amazon Redshift

### Lower Total Cost of Ownership

- 1/3 the Cost of Amazon RDS
- 1/3 the Cost of Amazon Redshift
- Easy migration from Amazon RDS

Try Now >

# Use MySQL Installer

- 3. Select MySQL Installer for Windows.

## › MySQL Community Downloads

- MySQL Yum Repository
- MySQL APT Repository
- MySQL SUSE Repository
- MySQL Community Server
- MySQL Cluster
- MySQL Router
- MySQL Shell
- MySQL Workbench
- MySQL Installer for Windows
- MySQL for Visual Studio
- C API (libmysqlclient)
- Connector/C++
- Connector/J
- Connector/NET
- Connector/Node.js
- Connector/ODBC
- Connector/Python
- MySQL Native Driver for PHP
- MySQL Benchmark Tool
- Time zone description table
- Download Archives

Select Operating System:

Microsoft Windows

Looking for previous GA versions?

**Windows (x86, 32-bit), MSI Installer**

8.0.23

2.4M

[Download](#)

(mysql-installer-web-community-8.0.23.0.msi)

MD5: a3af6d91f93e046452b38a1e2589534c | [Signature](#)

**Windows (x86, 32-bit), MSI Installer**

8.0.23

422.4M

[Download](#)

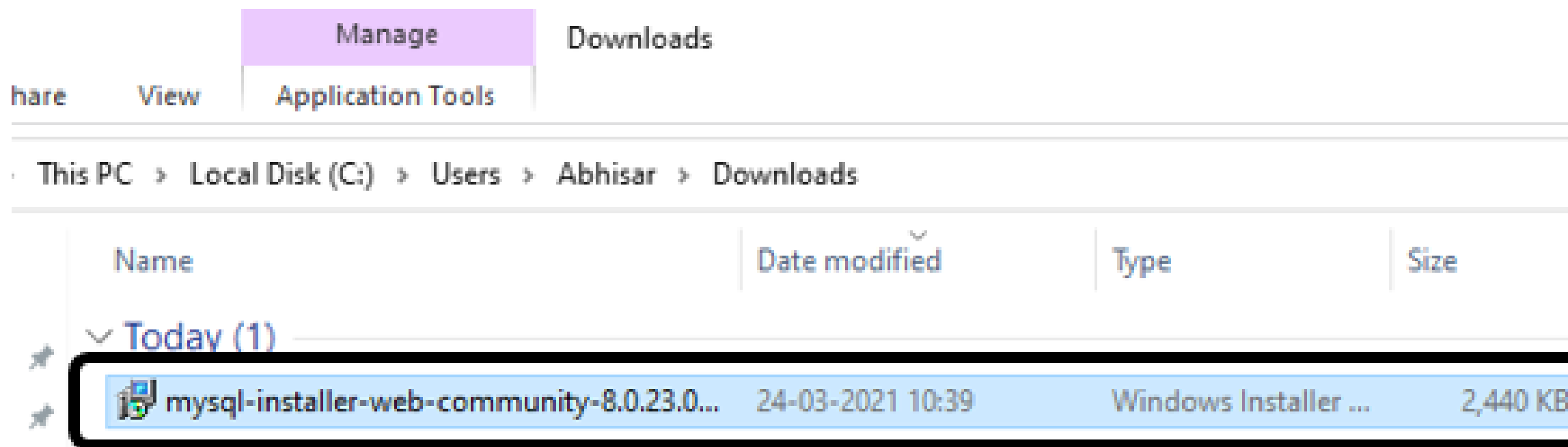
(mysql-installer-community-8.0.23.0.msi)

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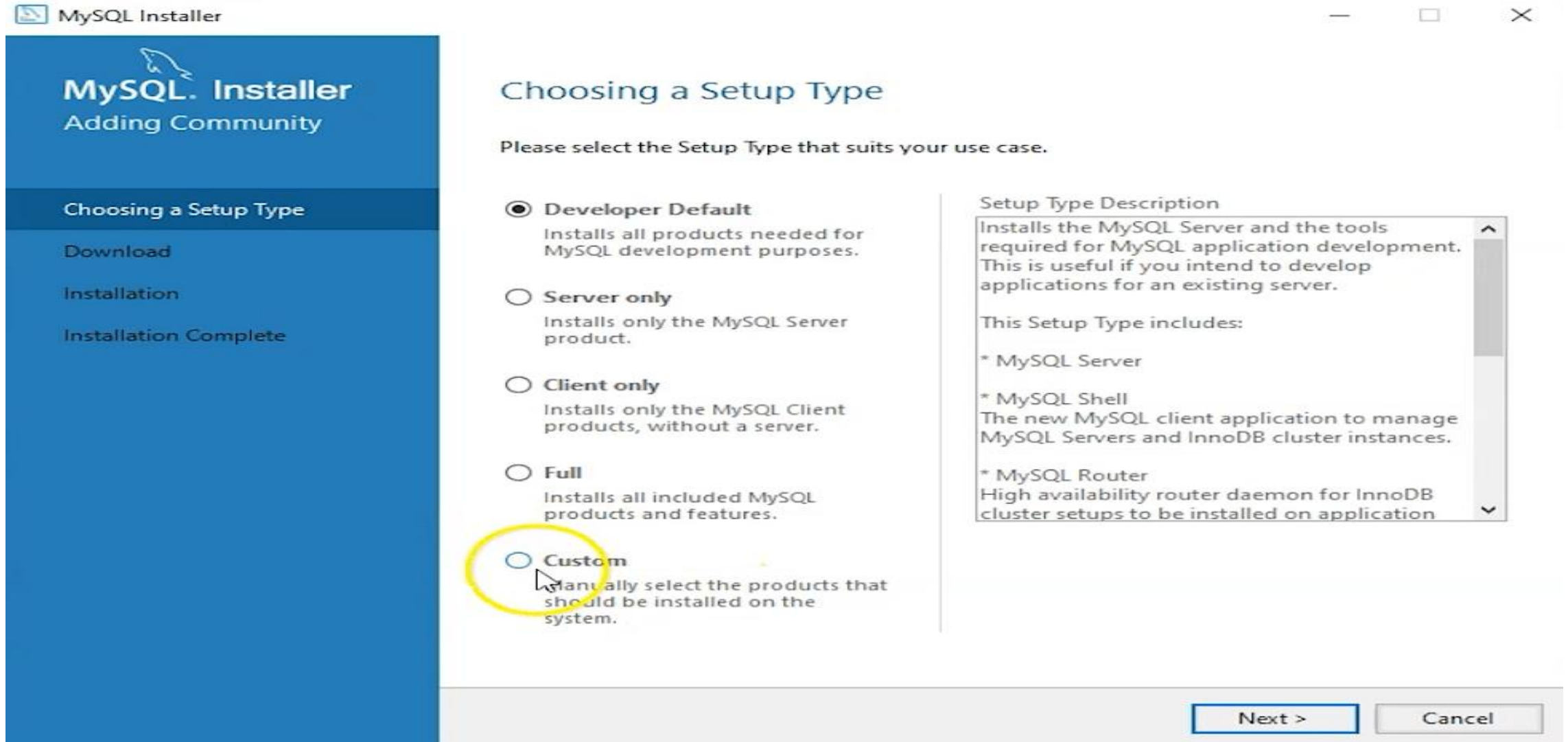
**4. Choose the desired installer and click on download.**

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## 5. After the download, open the installer.

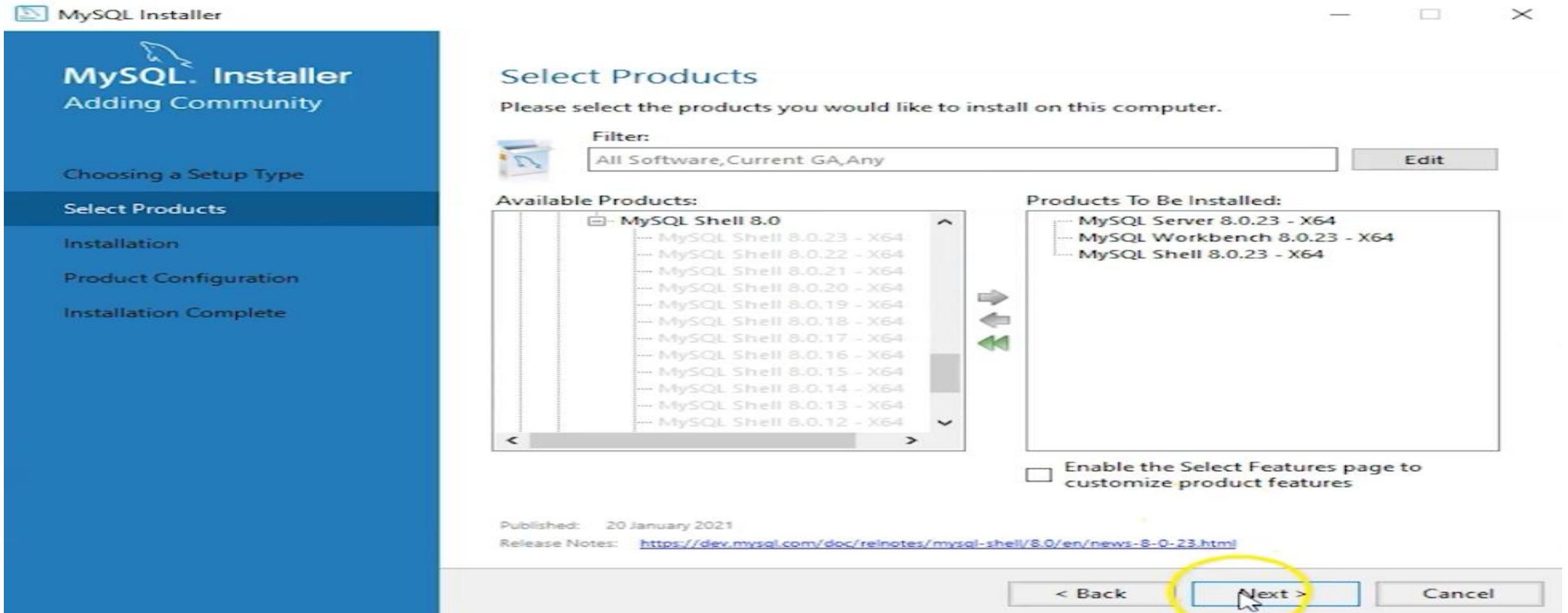


6. It will ask for permission; when it does, click Yes. The installer will then open. Now, it will ask to choose the setup type. Here, select Custom.

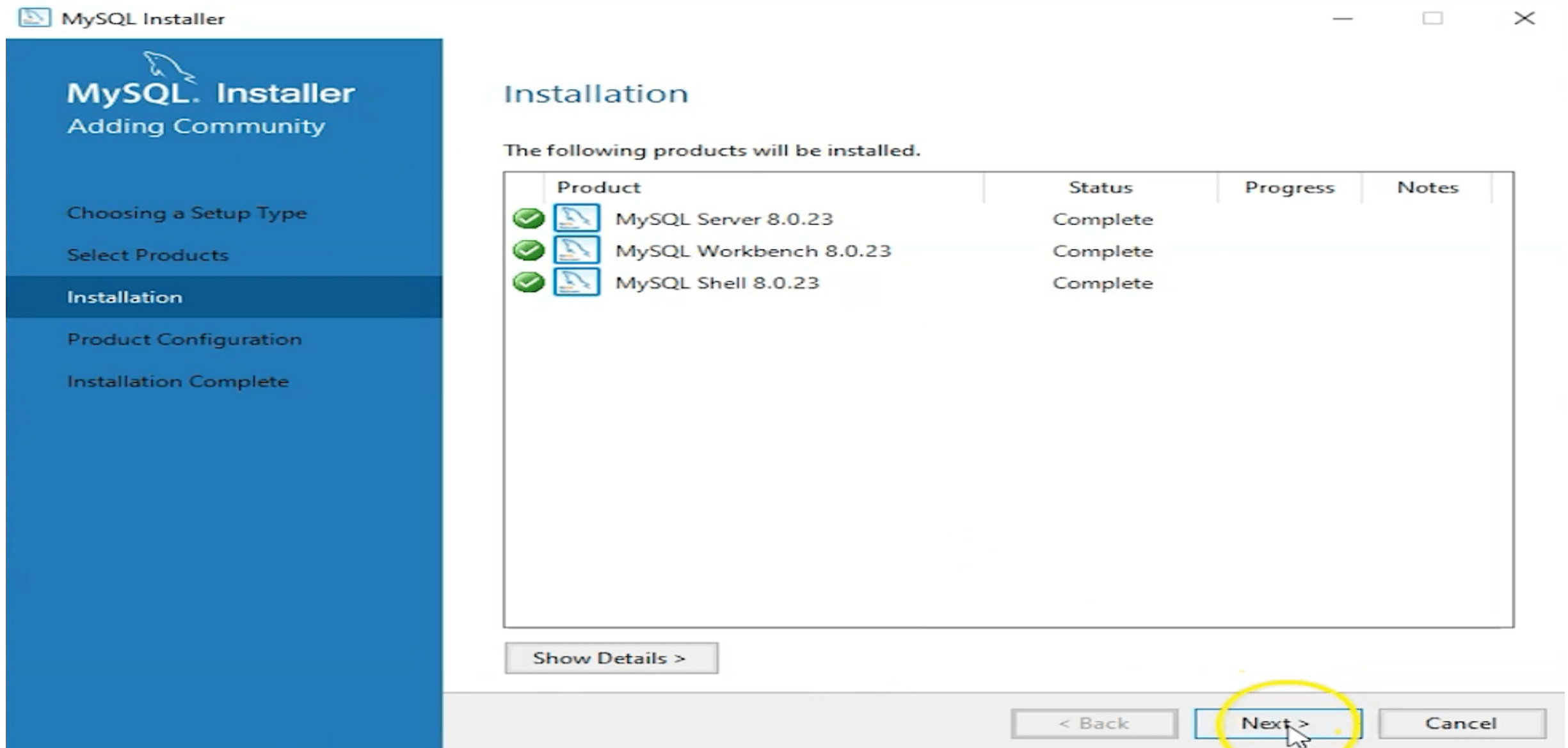


7. Click on Next. With this, you will install MySQL server, MySQL Workbench, and MySQL shell.

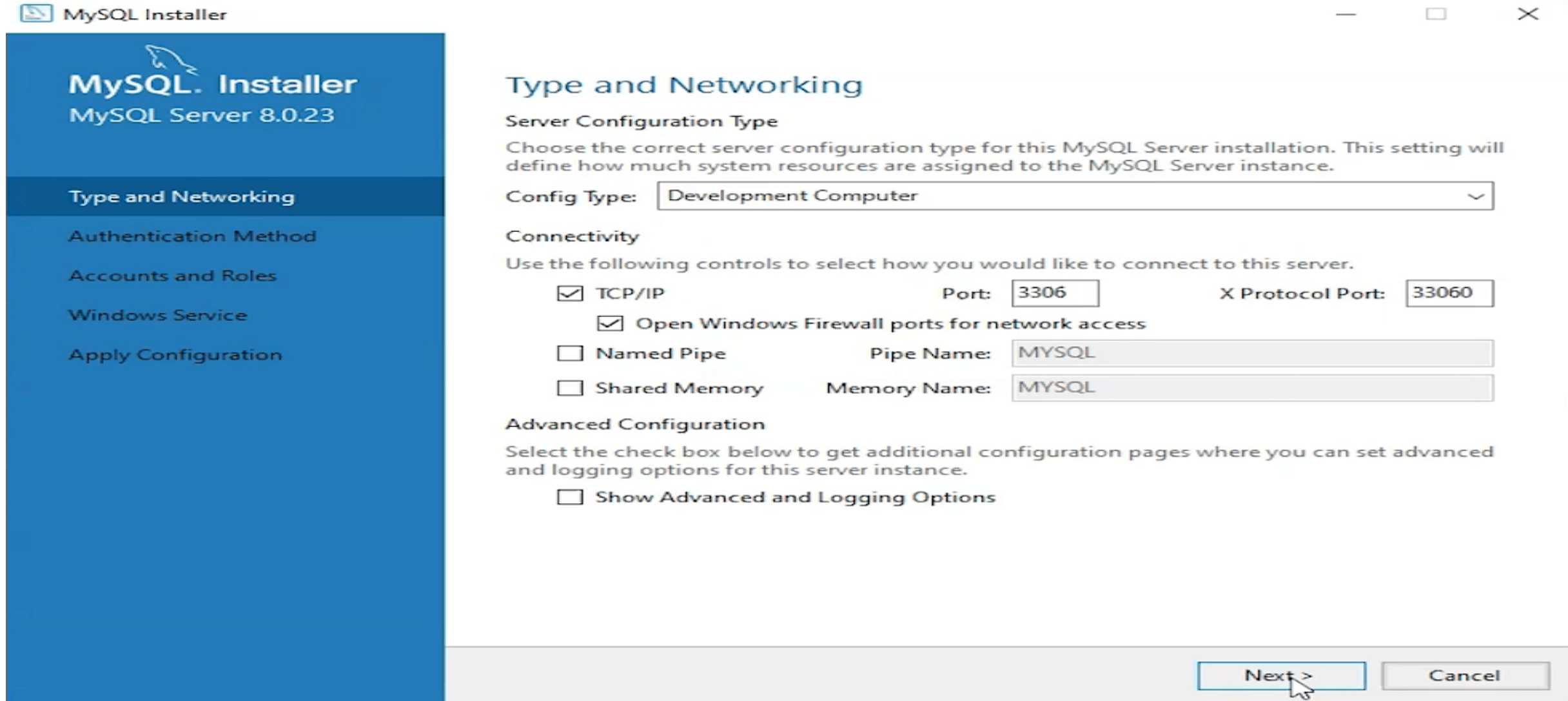
8. Open MySQL Servers, select the server you want to install, and move it to the Products/Features to be installed window section. Now, expand Applications, choose MySQL Workbench and MySQL shell. Move both of them to 'Products/Features to be installed'.



9. Click on the Next button. Now, click on the Execute button to download and install the MySQL server, MySQL Workbench, and the MySQL shell.



10. Once the product is ready to configure, click on Next. Under Type and Networking, go with the default settings and select Next.



The screenshot shows the MySQL Installer window for MySQL Server 8.0.23. The left sidebar contains a navigation menu with the following items: 'Type and Networking' (highlighted), 'Authentication Method', 'Accounts and Roles', 'Windows Service', and 'Apply Configuration'. The main content area is titled 'Type and Networking' and includes the following sections:

- Server Configuration Type:** A dropdown menu is set to 'Development Computer'. Below it is the instruction: '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.'
- Connectivity:** A section with the instruction: 'Use the following controls to select how you would like to connect to this server.'
  - TCP/IP: Port: 3306, X Protocol Port: 33060
  - Open Windows Firewall ports for network access
  - Named Pipe: Pipe Name: MYSQL
  - Shared Memory: Memory Name: MYSQL
- Advanced Configuration:** A section with the instruction: '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

At the bottom right, there are two buttons: 'Next >' and 'Cancel'. A mouse cursor is pointing at the 'Next >' button.



11. For authentication, use the recommended strong password encryption.

12. Set your MySQL Root password and click on next.

Type and Networking
Authentication Method
<b>Accounts and Roles</b>
Windows Service
Apply Configuration

Enter the password for the root account. Please remember to store this password in a secure place.

MySQL Root Password:

Repeat Password:

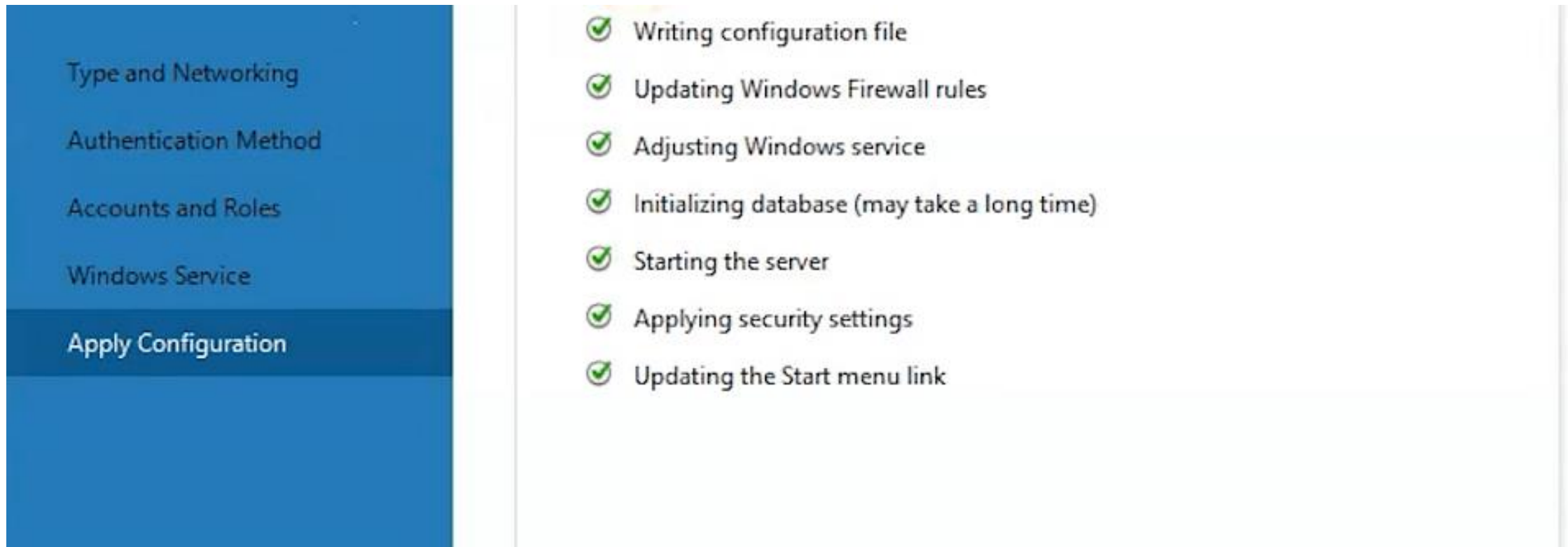
Password strength: **Medium**

### MySQL User Accounts

Create MySQL user accounts for your users and applications. Assign a role to the user that consists of a set of privileges.

MySQL User Name	Host	User Role		Add User
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**13. Go for the default windows service settings and under apply configuration, click on execute. Once the configuration is complete, click on finish.**



The screenshot shows a configuration progress window. On the left is a blue sidebar with menu items: 'Type and Networking', 'Authentication Method', 'Accounts and Roles', 'Windows Service', and 'Apply Configuration'. The 'Apply Configuration' item is highlighted in a darker blue. On the right, a list of tasks is shown, each with a green checkmark icon, indicating completion:

- ✔ Writing configuration file
- ✔ Updating Windows Firewall rules
- ✔ Adjusting Windows service
- ✔ Initializing database (may take a long time)
- ✔ Starting the server
- ✔ Applying security settings
- ✔ Updating the Start menu link

## Installation Complete

The installation procedure has been completed.

Copy Log to Clipboard

- Start MySQL Workbench after setup
- 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 an 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](#)

# 14. Complete the installation. This will now launch the MySQL Workbench and the MySQL Shell.

MySQL Installer

Adding Community

Choosing a Setup Type

Select Products

Check Requirements

Installation

Product Configuration

Installation Complete

## 15. Once MySQL Workbench is installed, select the Local instance and enter the password.

MySQL Workbench

File Edit View Database Tools Scripting Help

# Welcome to MySQL Workbench

MySQL Workbench is the official graphical user interface (GUI) tool for MySQL. It allows you to design, create and browse your database schemas, work with database objects and insert data as well as design and run SQL queries to work with stored data. You can also migrate schemas and data from other database vendors to your MySQL database.

[Browse Documentation >](#) [Read the Blog >](#) [Discuss on the Forums >](#)

### MySQL Connections + ⌵

Local instance MySQL80  
root  
localhost:3306

Now, you can use the MySQL query tab to write your SQL queries.

# MySQL Workbench

MySQL Workbench is a unified software used to add functionality and ease to SQL development work. MySQL Workbench provides data modeling, SQL development, and various administration tools for configuration. It also offers a graphical interface to work with the databases in a structured way.

With its comprehensive features, MySQL Workbench is a popularly used software by businesses to manage their structured databases.

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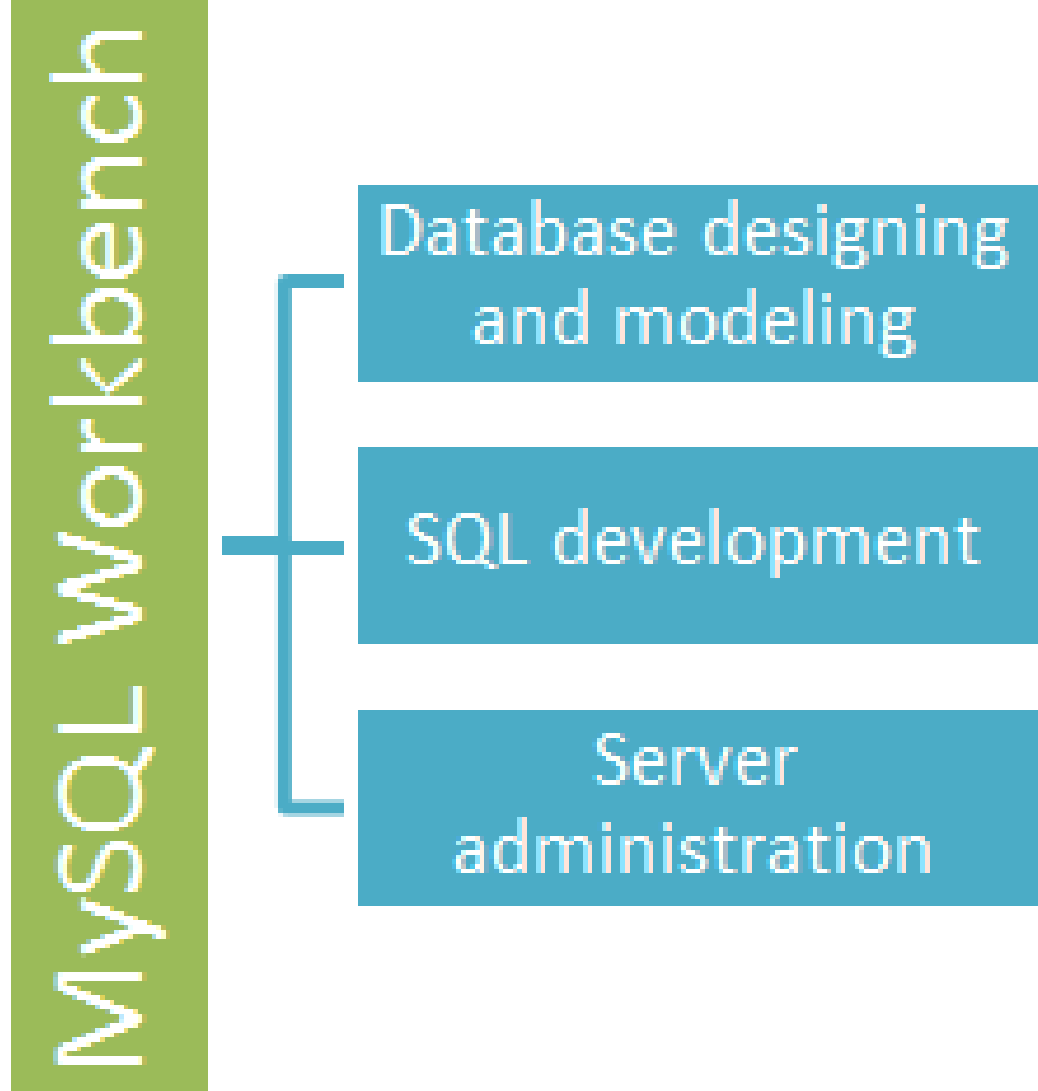
# MySQL Workbench

MySQL Workbench provides data modeling, SQL development, and various administration tools for configuration. It also offers a graphical interface to work with the databases in a structured way.

- You can create a Graphical Model using MySQL Workbench
  - MySQL Workbench provides reverse engineering for live databases to models
  - MySQL Workbench offers a forward engineering model to a script/live database
-

# MySQL Workbench

The purpose of MySQL Workbench is to provide the interface to work with databases more easily and in a more structured way.

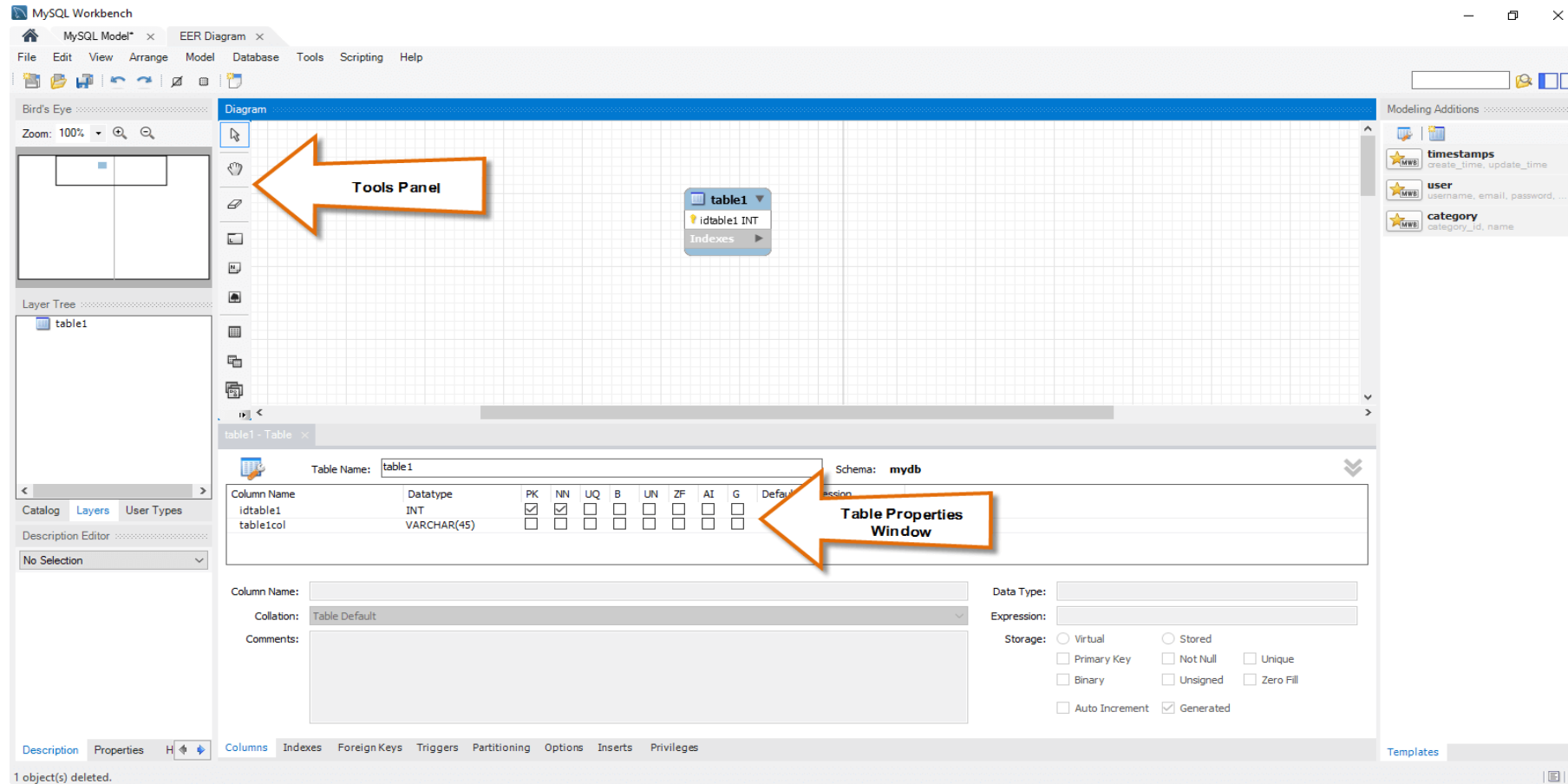


# MySQL workbench- Modeling and Design Tool

- Models are at the core of most valid and high performance databases. MySQL Workbench has tools that allow developers and database administrators visually create physical database design models that can be easily translated into MySQL databases using forward engineering.
  - MySQL workbench supports creation of multiple models in the same environment.
  - It supports all objects such as tables, views, stored procedures, triggers, etc. that make up a database.
  - MySQL workbench has a built in model validating utility that reports any issues that might be found to the data modeler.
- 







# MySQL Workbench Modeling window

# MySQL workbench – SQL Editor

Structured Query Language (SQL) allows us to manipulate our relational databases. SQL is at the heart of all relational databases

- MySQL workbench, has built in SQL visual editor.
  - The Visual SQL editor allows developers to build, edit and run queries against MySQL server databases. It has utilities for viewing data and exporting it.
  - Its syntax color highlighters help developers easily write and debug SQL statements.
  - Multiple queries can be run and results automatically displayed in different tabs.
  - The queries are also saved in the history panel for later retrieval and running.
-

MySQL Workbench

MySQL Model\* x EER Diagram x Local instance MySQL57 x

File Edit View Query Database Server Tools Scripting Help

Navigator

myflxDB

- Tables
  - categories
  - members
  - Columns
  - Indexes
  - Foreign Keys
  - Triggers
- movierentals
- movies
- payments
- Views
- Stored Procedures
- Functions

sakila sys world

Query 1 members x

1 • SELECT \* FROM myflxDB.members;

SQL Visual Editor

Object Browser

Result Grid

membership_number	full_names	gender	date_of_birth	physical_address	postal_address	contact_number	email
1	Janet Jones	Female	1980-07-21	First Street Plot No 4	Private Bag	0759 253 542	janetjones@yagoo.cm
2	Janet Smith Jones	Female	1980-06-23	Melrose 123	NULL	NULL	jj@fstreet.com
3	Robert Phil	Male	1989-07-12	3rd Street 34	NULL	12345	rm@tstreet.com
4	Gloria Williams	Female	1984-02-14	2nd Street 23	NULL	NULL	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

members 1 x

Apply Revert

Help Panel

Output

Action Output

#	Time	Action	Message	Duration / Fetch
1	09:58:00	SELECT * FROM myflxDB.members LIMIT 0, 1000	1 row(s) returned	0.015 sec / 0.000 sec

History Output Window

# MySQL Workbench SQL Development Window

# MySQL Workbench – Administration tool

Server administration plays a critical role in securing the data of the company. The major issues concerning server administration are users' management, server configuration, server logs and many more.

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# MySQL Workbench – Administration tool

MySQL Workbench has the following features that simplify the process of MySQL server administration:

- **User administration** – visual utility for managing users that lets database administrators easily add new and remove existing users if need arises, grant and drop privileges and view user profiles.
  - **Server configuration** – allows for advanced configuration of the server and fine tuning for optimal performance.
  - **Database backup and restorations** – visual tool for exporting/importing MySQL dump files. MySQL dump files contain SQL scripts for creating databases, tables, views, stored procedures and insertion of data.
  - **Server logs** – visual tool for viewing MySQL server logs. The logs include error logs, binary logs and InnodbDB logs. These logs come in handy when performing diagnosis on the server.
-

# MySQL Workbench – Admin Panel

The screenshot displays the MySQL Workbench interface. The left sidebar, titled 'Navigator', is highlighted with a red box and labeled 'Admin Operations' with a green arrow. The sidebar contains three sections: MANAGEMENT, INSTANCE, and PERFORMANCE. The main area shows the 'Administration - Server Status' panel for 'Local instance MySQL57'. The panel includes a MySQL Server 5.7 logo, a 'Refresh' button, and a table of 'Available Server Features'.

**MANAGEMENT**

- Server Status
- Client Connections
- Users and Privileges
- Status and System Variables
- Data Export
- Data Import/Restore

**INSTANCE**

- Startup / Shutdown
- Server Logs
- Options File

**PERFORMANCE**

- Dashboard
- Performance Reports
- Performance Schema Setup

**Administration - Server Status**

Connection Name: Local instance MySQL57

Host: DESKTOP-LH9B1NN

Socket: MYSQL

Port: 3306

Version: 5.7.14-log  
MySQL Community Server (GPL)

Compiled For: Win64 (x86\_64)

Configuration File: C:\ProgramData\MySQL\MySQL Server 5.7\my.ini

Running Since: Fri Sep 02 09:37:07 2016 (3 days 0:37)

Refresh

**Available Server Features**

Performance Schema:	<input checked="" type="radio"/> On	Windows Authentication:	<input type="radio"/> Off
Thread Pool:	<input type="radio"/> n/a	Password Validation:	<input type="radio"/> n/a
Memcached Plugin:	<input type="radio"/> n/a	Audit Log:	<input type="radio"/> n/a
Semisync Replication Plugin:	<input type="radio"/> n/a	Firewall:	<input type="radio"/> n/a
SSL Availability:	<input type="radio"/> Off	Firewall Trace:	<input type="radio"/> n/a