Coding Bootcamp

MySQL

TECHNOLOGY

Understanding MySQL

simplilearn

Learning Objectives

By the end of this lesson, you will be able to:

- Explain databases and their types to grasp their various forms and applications
- Explore the significance and operation of a database through illustrative examples to understand its role and functionality
- Differentiate between databases and spreadsheets with practical examples to highlight their distinct features and uses
- Use query language by exploring real-world scenarios to comprehend its practical applications

Learning Objectives

By the end of this lesson, you will be able to:

- List the features of MySQL for storing and managing data to demonstrate its capabilities
- Illustrate how to install MySQL through step-by-step examples to understand the installation process
- Connect and disconnect from the MySQL server to master the connectivity process
- Create a database table, a new user, and list table-specific privileges with practical examples to understand the creation process, user management, and permissions

TECHNOLOGY

The Importance of Data

Data

Data is a raw form of information. It provides insights that lead to effective business strategies and decisions.

Organizations need data and predictive analytics to develop better products.

Scenario: Importance of Data

Consider that an organization has hired a digital marketer and does not have a database. The information on previous customers and a few prospective buyers is stored in a Microsoft spreadsheet.

Is this information enough for the organization to thrive?

Microsoft spreadsheet

A database is necessary to manage and analyze customer data effectively, enabling better marketing strategies and decision-making.

Importance of Data

A strong database is needed to analyze prospects and digital touchpoints.

Data should be leveraged for audience analysis.

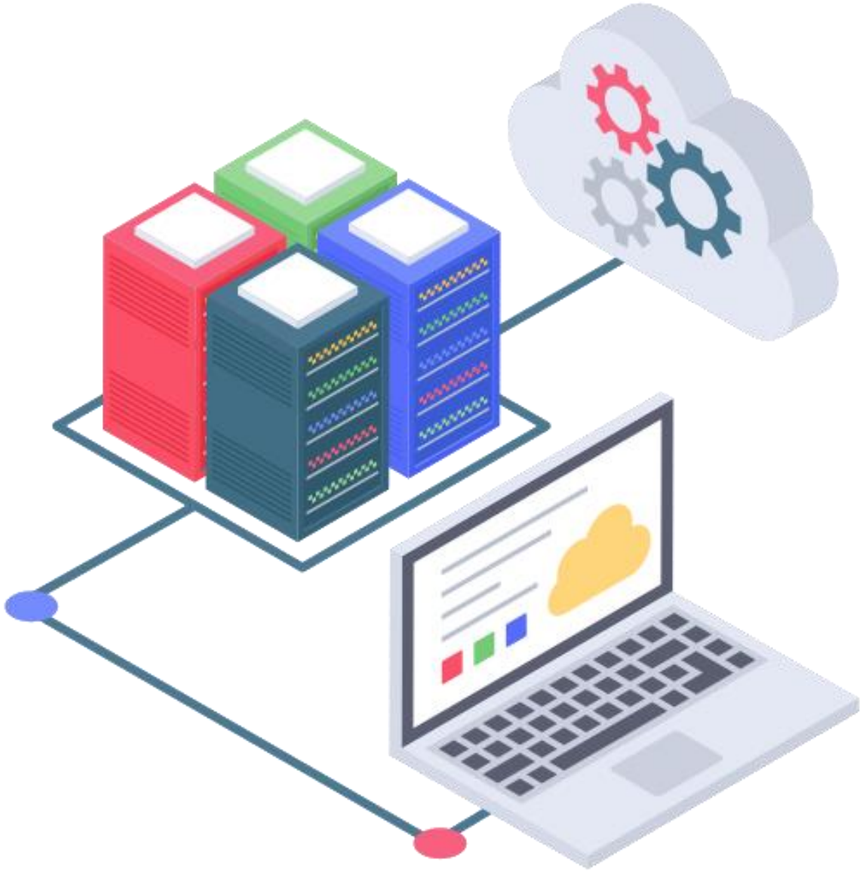
Data creates a personalized experience for every customer.

Database systems help collect and store vast amounts of data in the correct format.

What Is Database?

Database

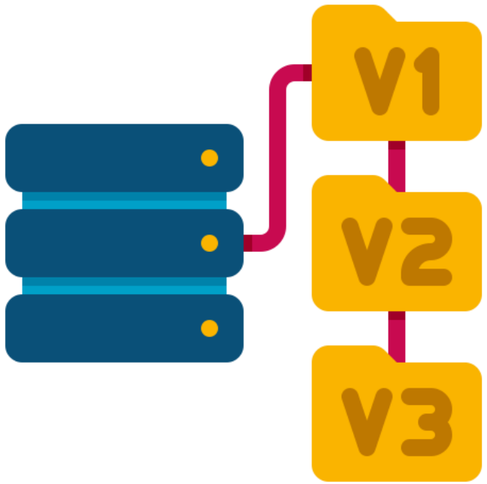
A database is an organized collection of data stored in a structured format on a computer system that can easily be accessed.



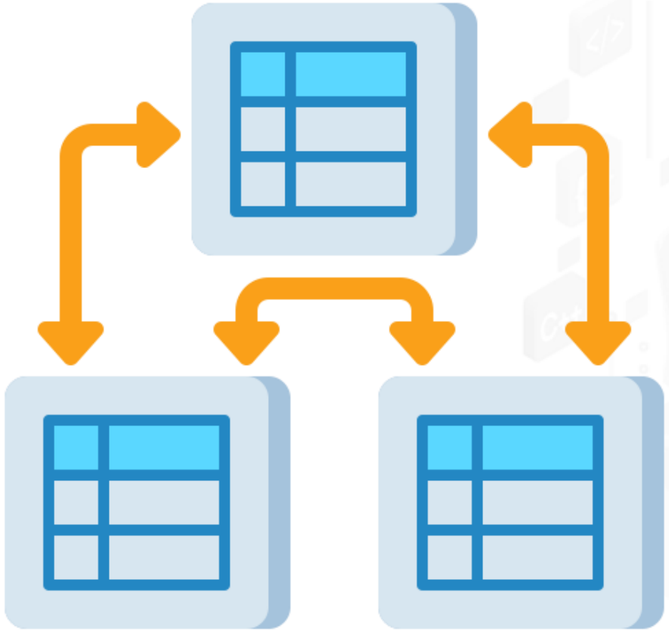
This software (DBMS) also allows users or programs to create, store, retrieve, update, and manage data with strong database security.

Database

A database is also described as a set of interrelated data held together to serve various applications.



It may serve as a basis for future application development.



A database is frequently defined as the repository of information required to carry out specific duties in a firm or organization.

Database

The database enables the recovery of information through regular backups and transaction logs, ensuring data can be restored to a previous state if needed.

It also facilitates the change of data required for operation control through CRUD operations (Create, Read, Update, Delete), ensuring data remains accurate.

Database

A database is a reservoir for the data required for an organization's information processing.

The information needs to be:

Accurate

Confidential

Secure

Structured

Database

The database holds all the pertinent information about the company, such as:

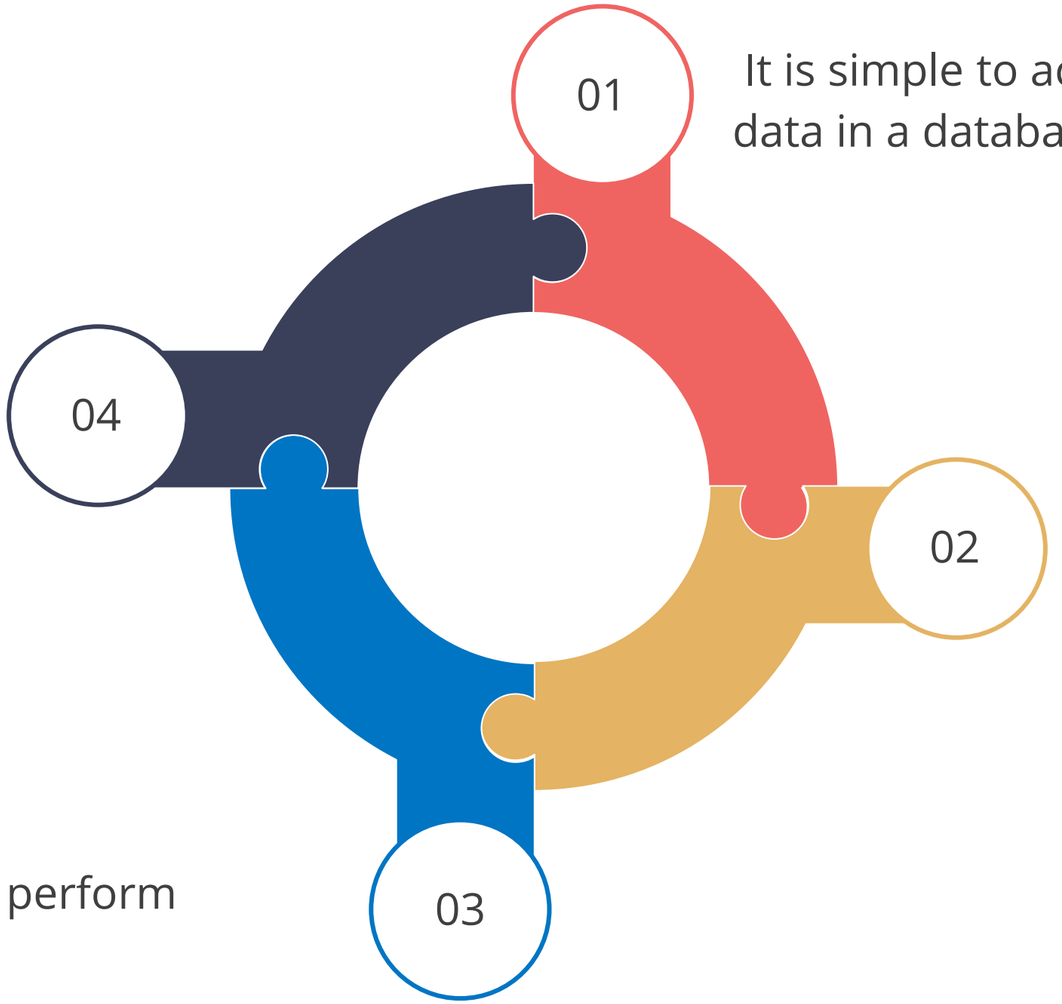
Worker records

Value-based records

Remuneration subtleties

MySQL

MySQL is one of the most popular databases.



It is simple to access and research data in a database.

It uses Data Query Languages (DQL) to search for data in the database.

It uses DQL to perform calculations.

It uses Data Manipulation Languages (DML) to update data.

Digital Marketing: Example

Suppose one wants to know which sector of cars has made a good sale during the last quarter.

One will access the database application and key in the information (query).

A report with numbers and a sales graph will be generated.

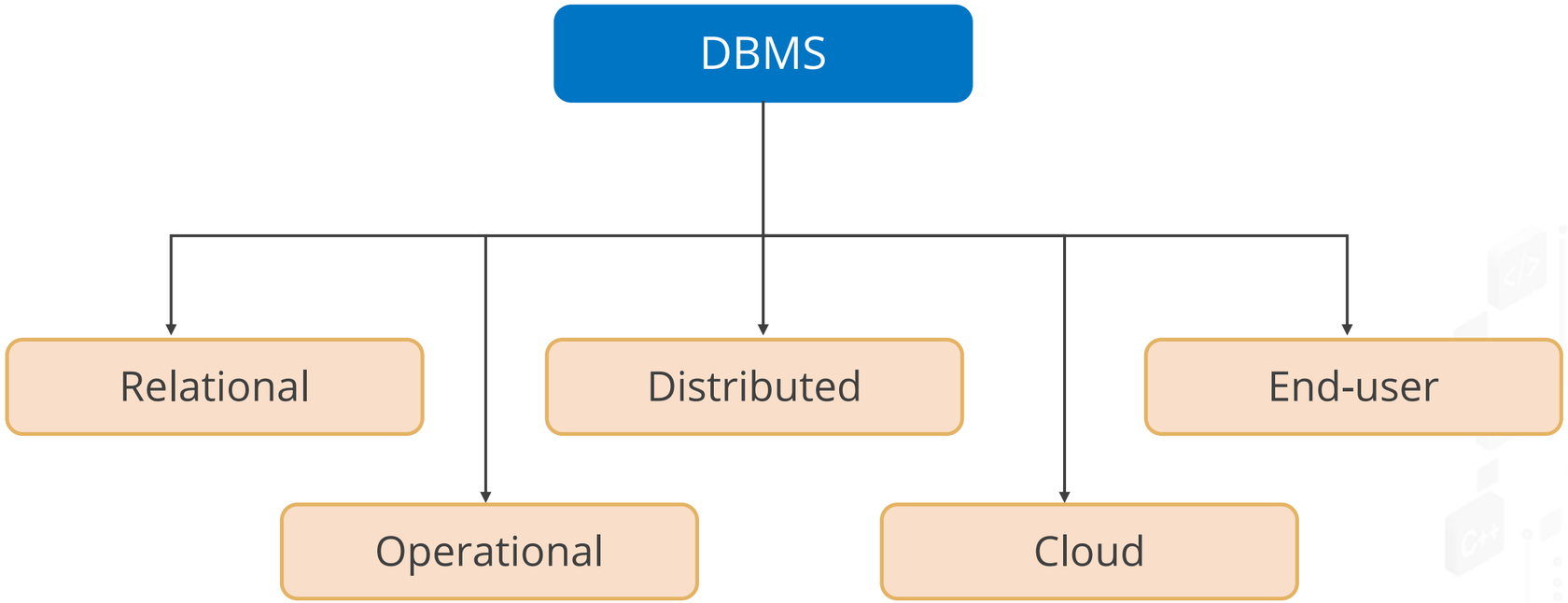
This example illustrates how databases can be used to retrieve and analyze data, providing valuable insights for decision-making and strategy development.

Database vs. Spreadsheets

Spreadsheets	Vs.	Databases
• Allow individual users • Store limited data storage • Offer less chance for manipulation • Are unscalable for big data		• Allow multiple users on various devices • Store massive amounts of data • Allow multiple users access at once • Handle a large amount of data with ease

Types of Databases

Types of Databases



- Relational databases are ideal for structured data and complex queries.
- Distributed databases are excellent for high availability and fault tolerance.
- Operational databases support real-time transactions.
- End-user databases are user-friendly for individual or departmental use.
- Cloud databases offer scalability and flexibility for modern applications.

Relational Database

A relational database stores data in rows and columns that form a table. It uses SQL for:

Storing data

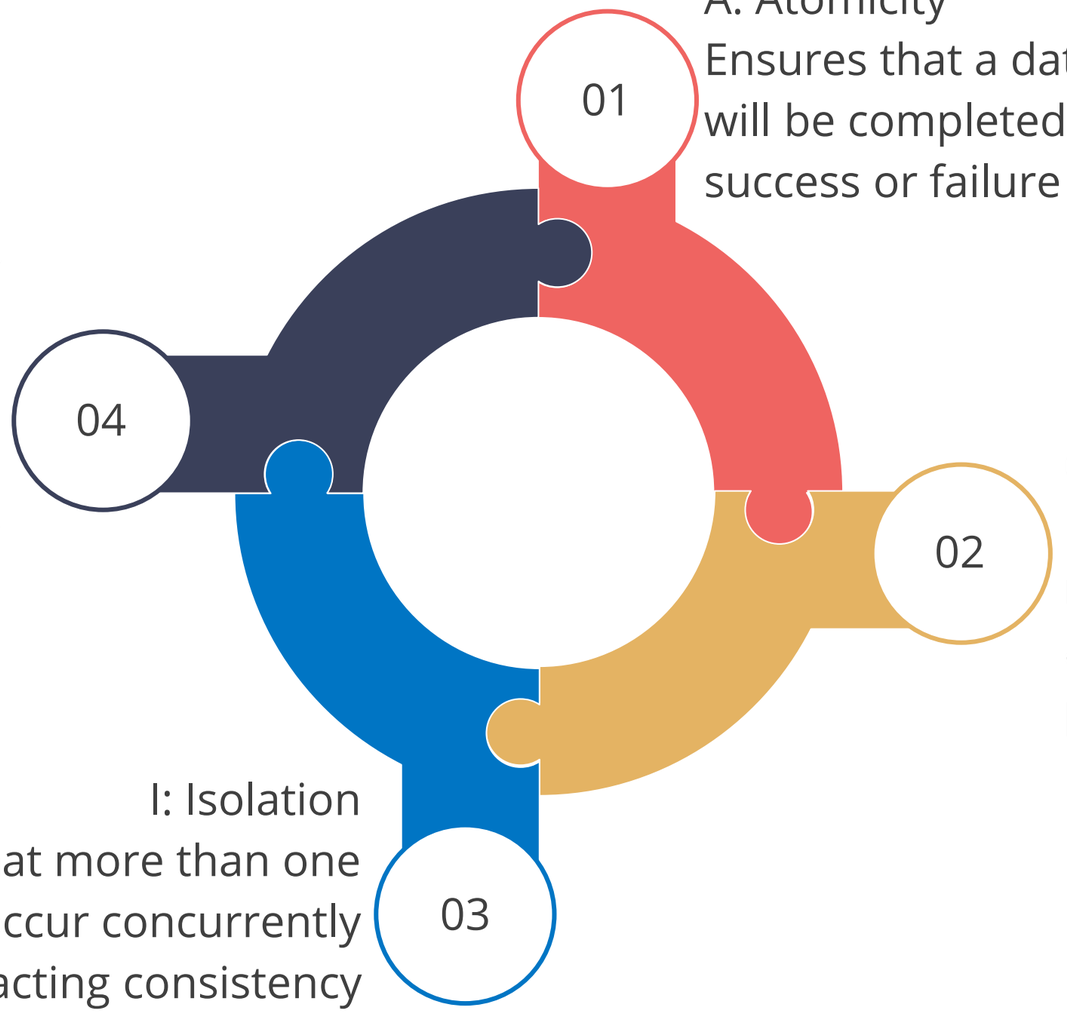
Changing data

Maintaining data

Every table in the database contains a key that differentiates data from other sources.

Relational Database: Properties

There are four properties of relational databases that are known as ACID properties.



A: Atomicity
Ensures that a data operation will be completed either with success or failure

C: Consistency
Ensures that when the data is modified, its value before and after the modification must be preserved

I: Isolation
Ensures that more than one transaction can occur concurrently without impacting consistency

D: Durability
Ensures that once the operation is finished and data is finalized, data changes must be permanent

Operational Database

Operational databases create and edit the database in real time. Companies use operational databases for handling daily transactions.

It is also known as transactional or OLTP (Online Transaction Processing) databases.

Distributed Database

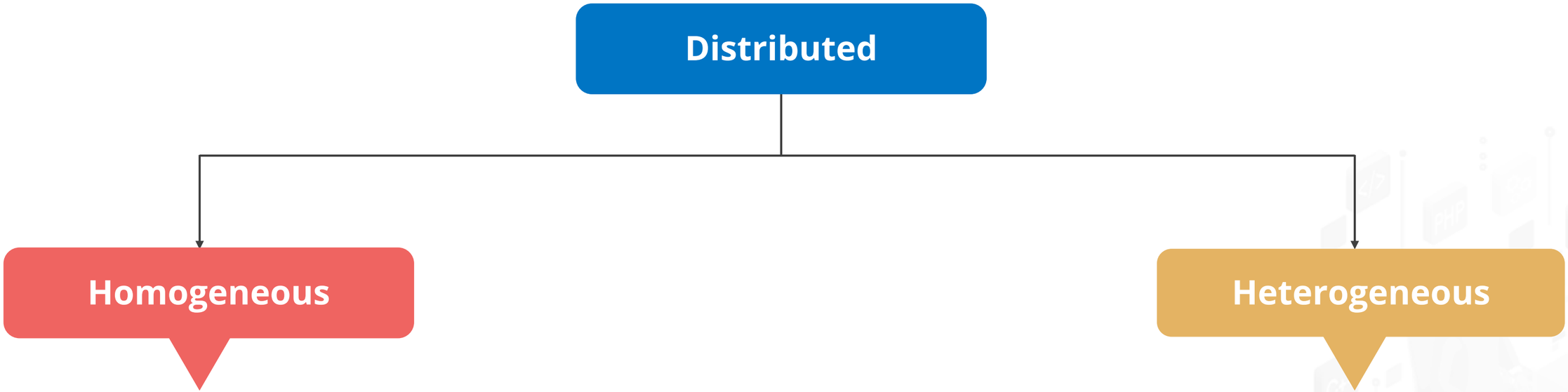
A distributed database is spread over different sites, computers, or networks of computers. It:

- Delivers files quickly and easily
- Allows to upsize the database system

Note

The failure of one server does not impact the overall database.

Distributed Database: Types

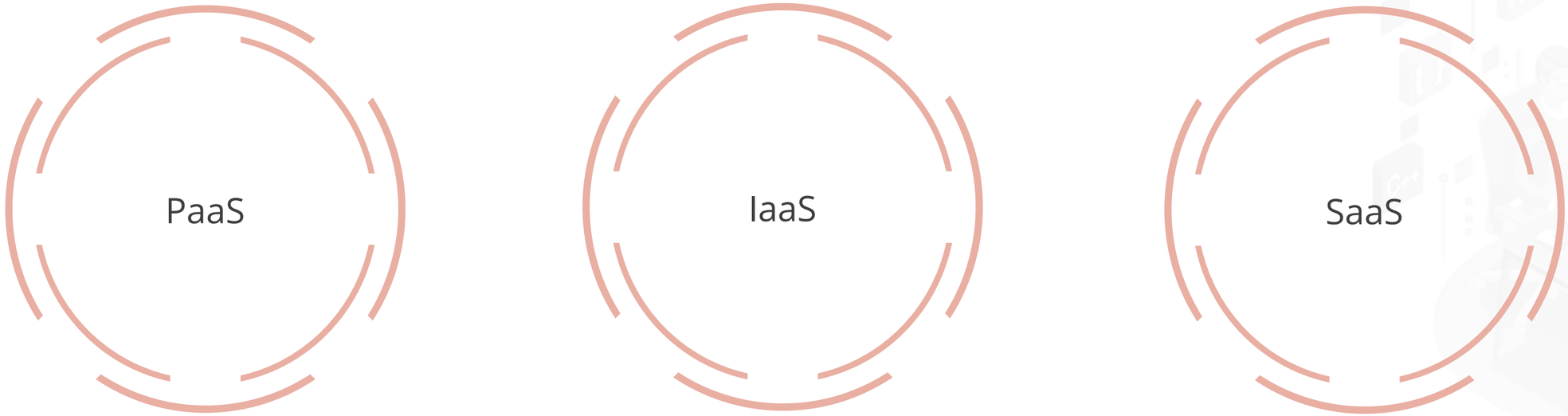


- Runs on the same operating system
- Uses the same process and hardware
- Is quite easy to manage

- Runs on different operating systems with different processes
- Leads to problems and failures as all sites are unaware of each others

Cloud Database

A cloud database is a database that is stored and accessed over a cloud computing platform. It offers various computing services, like:



It runs in a virtual environment, allowing users to store and manage data without physical hardware.

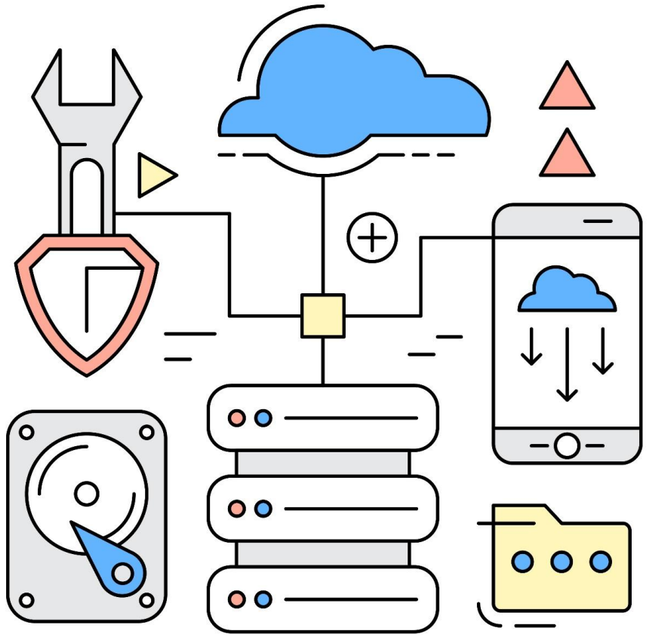
Cloud Database

There are many cloud platforms, but the most popular ones are:

End-User Database

The end-user is mindful of the product.

It is a common database that is intended for the end-user.



The end-user database is known as a shared database.

TECHNOLOGY

Database Management System and MySQL

Database Management System (DBMS)

A Database Management System (DBMS) is a software that manages databases. It provides an interface for users to create, read, update, and delete data in a structured and organized way.

DBMS

Any enterprise depends a lot on its proper functioning.

Data and information about different aspects of an enterprise are crucial.

A DBMS provides enterprises with centralized control of their operational data, especially sensitive and crucial data.

MySQL

MySQL is a Relational Database Management System (RDBMS) that uses SQL to query databases.

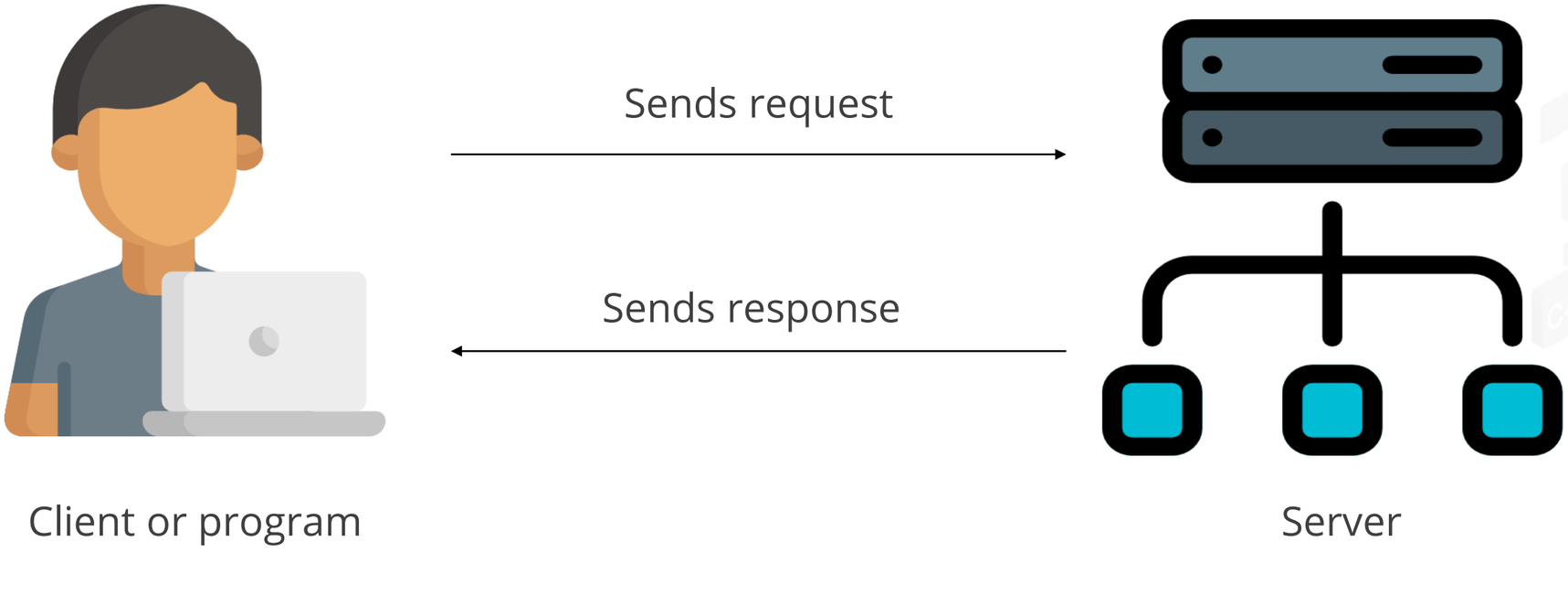
- It is a widely used database as it is free, fast, reliable, and scalable.
- It is written in C++ and the C programming language.
- It allows for keeping records of any important database.
- It contains many tables and stores thousands of individual records.

MySQL

- It provides in-built features that support a secure environment.
- It manages information by allowing users to create, read, update, and delete data using SQL queries.
- It operates using client or server architecture.
- It is a multi-user database system.

How Does MySQL Function?

The server takes the client requests that are received on the network through the Graphic User Interface (GUI) and accesses database contents according to those requests.



Clients refer to the programs that connect to the database server and issue queries in a pre-specified format.

MySQL: Features

Speed

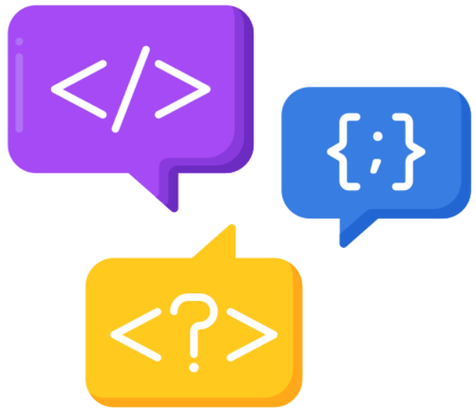
- Runs fast
- Supports clustered and servers demanding applications
- Provides multiple functionalities

MySQL: Features

Ease of Use

- Is a high-performance database system
- Supports multiple OS with different programming languages, like:

1. PHP
2. PERL
3. C, C++
4. JAVA



MySQL: Features

Data Types

- Supports fixed-length and variable-length records
- Offers a standard limit of 4 GB per table

MySQL: Features

Connectivity

Clients connect to the MySQL server using various protocols.

Localization

The server provides error messages in many languages.

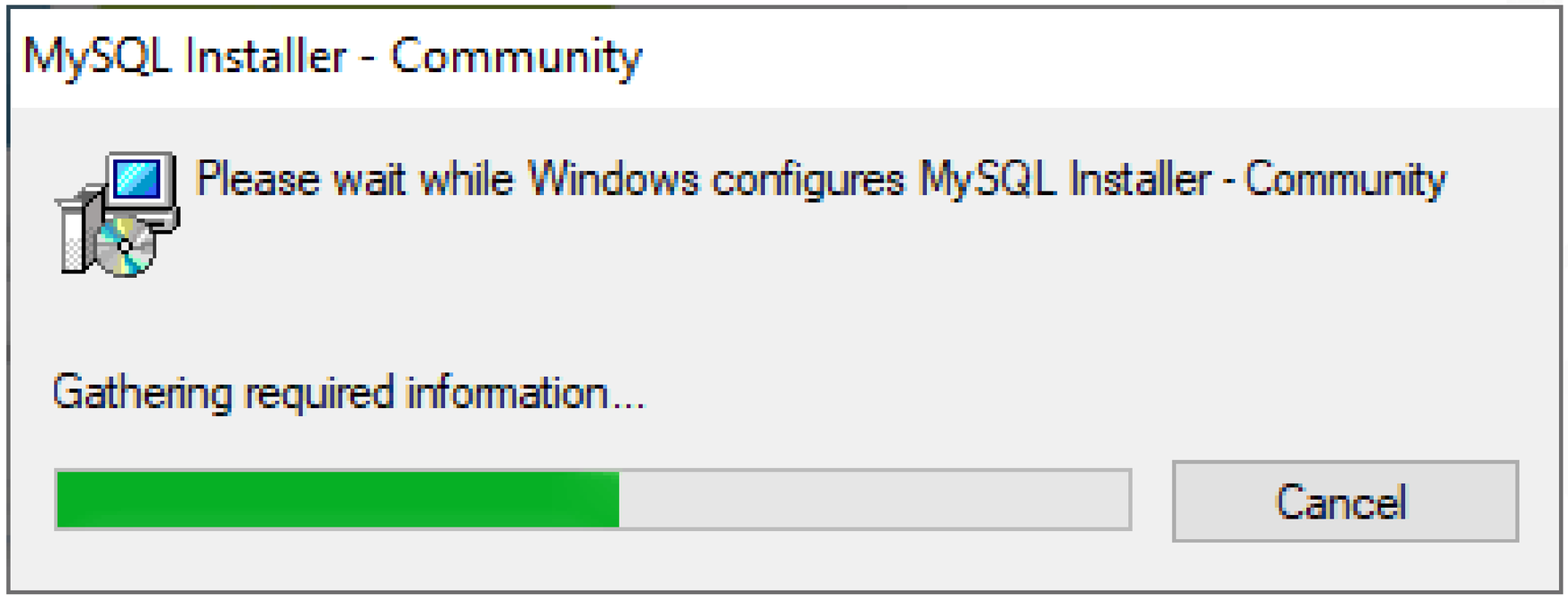
Cost

MySQL is free.

MySQL Installation

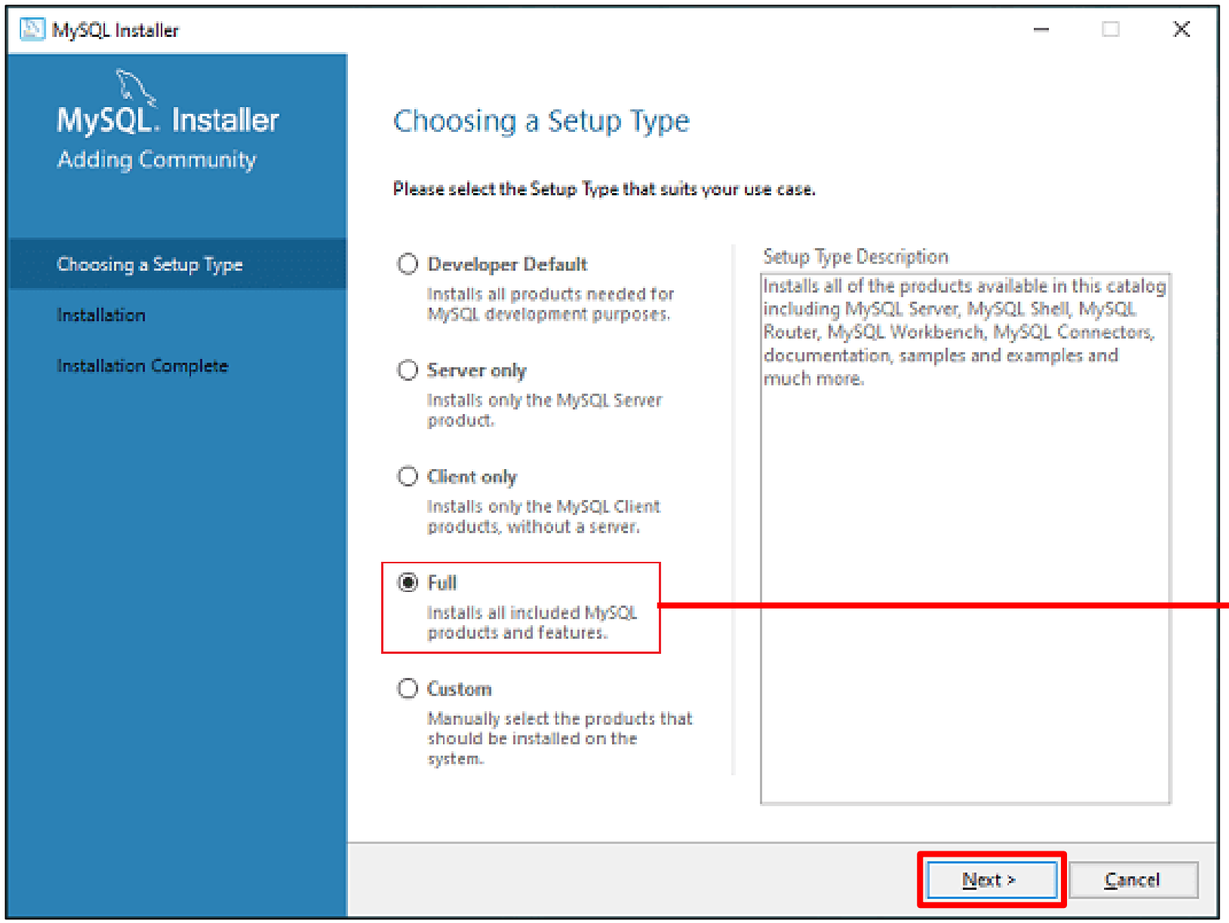
Installing MySQL

Open the MSI installer**.exe** file.



Installing MySQL

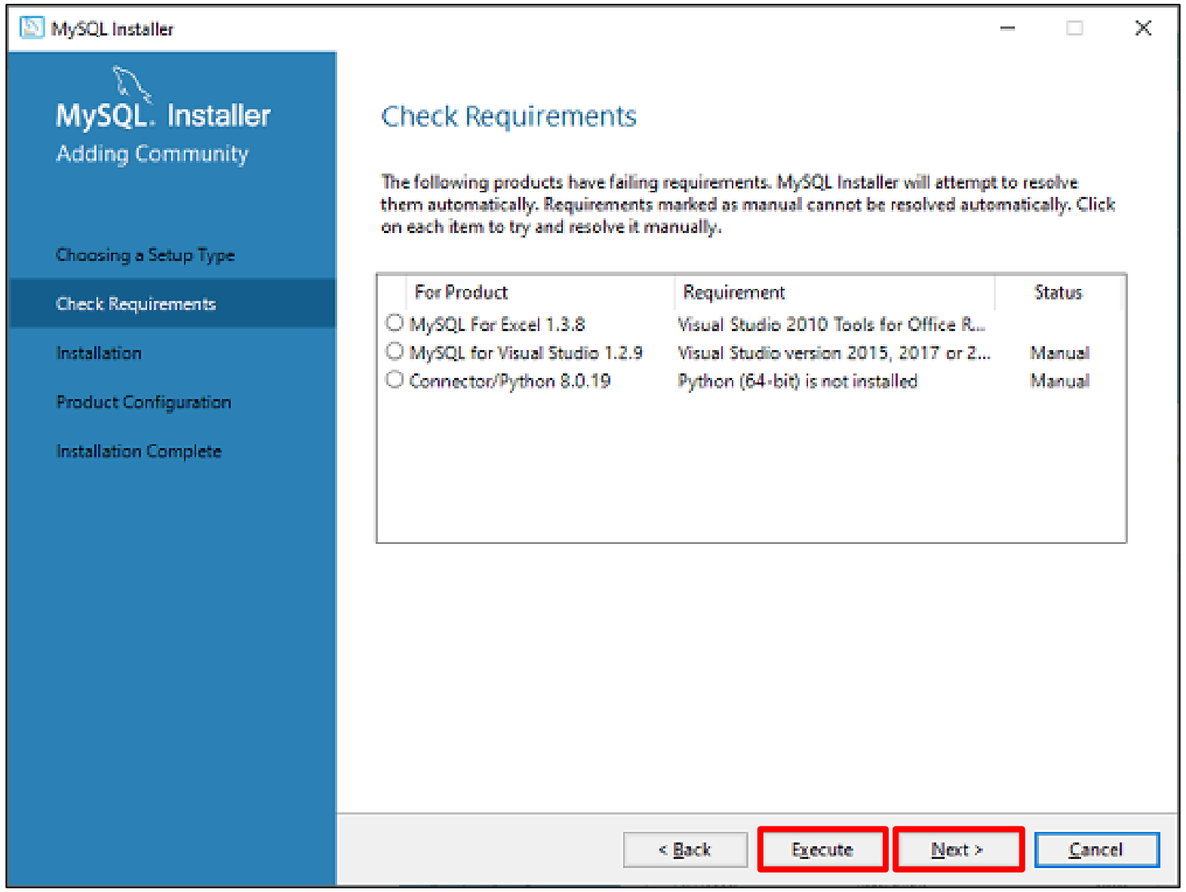
Select the suitable setup type from the **Choosing a Setup Type page** and click **Next**



MySQL server, MySQL Shell, MySQL Workbench, MySQL Router, and MySQL connector

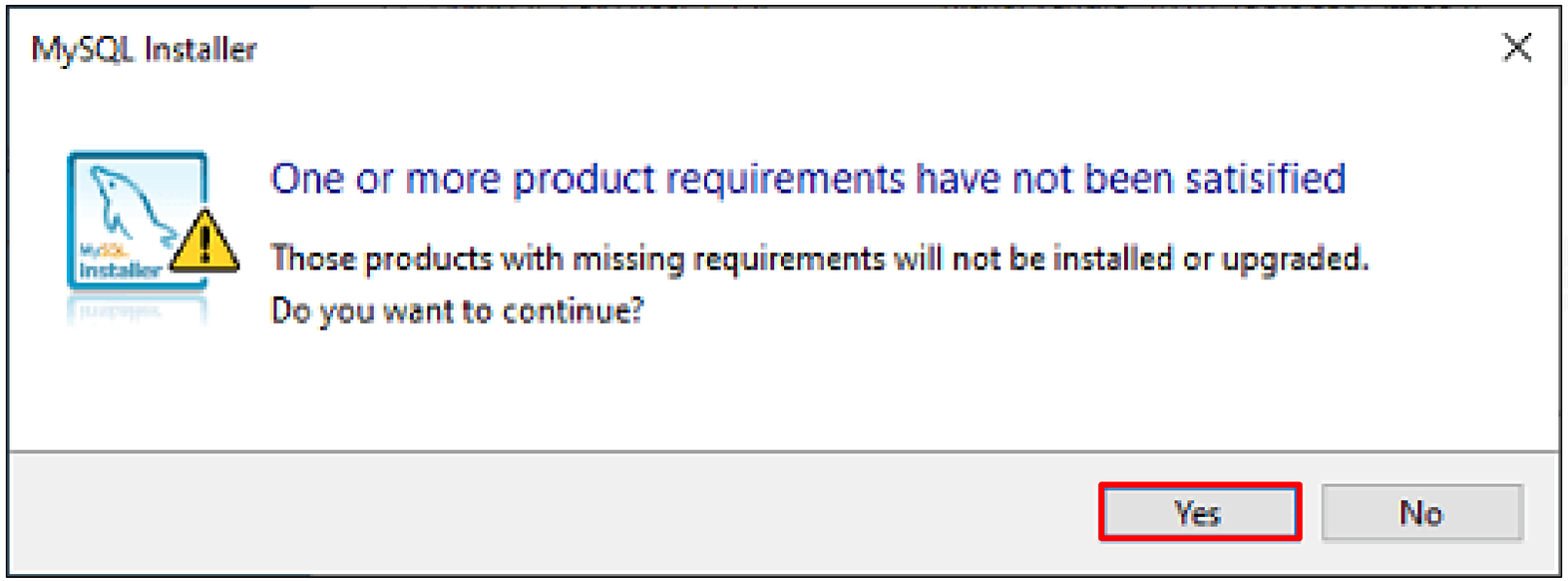
Installing MySQL

Click **Execute** to download and install all the required information on the system. Then, click **Next**.



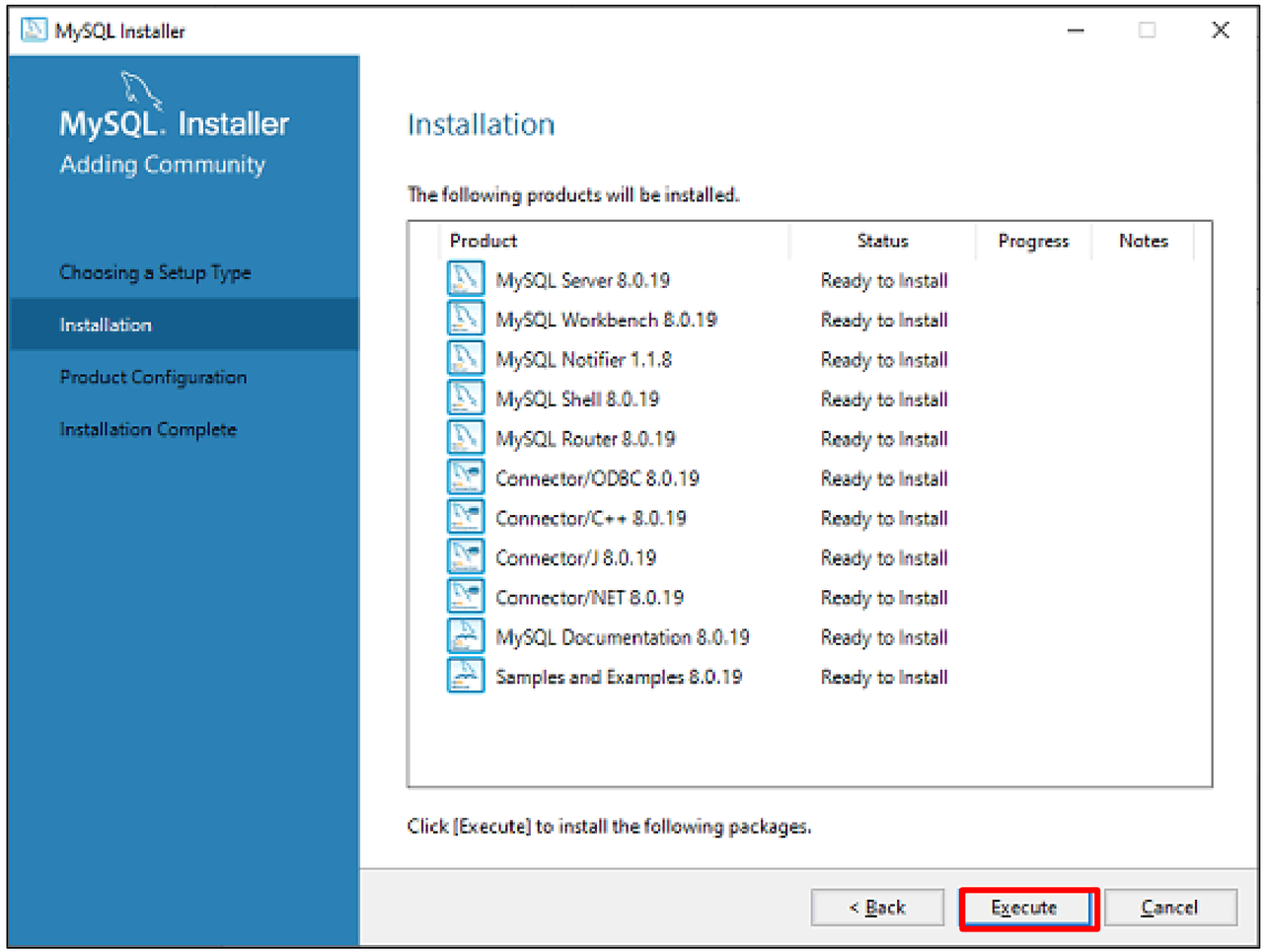
Installing MySQL

The following dialog box will appear. Now, click **Yes.**



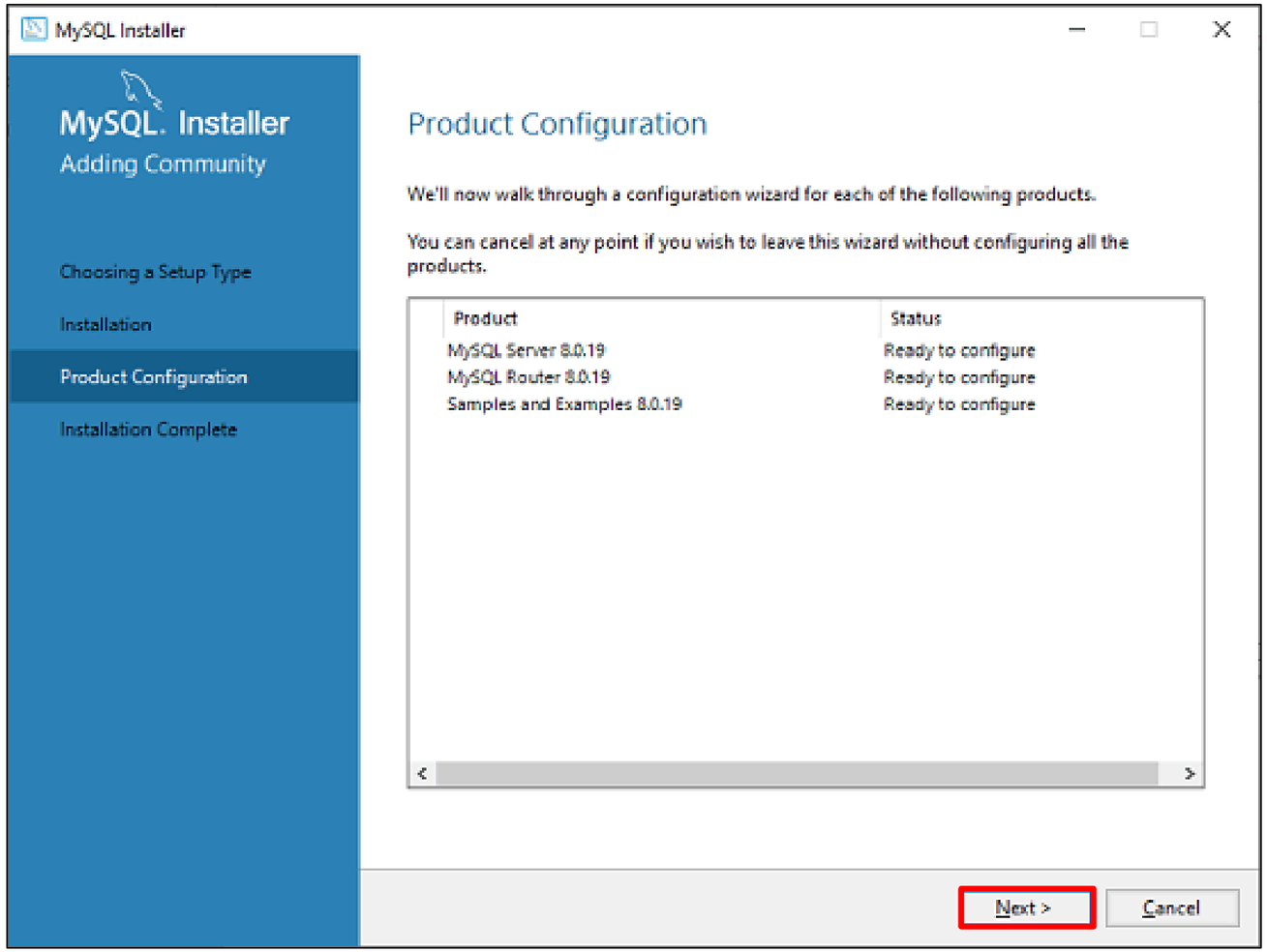
Installing MySQL

The products installed will be displayed. Now, click **Execute.**



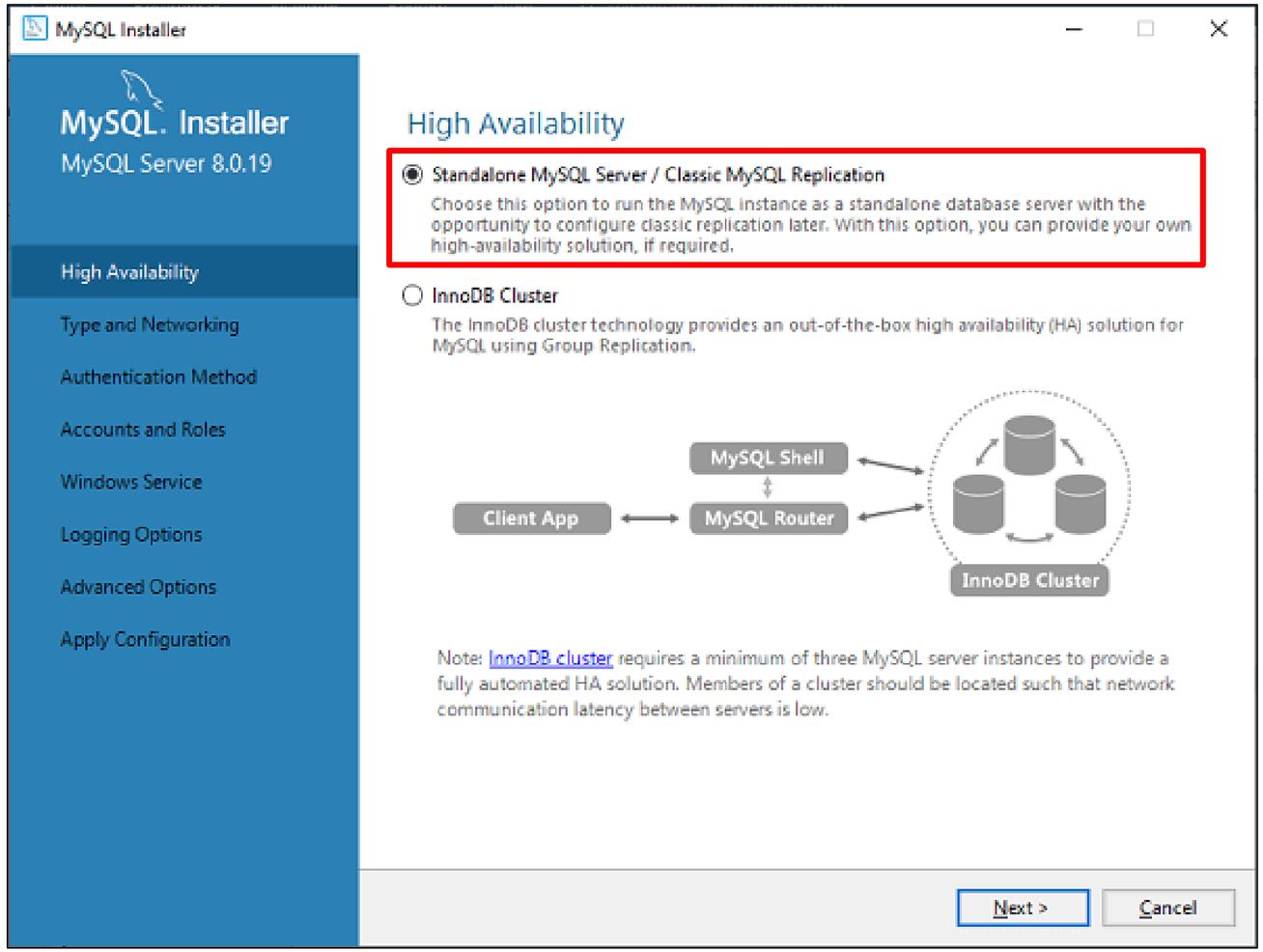
Installing MySQL

In the **Product Configuration** page, click **Next** to configure the MySQL server and router.



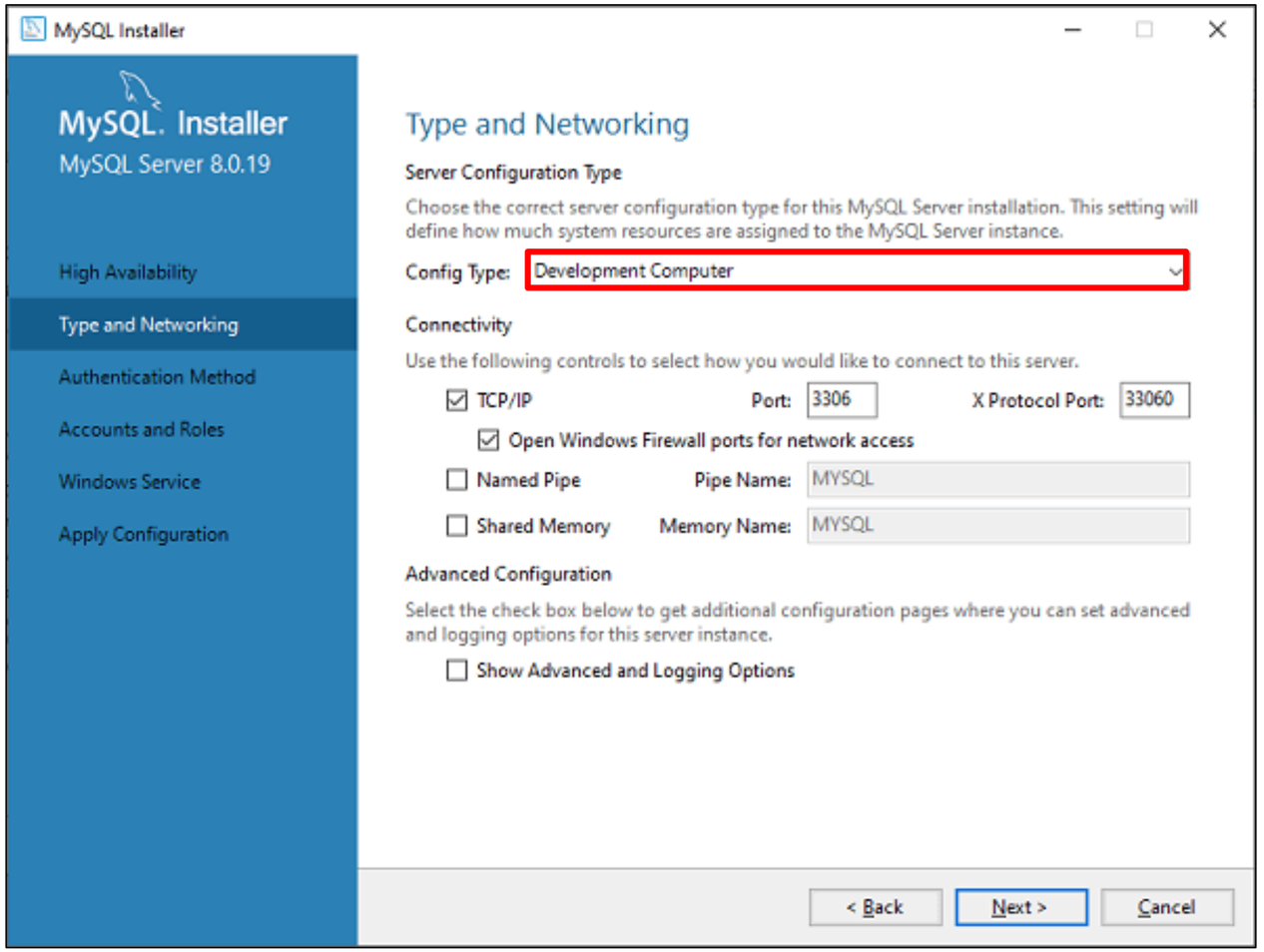
Installing MySQL

Select the **Standalone MySQL Server or the Classic MySQL Replication** option to configure the MySQL server.



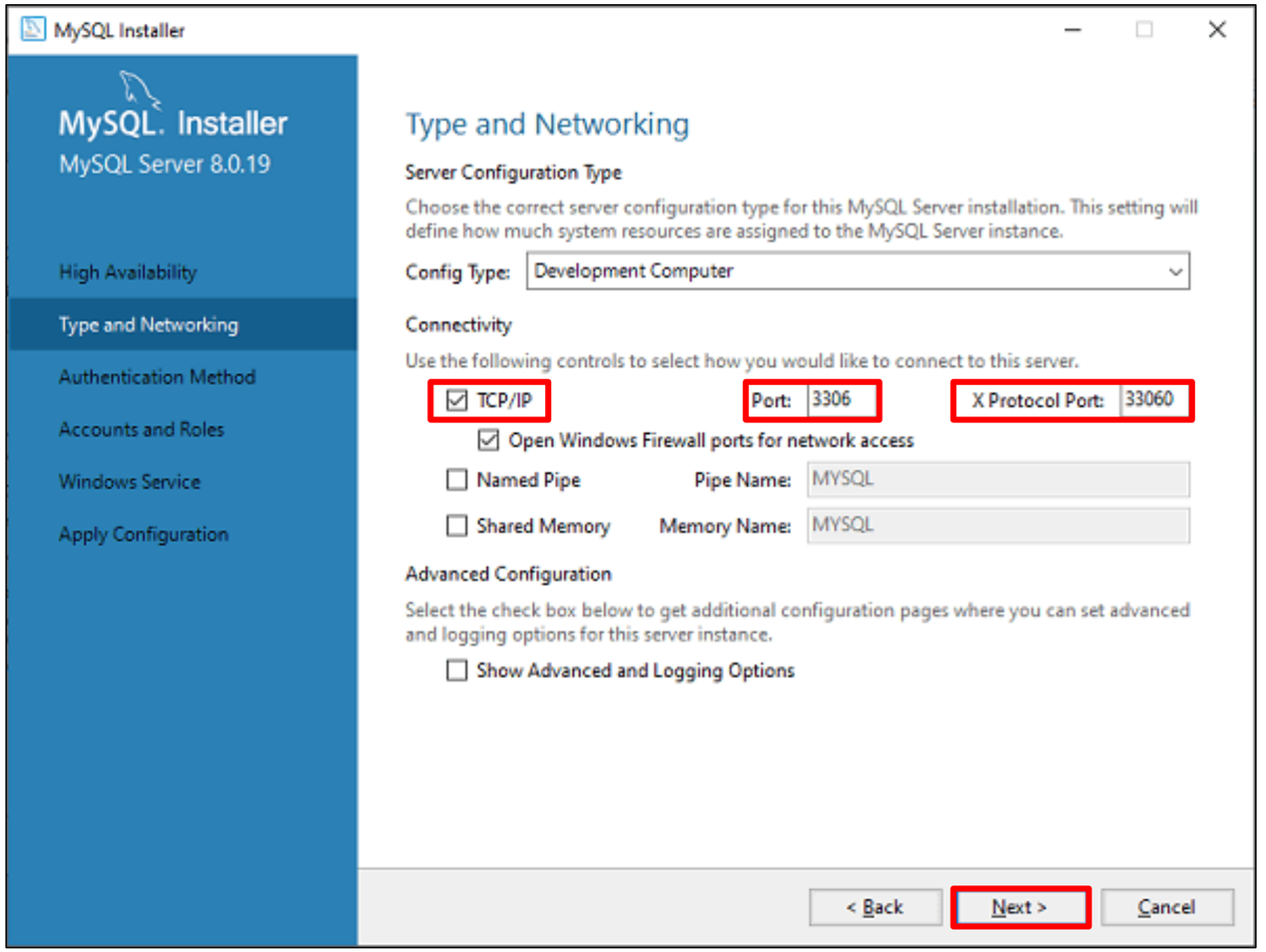
Installing MySQL

Select the **Development Computer** list option from the Config Type drop-down list.



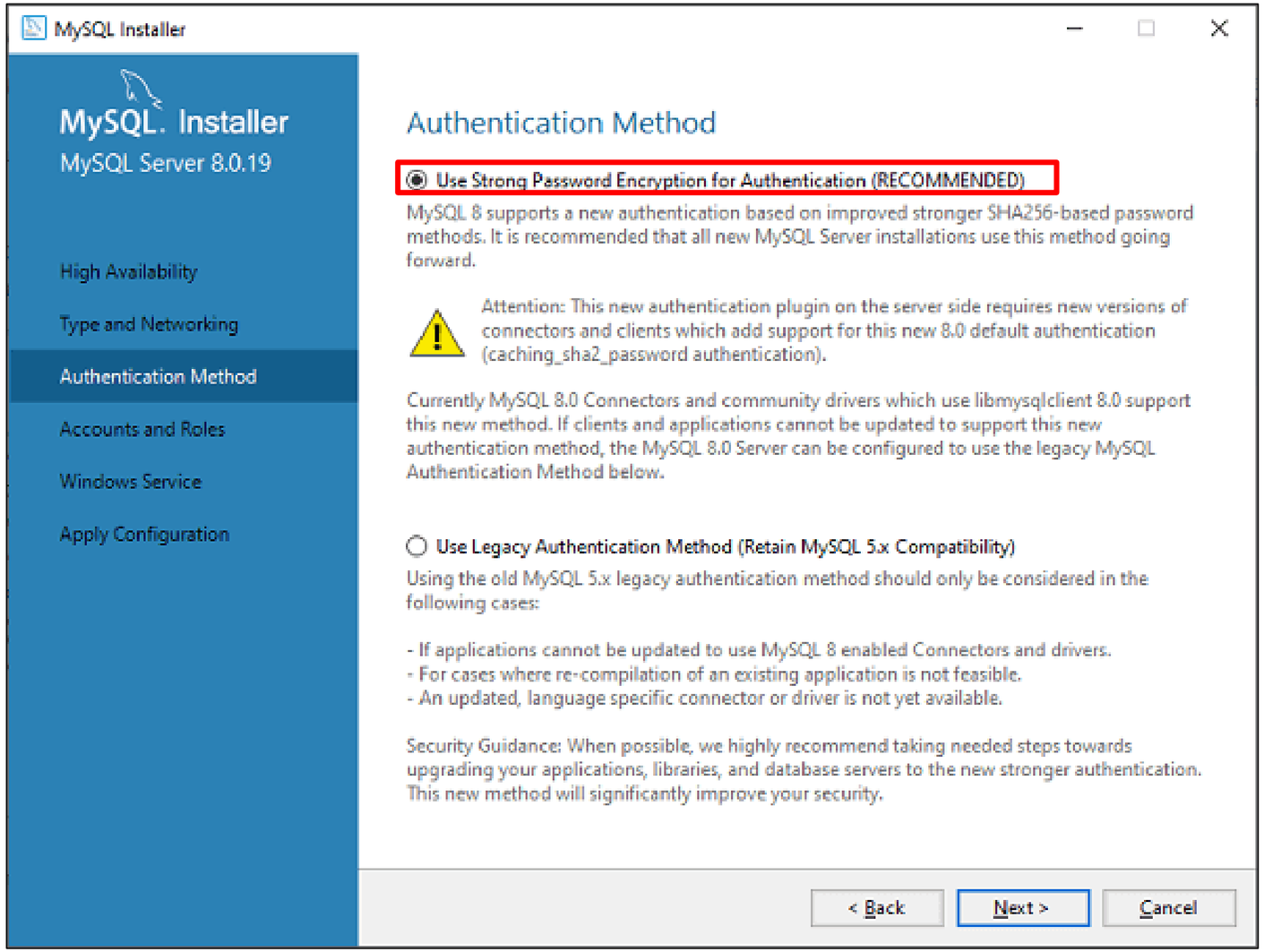
Installing MySQL

Click **TCP/IP** and fill in the input field.



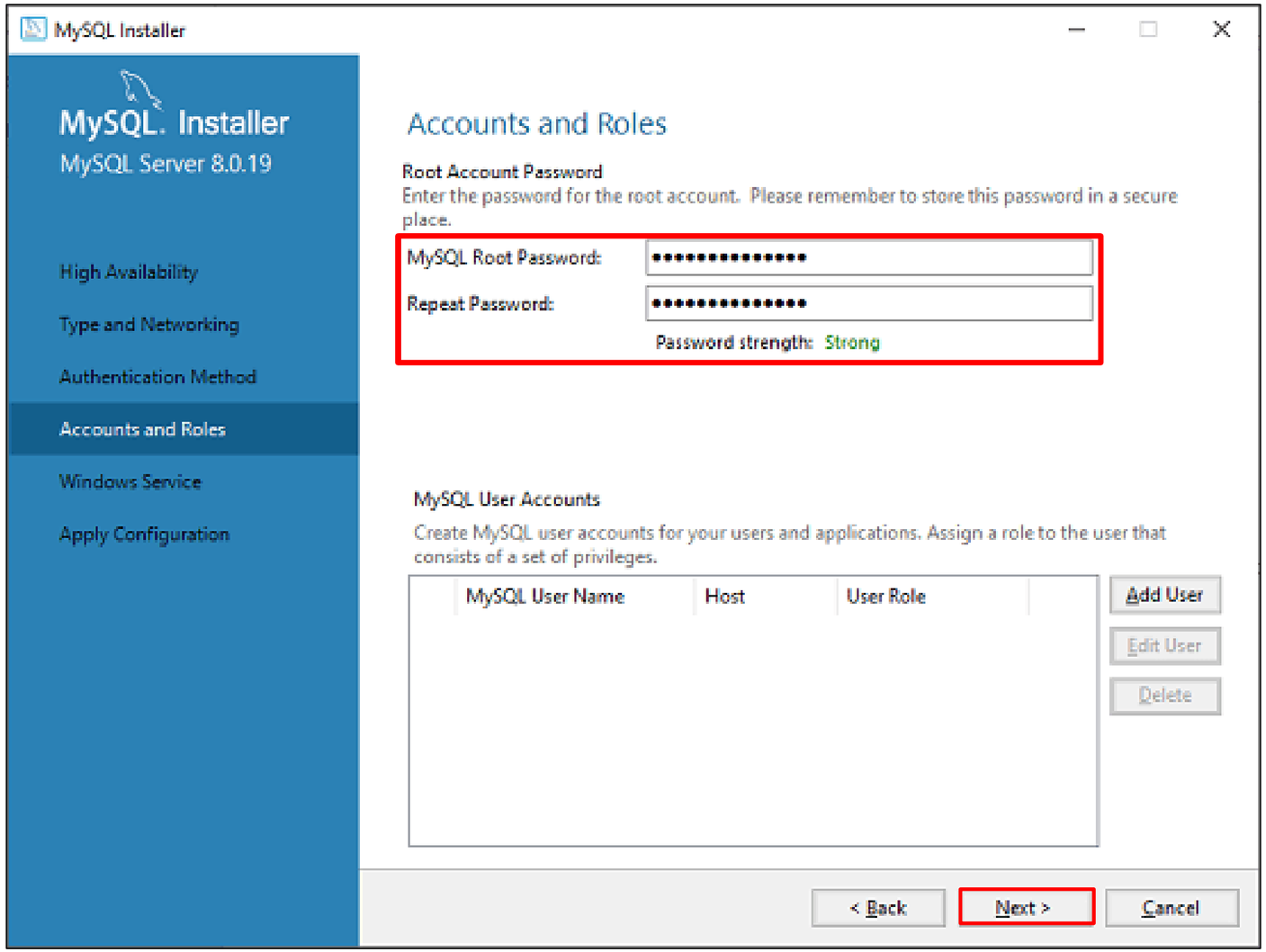
Installing MySQL

Select the **Use Strong Password Encryption for Authentication.**



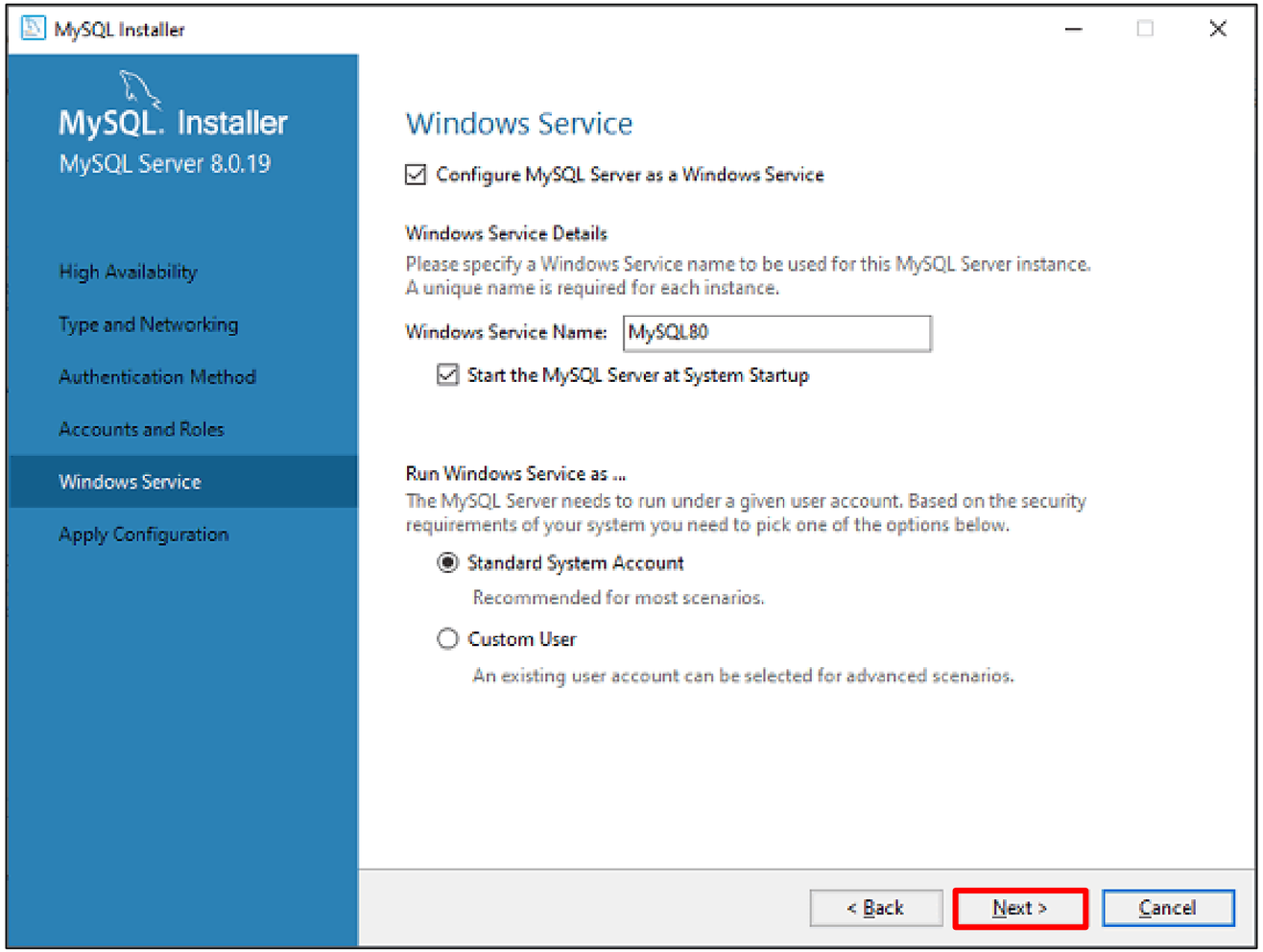
Installing MySQL

Enter the desired password and click **Next.**



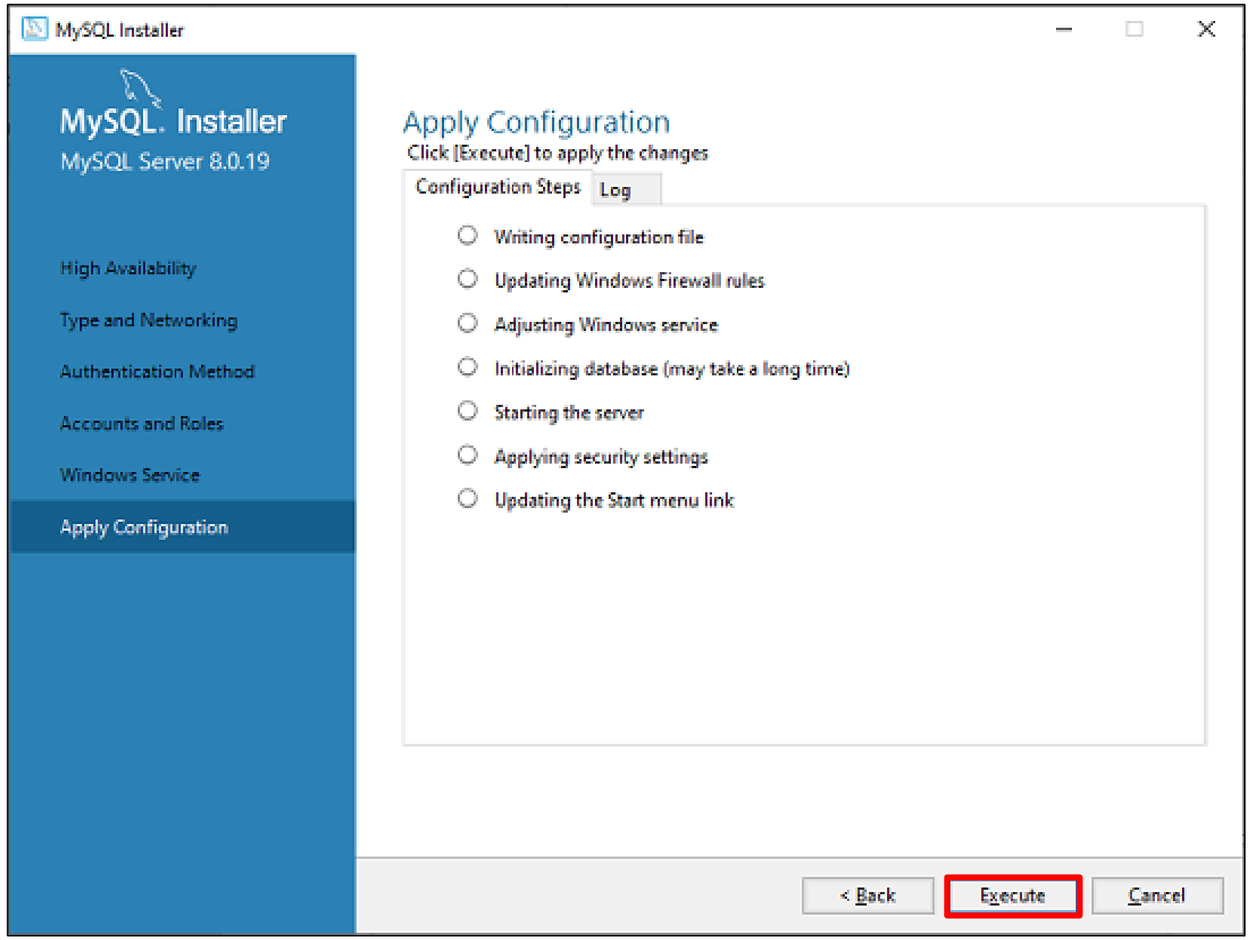
Installing MySQL

Keep all the default settings and click **Next.**



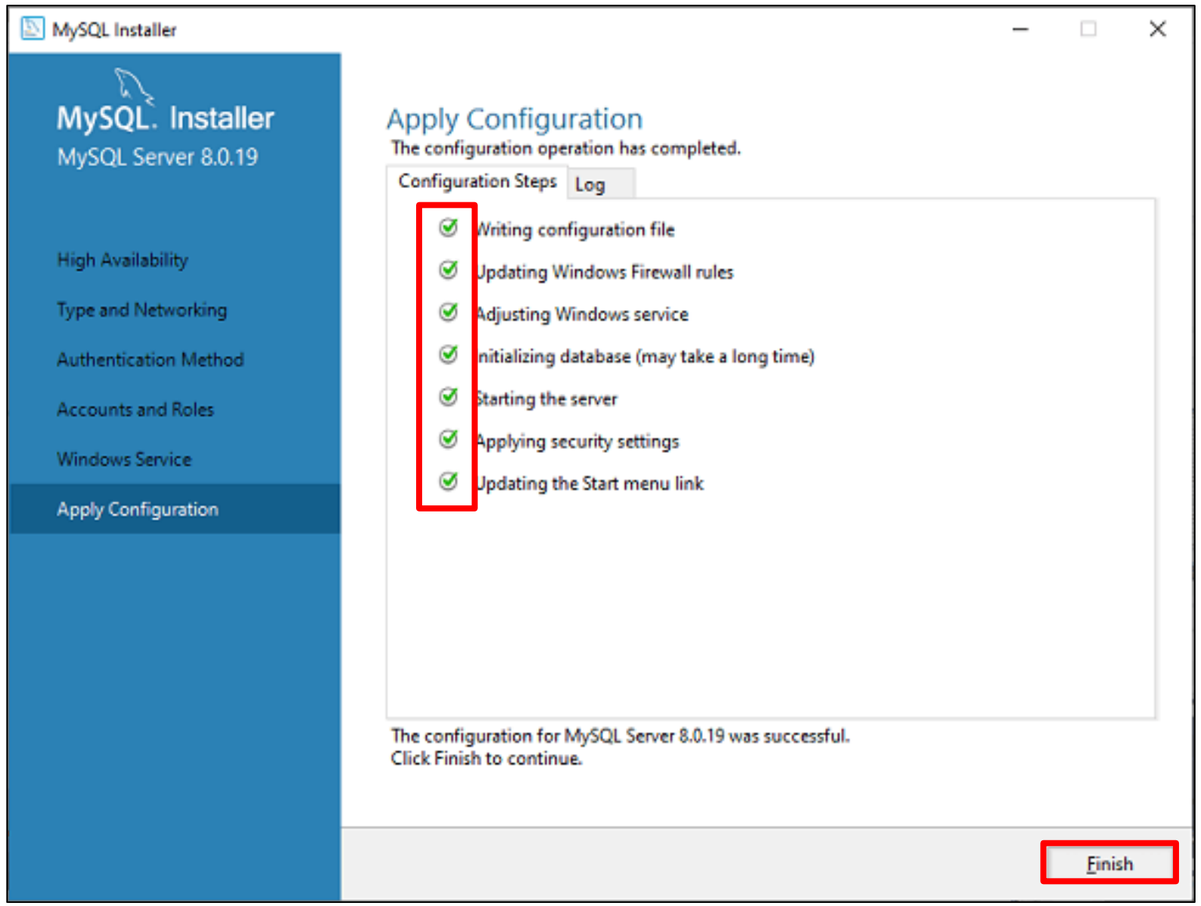
Installing MySQL

Click **Execute** to apply the changes.



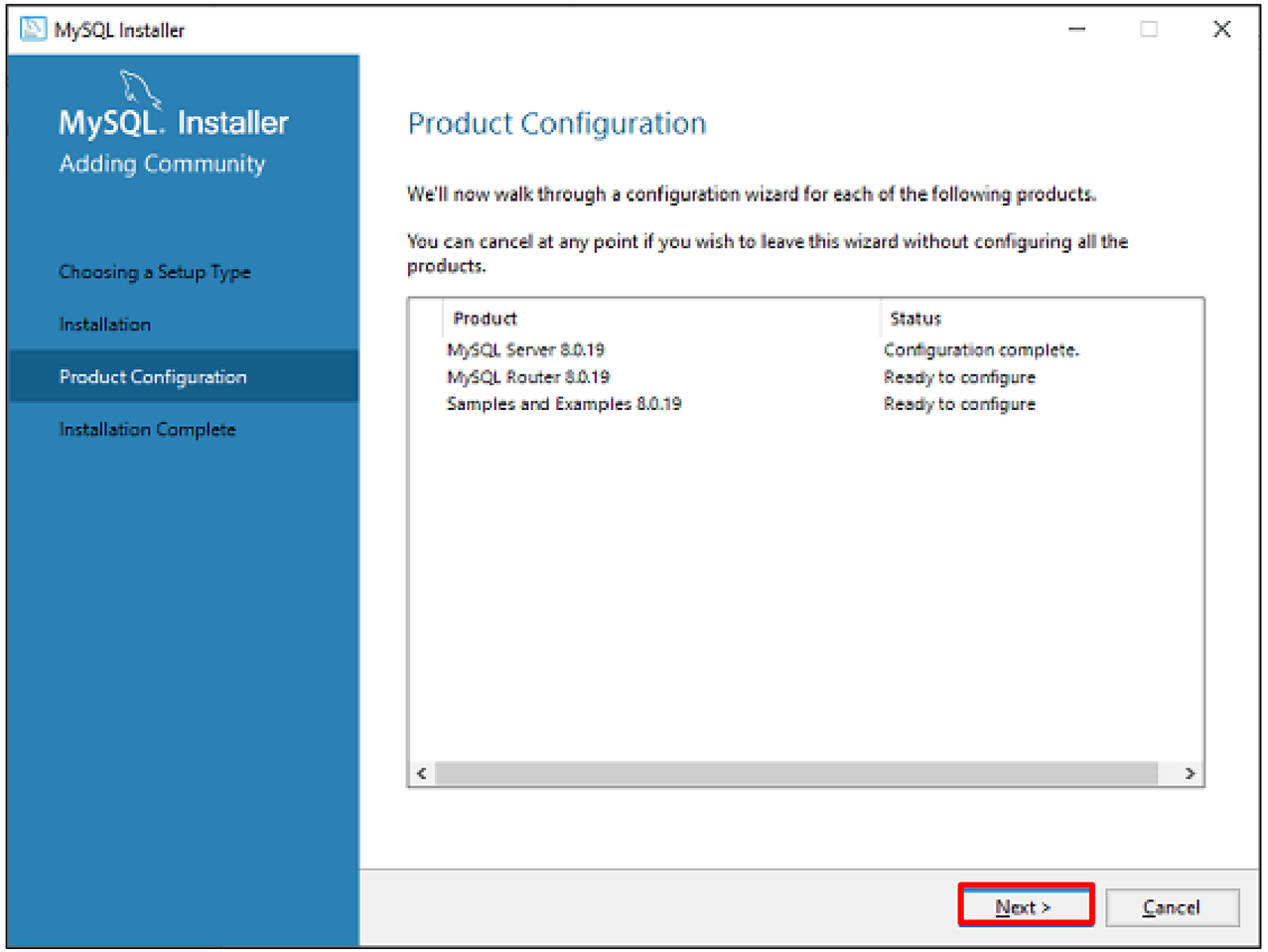
Installing MySQL

The options will be checked with a green checkmark.



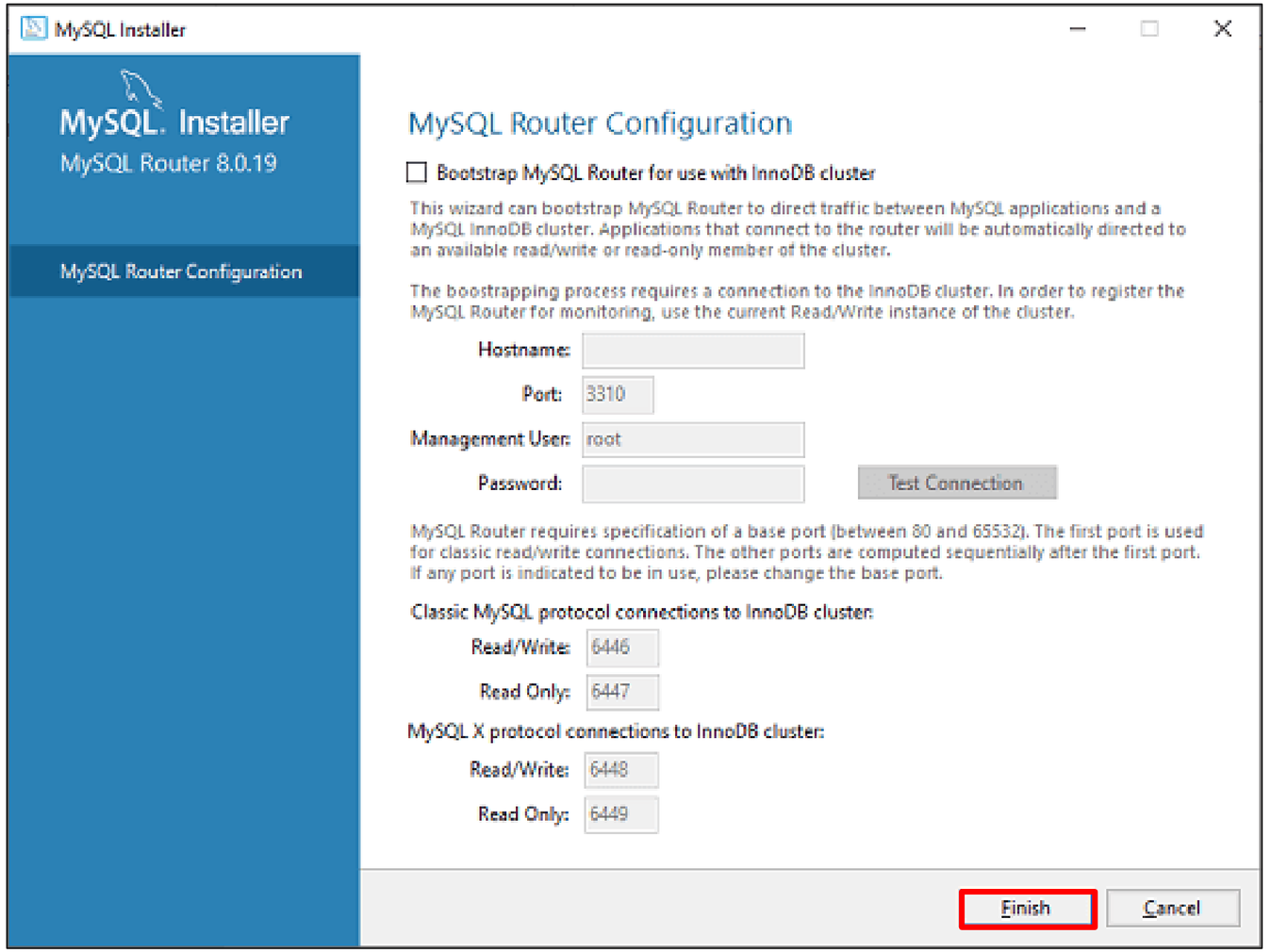
Installing MySQL

Once the product configuration is done, click **Next.**



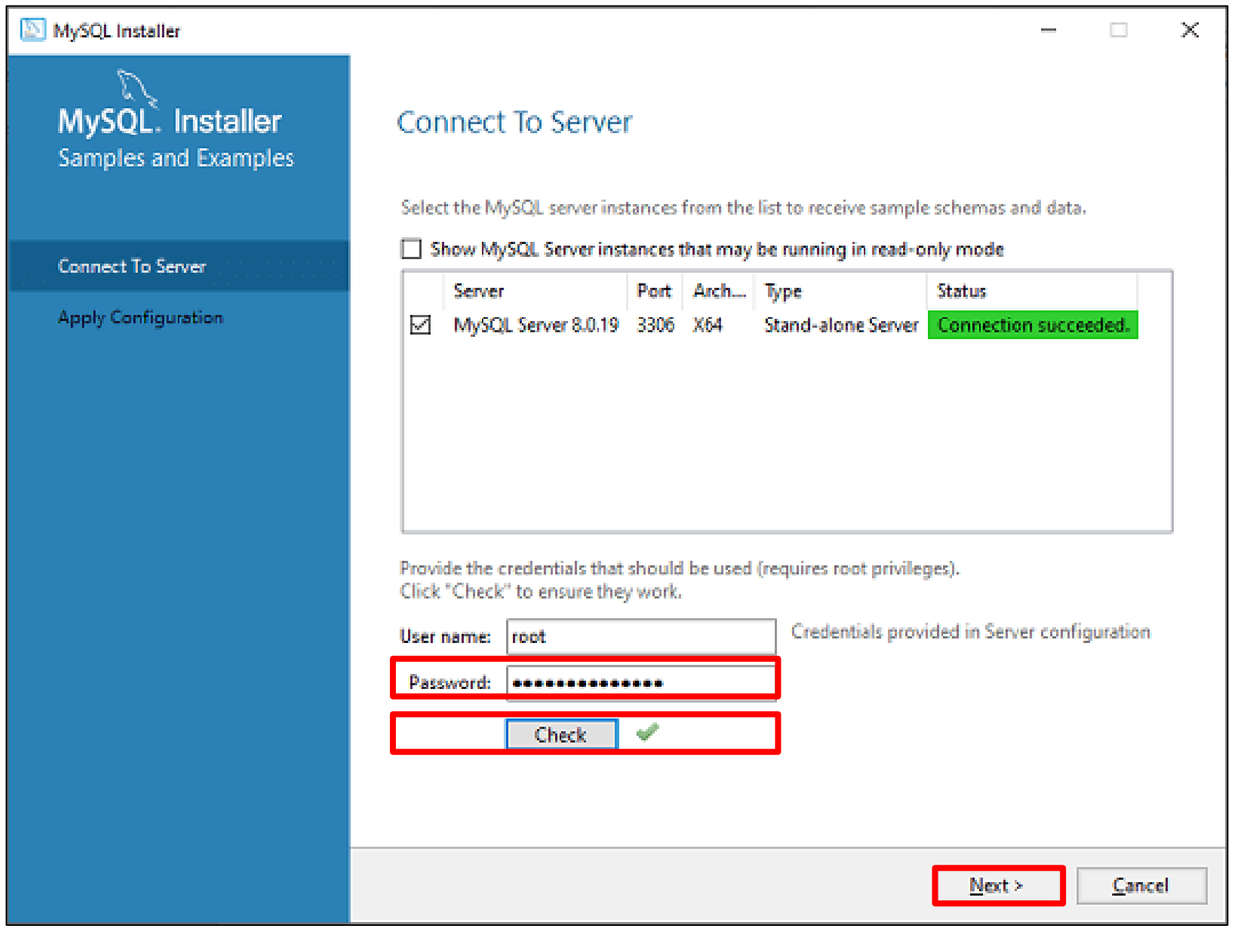
Installing MySQL

Click **Finish** to set up the router.



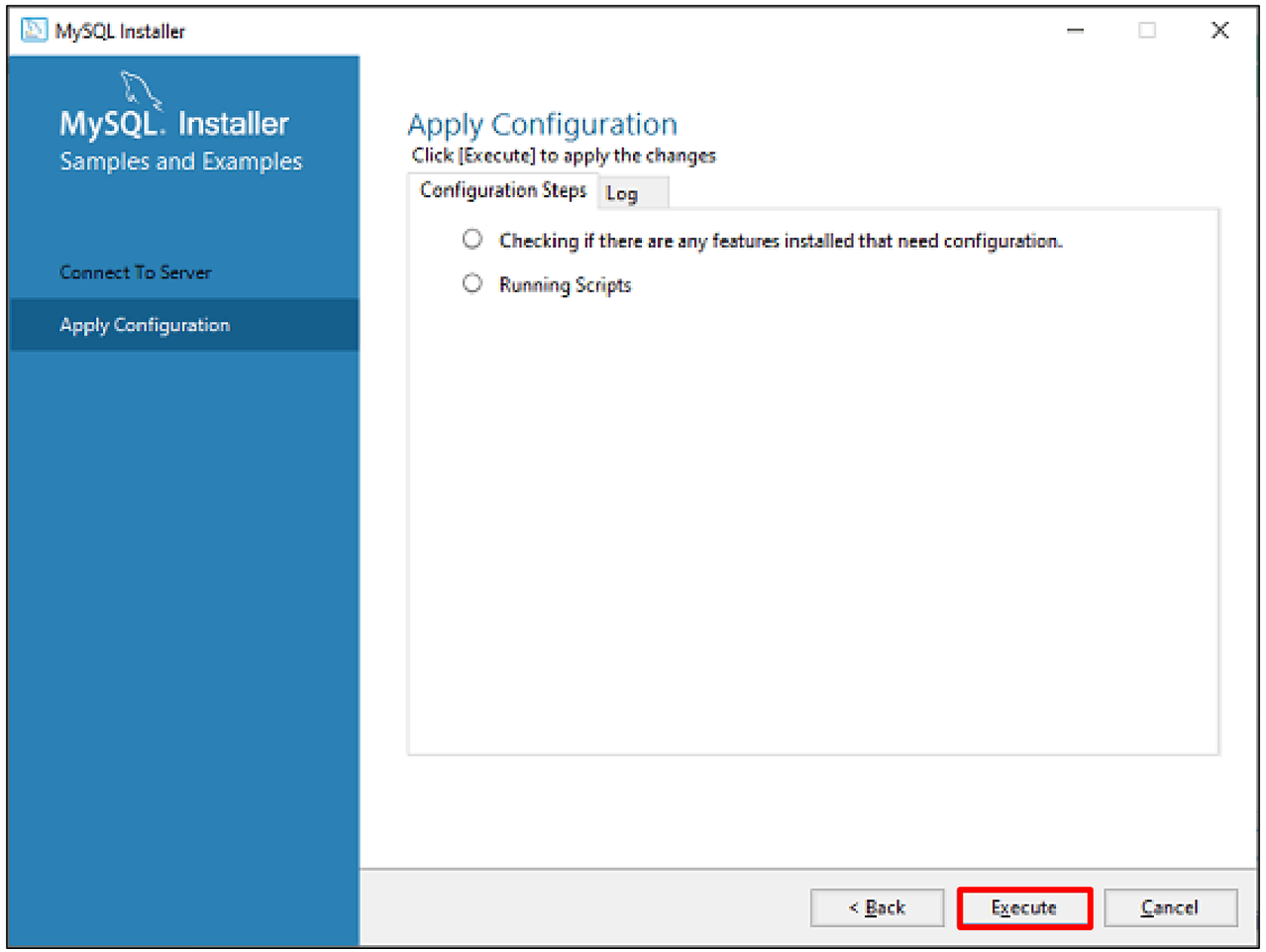
Installing MySQL

In the **Connect to Server page**, click **Execute**. Once the connection is successful, click **Next.**



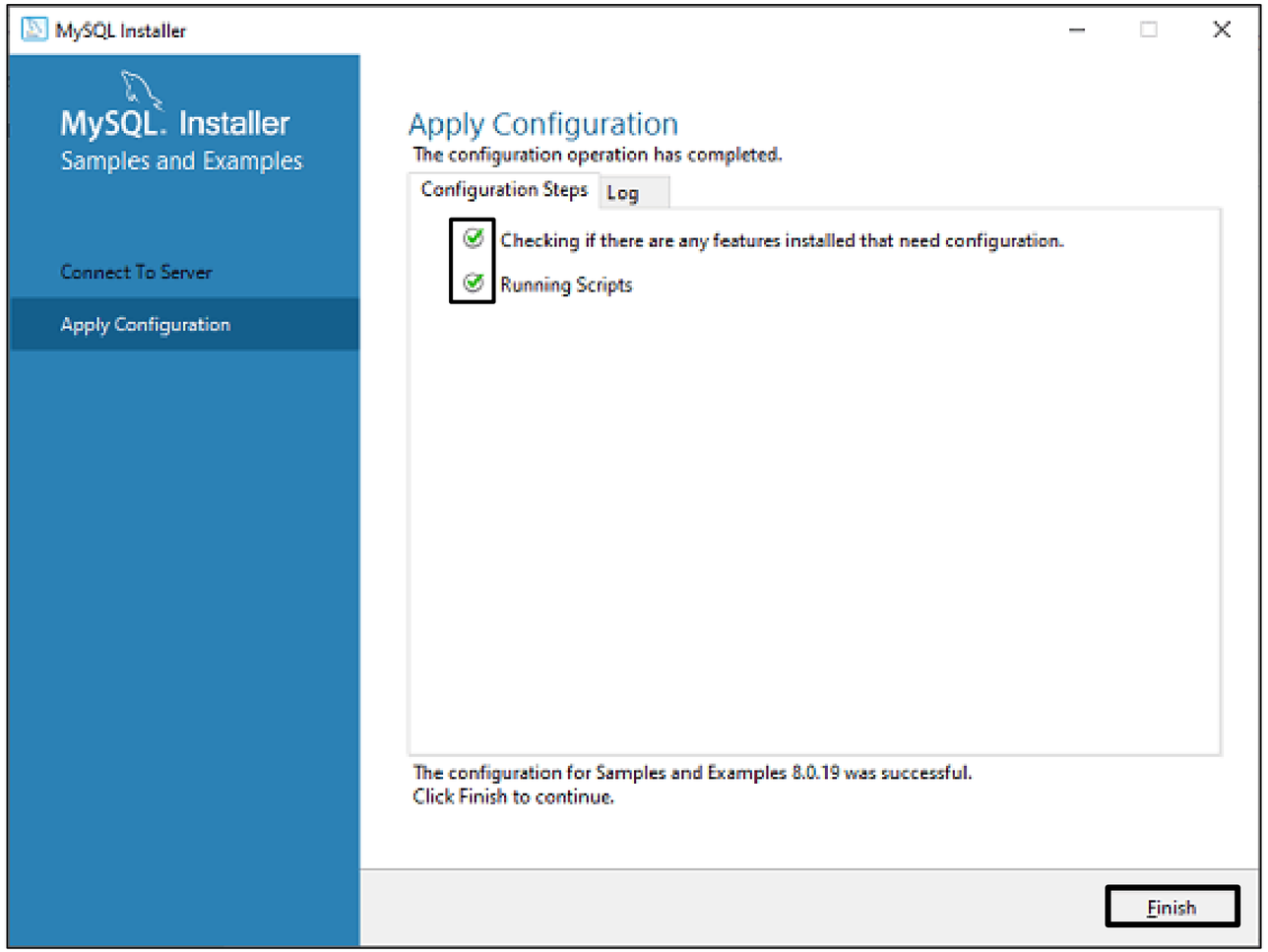
Installing MySQL

Go to the Apply Configuration page and click **Execute** to set up the Configuration Steps.



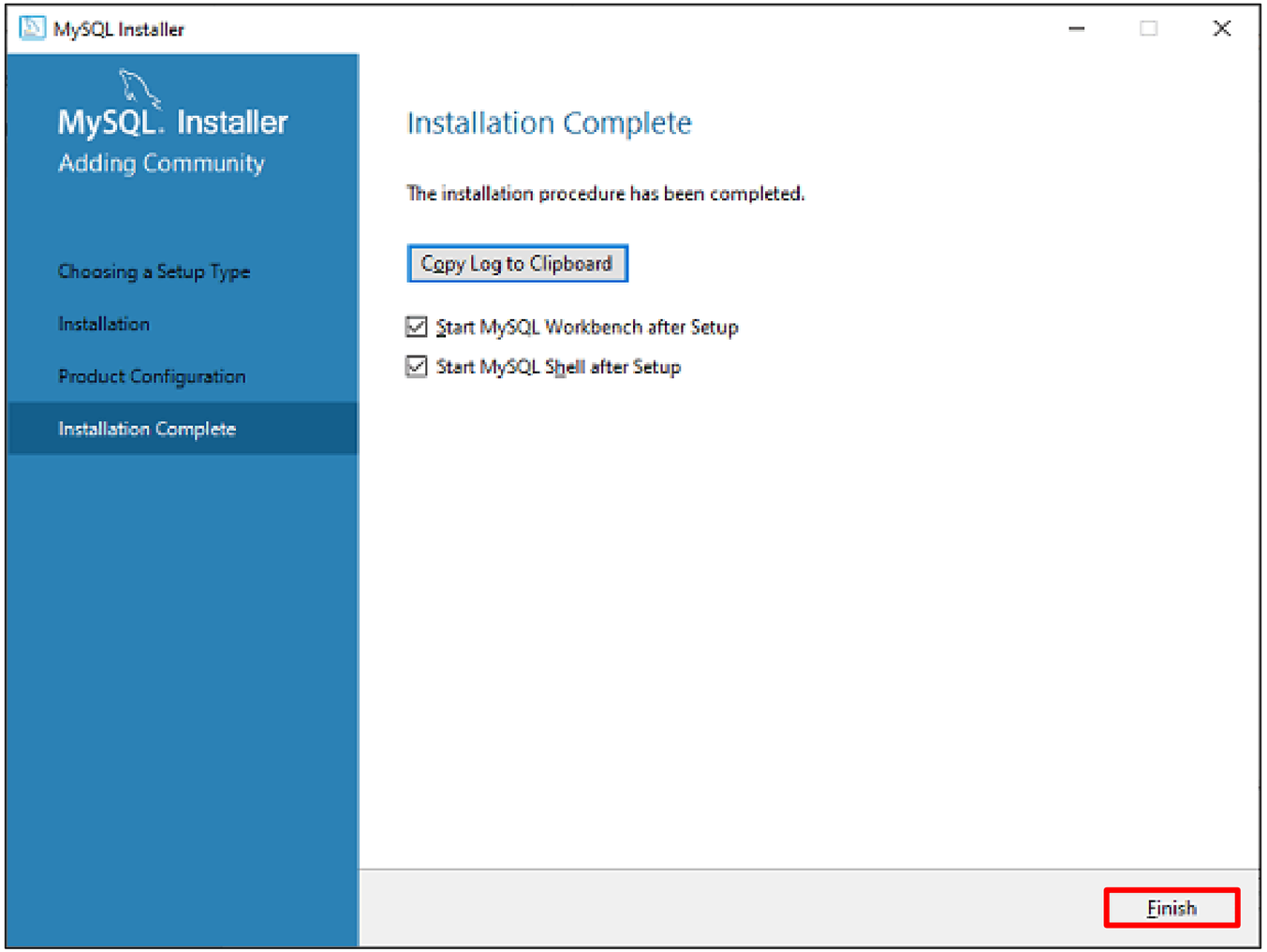
Installing MySQL

When both the configuration steps options are checked with a green checkmark, click **Next.**



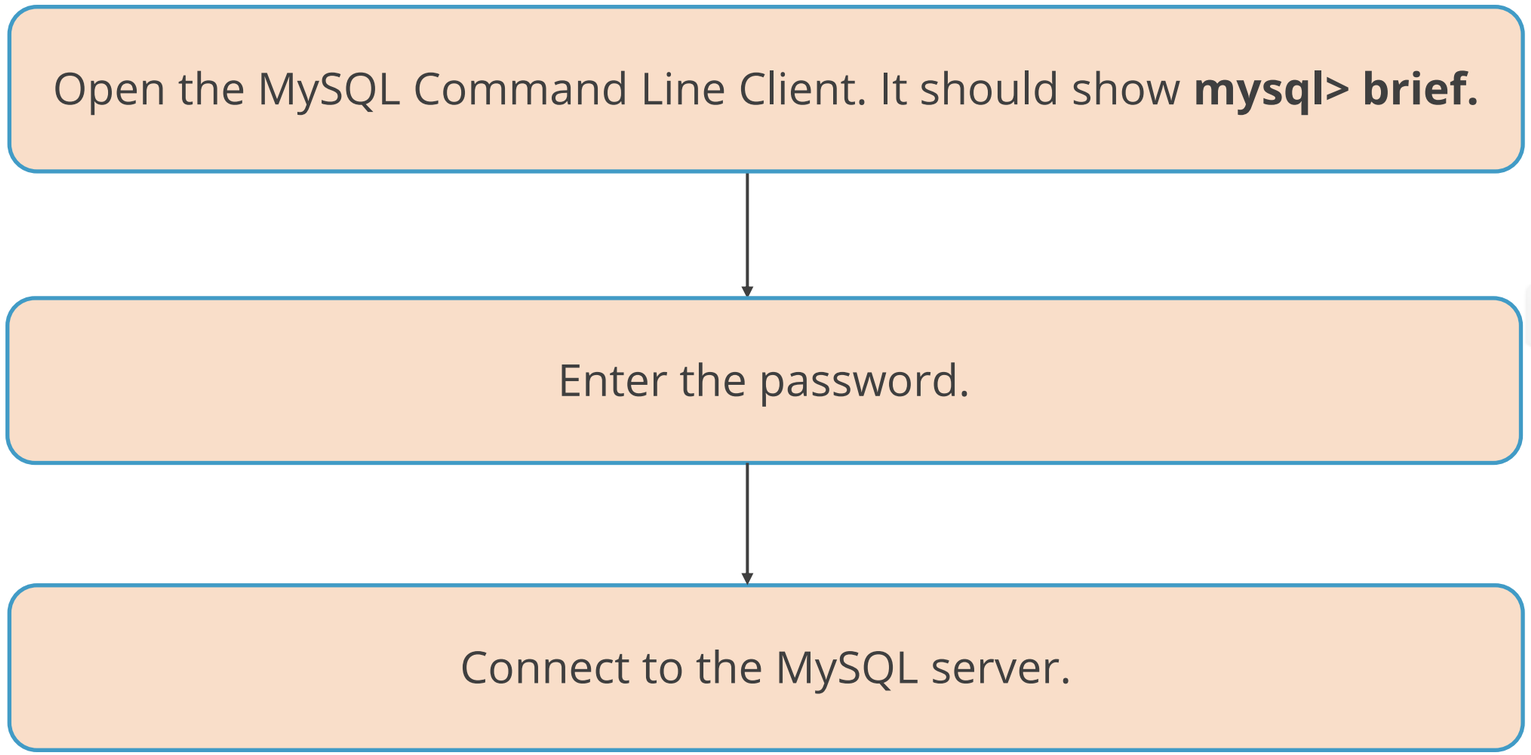
Installing MySQL

MySQL is successfully installed on the machine. Now, click **Finish.**



Installing MySQL

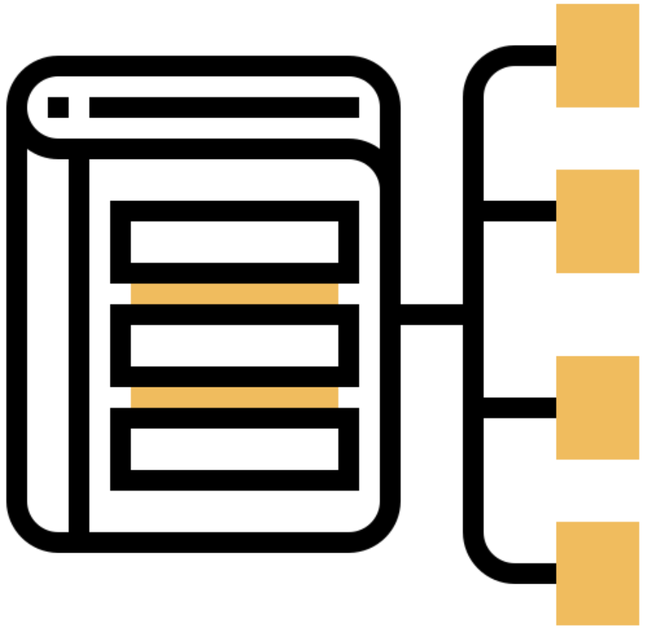
Verify the installation using these steps:



Connecting and Disconnecting from the Server

Connecting and Disconnecting from the Server

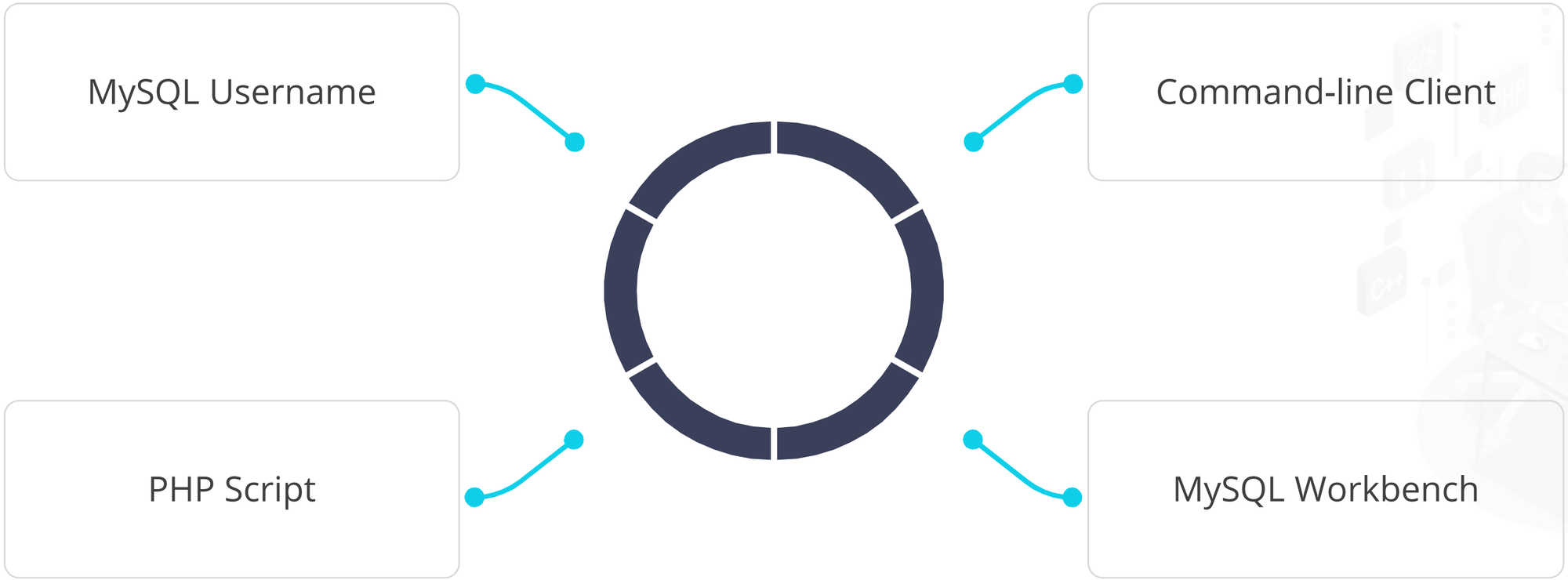
Connections are crucial for sending commands and receiving results from other servers.



The IT facility connects with the same machine servers.

Connecting to the Server

MySQL offers many ways to connect with database servers:



Connecting to the Server

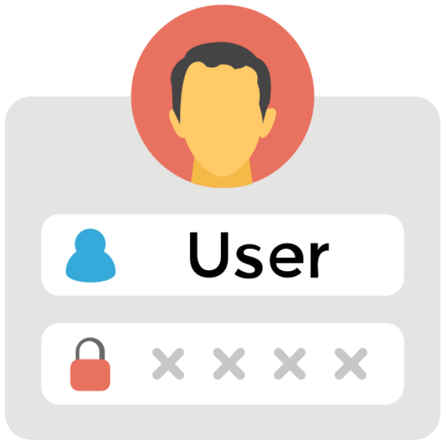
The following are the differences between Command-line Client and MySQL Workbench:

Command-line client	vs.	MySQL workbench
• Helps in interacting with a database server • Is available in the bin directory		Gives the authority to: 1. Design 2. Develop 3. Create the database schemas 4. Insert queries as well as data to work with stored data

Connecting to the Server

MySQL provides the authority to its users for keeping their database secure by creating a username.

This helps to keep a record of the table that contains:



Login information

Host information

Account privileges

Connecting to the Server

To make a connection with the server, enter the username and the password to authenticate the login.

If the server runs on a different machine, determine the hostname.

Connecting to the Server

Link to the host using **mysql –h host –u user -p**

MySQL database system will show the introductory information followed by a **mysql>** prompt:

```
mysql –h host –u user –p
        Enter password: *****

Welcome to the MySQL monitor. Commands end with: or Vg. Your MySQL
connection id is xxxx to the server version: x.x.x-standard Type 'help:' or
for help.
Type '\c' to clear the buffer.mysql>
```

Connecting to the Server

When the users login into the system where SQL is running, the host can be omitted. The following code can be used:

```
Mysql –u user –p

Error message 00 Sign into the MySQL server


ERROR 2002 (HYOOO) : can't connect to local MySQL server
through socket '/tmp/mysql.sock' (2) ,
```


Connect with that server by conjuring MySQL **>mysql**

Disconnecting from the Server

To disconnect from the MySQL server, enter QUIT or **\q** at the command line interface or press CTRL + D.

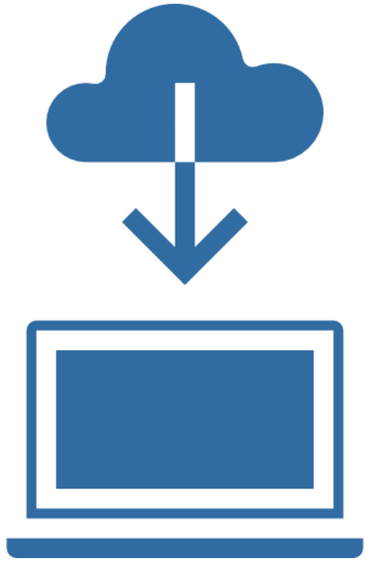
Enter QUIT or \q at the cli: mysql> QUIT

TECHNOLOGY

Structured Query Language (SQL)

Structured Query Language (SQL)

SQL is a standard technical language to store, retrieve, and manipulate databases.



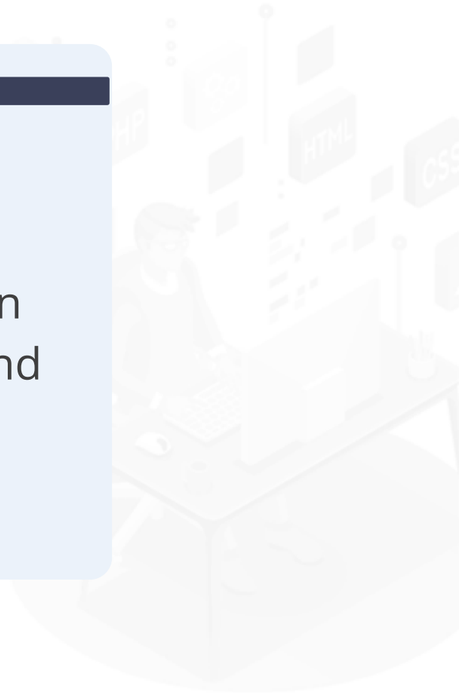
All SQL statements are instructions to the database only.

SQL: Functionalities

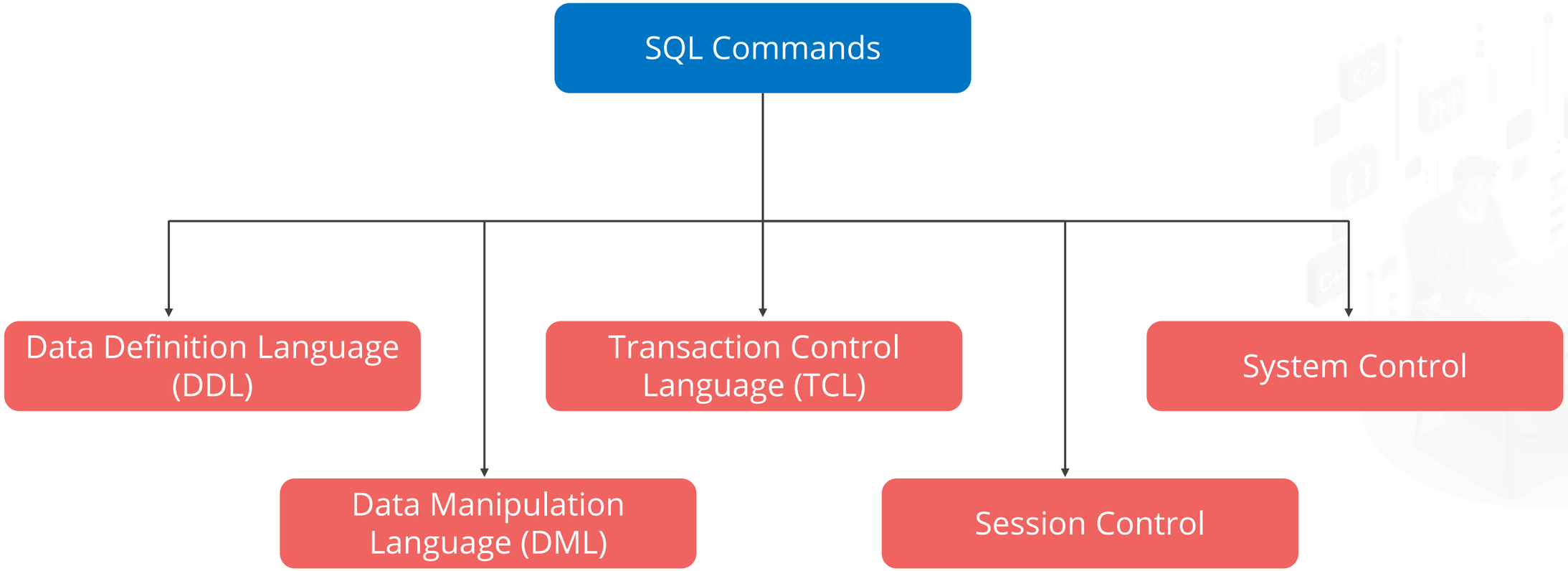
Connects to a database and helps in updating, retrieving, deleting, and inserting records

Creates new tables, stored procedures, and views in the database

Sets permissions on tables, processes, and views

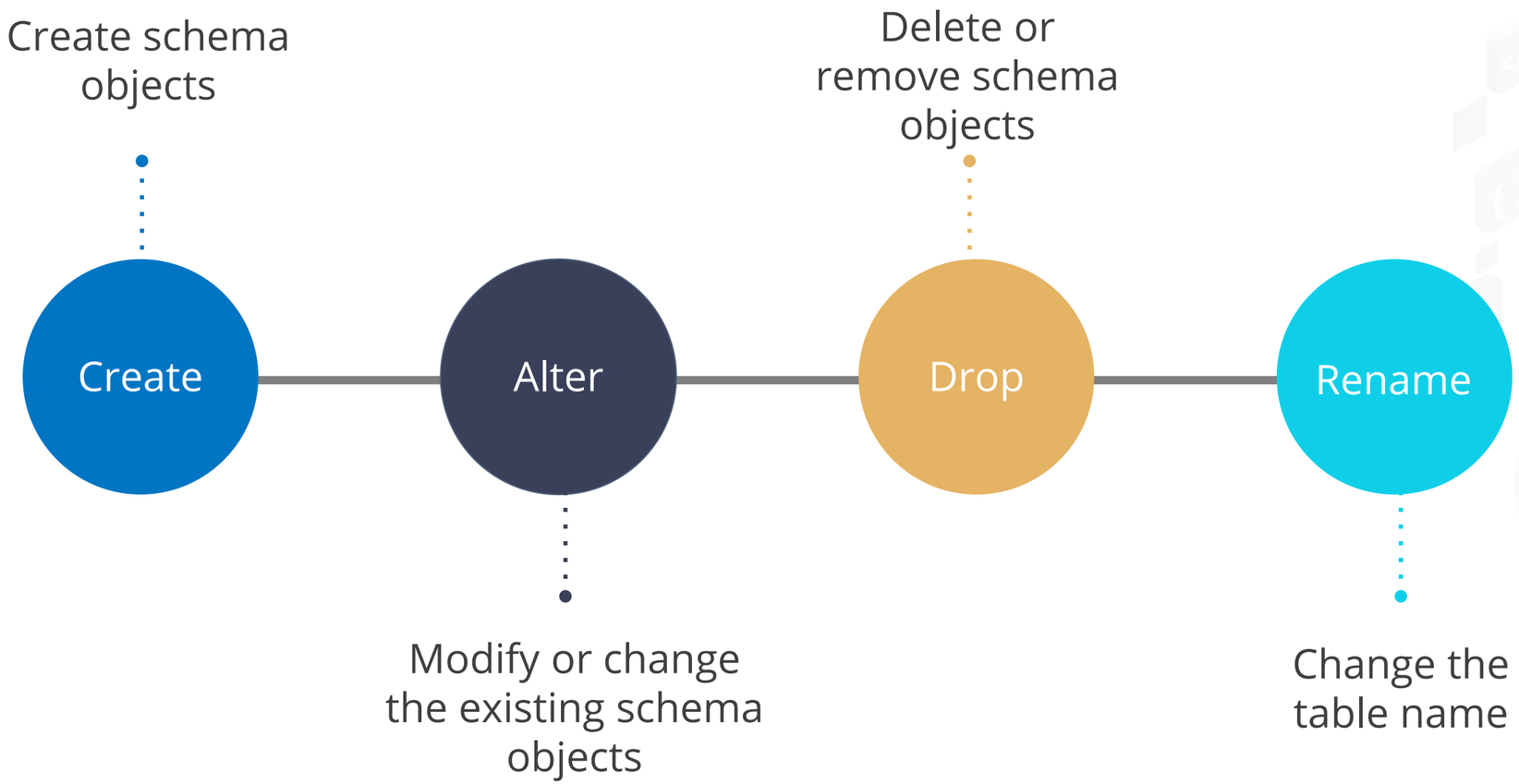


SQL: Command Categories



Data Definition Language (DDL) Commands

The DDL commands help the user perform data definitions tasks.



Data Definition Language (DDL) Commands

The DDL commands are also known as Data Control Language (DCL). It helps:

Revoke privileges

Grant or revoke permissions or privileges to work on schema objects

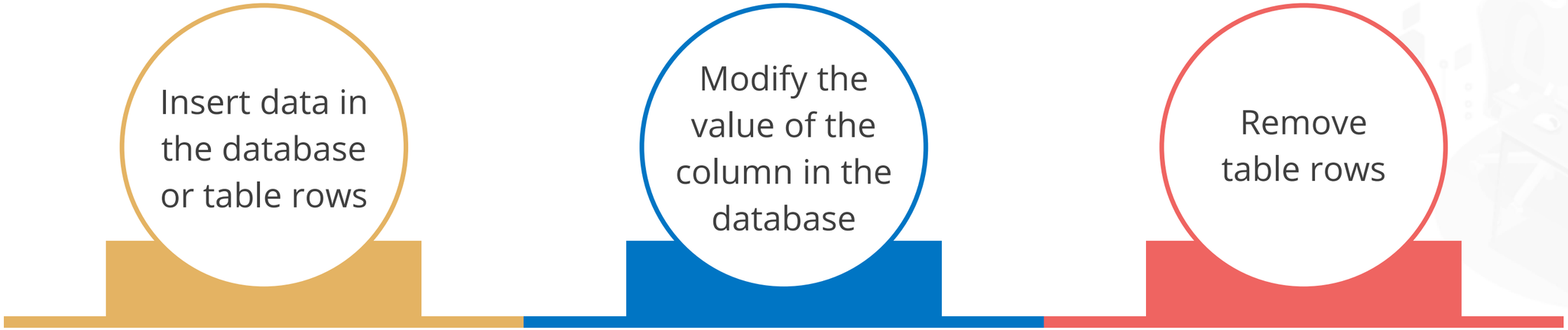
Maintenance Commands

Analyze the table information

Data Manipulation Language (DML) Commands

The DML commands are employed to manipulate and modify data, for example, SELECT, and LOCK table.

These commands are not permanently saved. These commands:



Transaction Control Language (TCL) Commands

Transaction control language manages and manipulates the data generated by:

INSERT< UPDATE< DELETE commands

A transaction refers to one complete logical unit of work.

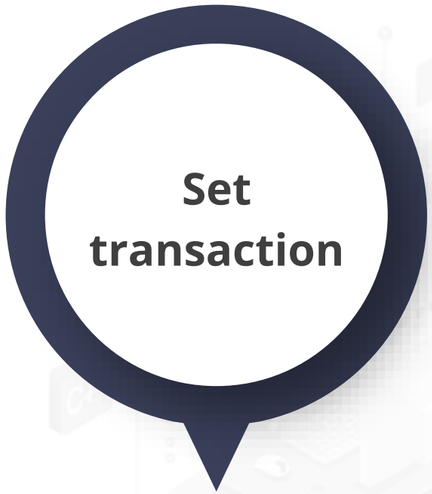
These commands manage changes that are made by DML commands.

Functionalities of TCL Commands

Makes all changes made by a statement issued and makes the transaction permanent

Undo the changes from the beginning or a save point

Saves the transaction temporarily



Implements properties for the current transaction

TECHNOLOGY

MySQL Security and Root Superuser

MySQL Security and Root Superuser

The following table explains the importance of MySQL security measures for protecting data. It describes the role of the root superuser, who has the highest administrative privileges in the database.

MySQL Security	Root Superuser
Provides strong data security to protect data for: • Secure connections • Authentication services • Authorization and controls • Data encryption and security	Is an admin who has the super privilege or GRANT statement that allows a user account to make changes and execute various operations in the database table

MySQL Security and Root Superuser

To create a superuser:

```
//Login to MySQL server and type this command:

mysql -u root –p

mysql -h host_name_ip -u root –p

//Create an admin user account using this command:

CREATE USER 'admin'@'localhost' IDENTIFIED BY 'the_secure_password';
```

Creating a Database and Table

Creating a Database

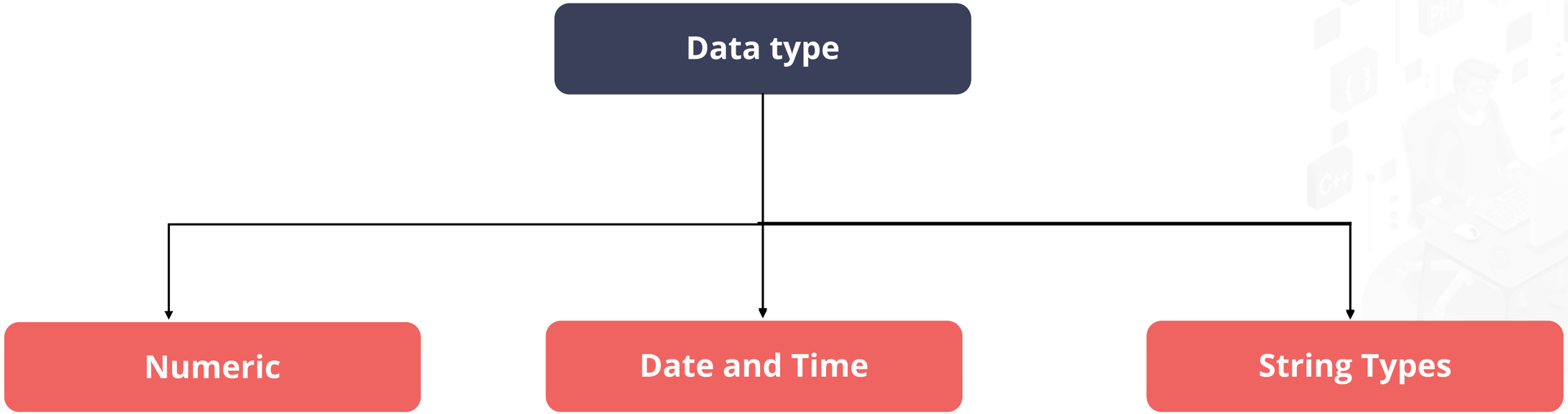
The syntax to create a database:

```
CREATE DATABASE databasename;
```

Creating a Table

Creating a table involves understanding data types.

A data type specifies a particular type of data stored in the table. Following are the different types of data values used in MySQL:



Creating a Table

SQL supports all integer data types that include:

Data types	Description	Signed	Unsigned	Width
INT	Integer	Permissible reach: 2147483648 - 2147483647	Permissible reach: 0 - 4294967295	11
TINYINT	Small integers	Permissible reach: -128 - 127	Permissible reach: 0 - 255	4
SMALLINT	Small integers	Permissible reach: -32768 - 32767	Permissible reach: 0 – 65535	5
MEDIUMINT	Medium-sized integers	Permissible reach: -8388608 - 8388607	Permissible reach: 0 – 16777215	9
BIGINT	Large integer	Permissible reach: 9223372036854775808 - 9223372036854775807	Permissible reach: 0 - 18446744073709551615	20

Numeric Data Type

SQL supports all numeric data types, that include:

FLOAT(M,D)

- Floating-point numbers (unsigned)
- Defines the visual length (M) and the number of decimals (D)
- Decimal accuracy: 24

DOUBLE(M,D)

- Double-precision floating-point numbers (unsigned)
- Visual length (M): 16
- Quantity of decimals (D): 4
- Decimal accuracy: 53

DECIMAL(M,D)

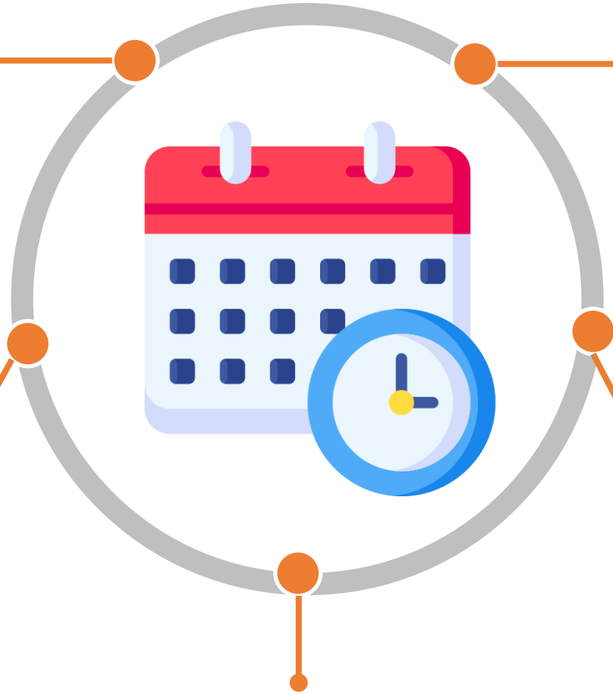
- Unpacked floating-point number (unsigned)
- Every decimal corresponds to 1 byte
- NUMERIC is equivalent to DECIMAL

Date and Time Data Types

The list of the date and time data types are as follows:

YEAR(M): Stored in a two-digit or a four-digit format

DATE: Written in YYYY-MM-DD format



TIME: Stored in HH:MM:SS format

DATETIME: Written in YYYY-MM-DD HH:MM:SS format

TIMESTAMP: Stored in YYYYMMDDHHMMSS format

String Data Types

The list of string data types are as follows:

CHAR(M)

- Fixed-length string
- **Length:** 1 and 255 characters

VARCHAR(M)

- Variable-length string
- **Length:** 1 and 255 characters

BLOB or TEXT

- **Length:** 65535 characters
- Stands for Binary Large Objects
- Helps to store large amounts of binary data

String Data Types

The list of string data types are as follows:

TINYBLOB or TINYTEXT

- BLOB or TEXT column
- **Length:** 255 characters
- Cannot define size

MEDIUMBLOB or MEDIUMTEXT

- BLOB or TEXT column
- **Length:** 16777215 characters
- Cannot define size

LONGBLOB or LONGTEXT

- BLOB or TEXT column
- **Length:** 4294967295 characters
- Cannot define size

ENUM or enumeration refers to an extravagant term for lists.

Creating a Table: Syntax

To create a table in MySQL, use the CREATE TABLE statement. This statement defines the table structure, including its columns and their data types. Here is the syntax for creating a table:

```
CREATE TABLE table_name (
    column1 datatype constraints,
    column2 datatype constraints,
    column3 datatype constraints,
    ...
);
```

Creating a Table: Example

Here is an example of how to create a table called Persons with columns for PersonID, LastName, FirstName, Address, and City.

Code

```
CREATE TABLE Persons (
PersonID int,
LastName varchar(255),
FirstName varchar(255),
Address varchar(255),
City varchar(255)
)
```


Output

PersonID	LastName	FirstName	Address	City

Creating Databases and Tables

Duration: 10 Min.

Problem Statement:

You are assigned a task to create a database and tables in MySQL.

Outcome:

By completing this task, you have successfully created and managed a MySQL database named my_database, and designed a **users** table within it to store user information.

Note: Refer to the demo document for detailed steps:
01_Creating_Databases_and_Tables

ASSISTED PRACTICE

Assisted Practice: Guidelines

Steps to be followed:

1. Create and manage databases
2. Create tables in the database
3. Modify tables

Creating a New User

Creating a New User

Creating a new user in MySQL involves several steps to set up login information, account privileges, and host information. This process is essential for managing database access and ensuring that users have the appropriate permissions to perform their tasks.

The create statement:

- Creates a new user account in the database
- Provides authentication of the user account
- Enables to hand in the account that must be firstly locked or unlocked

Creating a New User

The syntax for creating a new user:

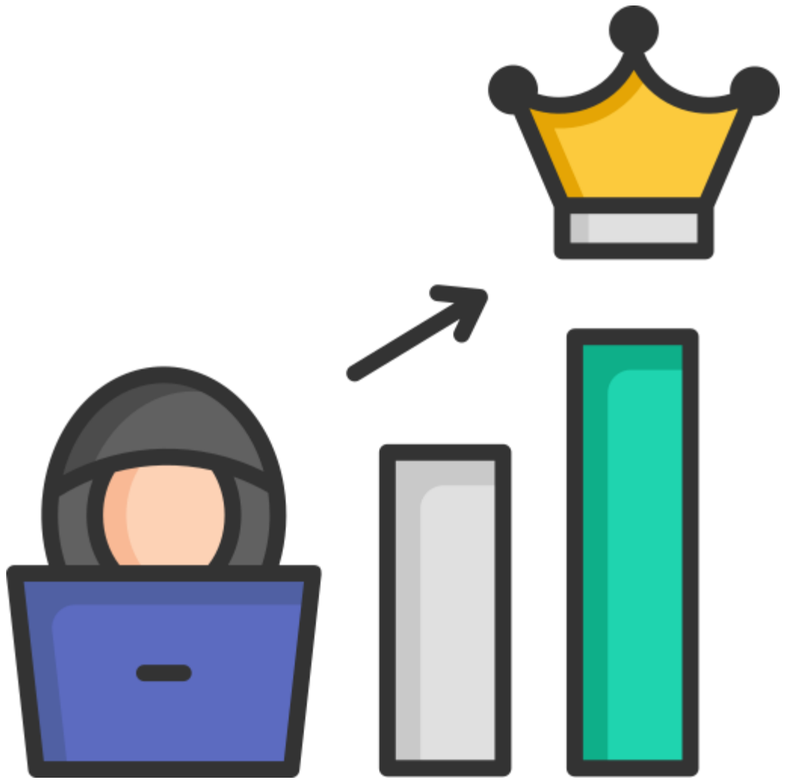
```
CREATE USER 'username' IDENTIFIED BY 'password';
```

TECHNOLOGY

MySQL Database and Table-Specific Privileges

MySQL Database and Table-Specific Privileges

The privileges granted to a MySQL account help identify operations a particular account can perform.



These privileges:

- Enable users to manage the operation of the MySQL server
- Do not just apply to one database, as they are global
- Apply to a database, including the objects within it

Privileges for database objects can be granted for specific objects within a database.

MySQL Database and Table-Specific Privileges

A grant statement provides privileges to the users.

```
GRANT        priv_type [(column_list)]
    [, priv_type [(column_list)]] ...
  ON [object_type] priv_level
  TO user_or_role [, user_or_role] ...
  [WITH GRANT OPTION]
  [AS user
     [WITH ROLE
        DEFAULT
      | NONE
      | ALL
      | ALL EXCEPT role [, role ] ...
      | role [, role ] ...
     ]
  ]
```

Key Takeaways

- A database system is a computer-based record-keeping system that helps in storing, managing, and retrieving data efficiently.
- MySQL is a Relational Database Management System (RDBMS) that uses SQL to query databases and supports structured query language for data management and retrieval.
- SQL is a standard technical language to store, retrieve, and manipulate databases, ensuring consistency and reliability.

Key Takeaways

- Transaction control language manages and manipulates the data, including commands like COMMIT, ROLLBACK, and SAVEPOINT to handle transactions.
- The DML commands are employed to manipulate and modify data within tables, including commands like INSERT, UPDATE, and DELETE.
- The DDL commands help the user perform data definition tasks, including commands like CREATE, ALTER, and DROP to define and manage the database schema.

TECHNOLOGY

Thank You

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