جامعة القاهرة الجديدة التكنولوجية
NEW CAIRO TECHNOLOGICAL UNIVERSITY
كلية تكنولوجيا الصناعة والطاقة

PEARSON BTEC International Standards Verifier

ICT Program

Dr. Amany AbdElSamea Saeed

Lec. 1 Introduction to DBMS

February 2024

Course Content

Module 0: includes an introduction to relational database management systems

Module 1: introduces basic Structured Query Language (SQL)

Module 2: includes SQL data types, operations and expressions.

Module 3: introduces SQL – procedures, functions, triggers.

Module 4: includes SQL constraints.

Module 5: introduces Views & Indexes in Databases

Module 6: discusses SQL Joins

Module 7: discusses query plans and query optimization

Module 8: introduces SQL transactions

Module 9: discusses NoSQL tools.

Outline

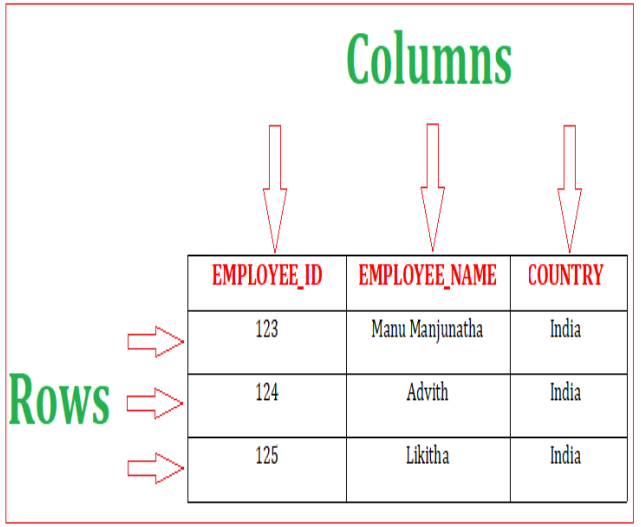
- Types of Database
- Database keys
- Database management systems
- Structured query language
- Types of SQL statements
- MySQL installation

Database

- A *database* is a tool used to organize, store, retrieve, and communicate groups of related information
- A database is an organized collection of *related data*
- *Database Structure*:
  - **Table:** It is the fundamental object of database structure. The basic purpose of a table is to store data.
    It consists of rows and columns.
    - ✓ **Rows/Records:**

    Rows are the horizontal part of the table
    - ✓ **Columns/Fields:**

    Columns are the vertical part of the table



Types of Database

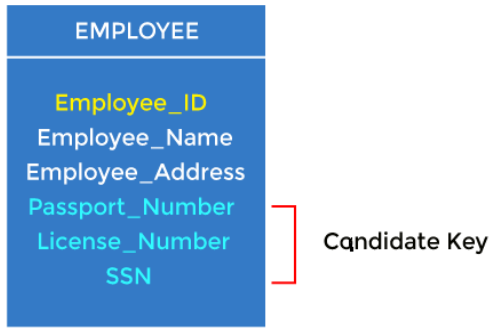
	Relational	Non-Relational
Structure	Ideal for structured data (Table-based)	Ideal for quasi-structured and un-structured data (Key-value pairs, Document-based, Graph database, Wide-column stores)
Strength	-Don't anticipate changes to the database structure - Working with complex queries and reports	- Data consistency and integrity is not top priority - Expecting high transaction load
Scalability	Designed for scaling up vertically by upgrading the custom-built hardware	Designed for scaling out horizontally by adding more database nodes to handle the increased workload
Management	Change management is difficult due to rigid schema	Schema free and change management is easy
Querying	Standard SQL is used to query data	No Standard for querying data
Applications	Suitable for Financial Applications i.e. Banking Transaction require ACID property	Suitable for social media sites and big web applications
Examples	Oracle Database, Microsoft Sql Server, IBM DB2, and PostgresSQL	CouchDB and MongoDB Cassandra and HBase and Redis

Types of keys

A DBMS key is an attribute or a set of attributes which help you uniquely identify a record or a row of data in a relation (table).

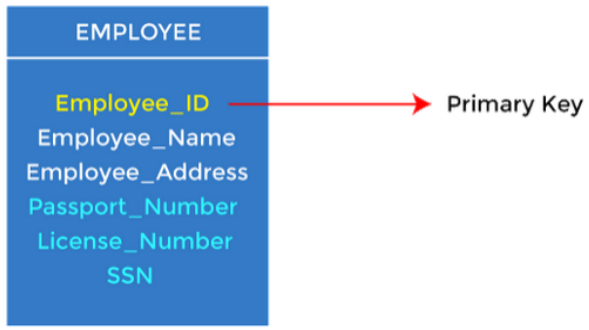
Candidate Key

- In other words, a candidate key is super key without any redundant attribute.
- Except for the primary key, the remaining attributes are considered a candidate key. The candidate keys are as strong as the primary key.



Primary Key

- The candidate key chosen to uniquely identify each row of data in a table.
- No two rows can have the same primary key value, primary key value cannot be NULL and every row must have a primary key

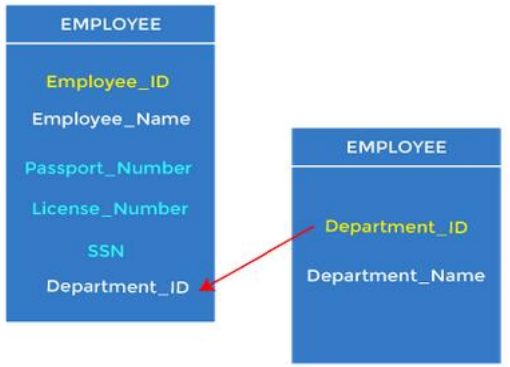


Alternate Key

- The candidate keys that are not selected as primary key are known as alternate keys.

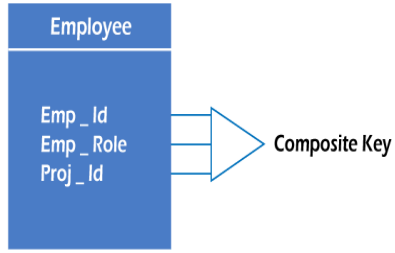
Foreign Key

- A foreign key is an attribute or a set of attributes in a relation whose values match a primary key in another relation.
- Foreign keys are the column of the table used to point to the primary key of another table.



Composite Key

- Whenever a primary key consists of more than one attribute, it known as a composite key



Relationships

- A relationship is a logical connection between different tables.
- It is established by connecting one or more fields of two tables. The fields used to connect two tables normally have same name, data type and size.
- Types of relationships are:

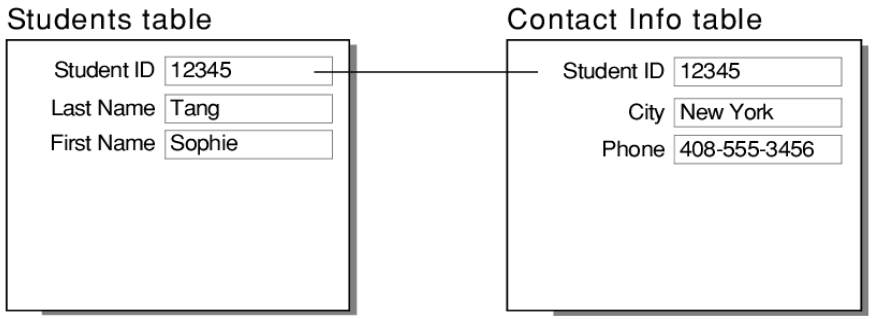
- One-to-One relationship
- One-to-Many relationship
- Many-to-Many relationship

Types of Relationships

One-to-One

- For each record in the first table, there is only one record in the second table

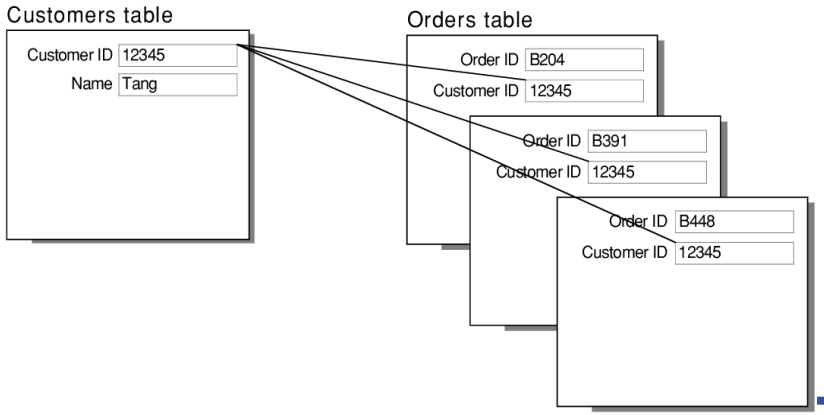
- For each record in the second table, there is only one record in the first table.



One-to-Many

- For each record in the first table, there are one or more records in the second table

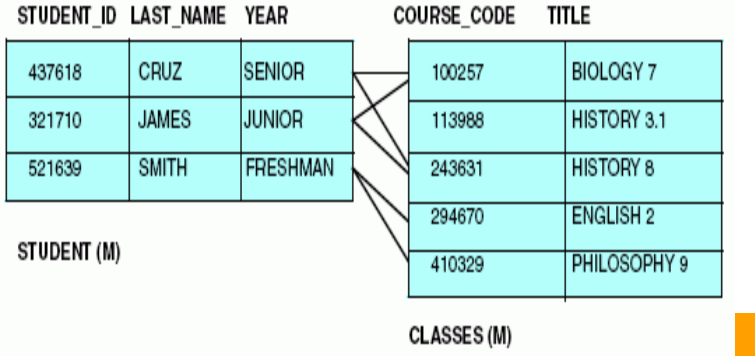
- For each record in the second table, there is only one record in the first table.



Many-to-Many

- For each record in the first table, there are one or more records in the second table

- For each record in the second table, there are one or more records in the first table.



Database Management Systems (DBMS)

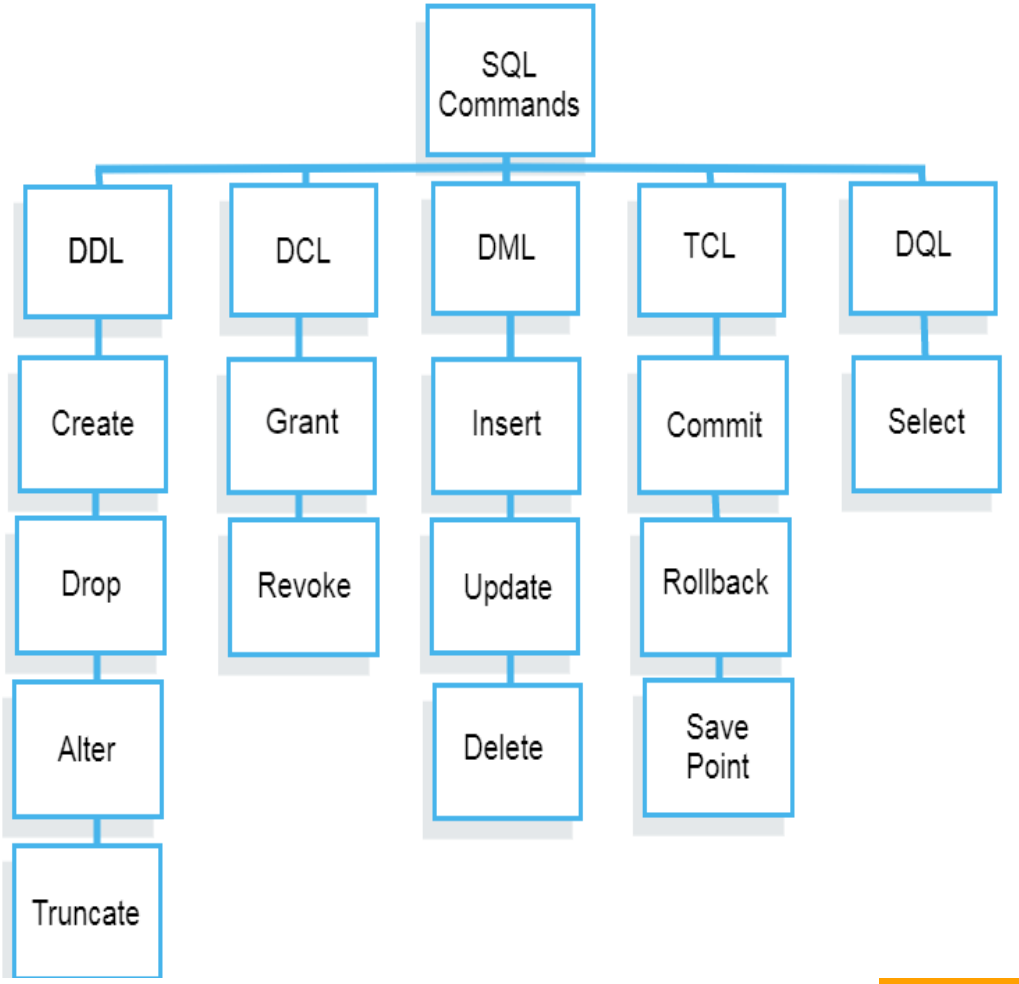
- A special computer software program that helps users create and maintain a database
  - ✓Makes it easy to manage large amounts of information
  - ✓Handles Security
  - ✓Backups
  - ✓Importing/exporting data
  - ✓Concurrency
  - ✓Interacts with software applications
    - Programming Languages
- Four main operations of DBMS are create, read, update and delete
- RDBMS uses SQL queries to access the data in the database.

What is SQL?

- **SQL** is a standardized language used for interacting with RDMS
  - You can use SQL to get the RDMS to do things for you
    - ✓ Create, retrieve, update & delete data
    - ✓ Create & manage databases
    - ✓ Design & create database tables
    - ✓ Perform administrative tasks (user management, security, backup, etc.,)
- SQL is an ANSI (American National Standards Institute) standard
- SQL implementations vary between systems. SQL code used on one RDMS is not always portable to another without modification
- SQL stands for Structured Query language, pronounced as “S-Q-L” or sometimes as “See-Quel”

Types of SQL Statements

- **Data Query Language (DQL)**
  - Used to query the database for information
  - Get information that is already stored there
- **Data Definition Language (DDL)**
  - Used for defining database schemas
- **Data Control Language (DCL)**
  - Used for controlling access to the data in the database
  - User & permissions management
- **Data Manipulation Language (DML)**
  - Used for inserting, updating and deleting data from the database
- **Transaction Control Language**
  - Manage the transactions in the database



Most Popular DBMS

What is MYSQL?

- MySQL is a relational database management system
- MySQL is open-source
- MySQL is free
- MySQL is ideal for both small and large applications
- MySQL is very fast, reliable, scalable, and easy to use
- MySQL is cross-platform
- MySQL is compliant with the ANSI SQL standard
- MySQL was first released in 1995
- MySQL is developed, distributed, and supported by Oracle Corporation
- MySQL is supported on a large number of platforms, including Linux, macOS, Microsoft Windows, etc.,. It also has APIs for large number of languages, including C, C++, Java, .NET, Perl, PHP, Python.

Who use MYSQL?

- Huge websites like Facebook, Twitter, Booking.com, Uber, GitHub, YouTube, etc.
- Content Management Systems like WordPress, Drupal, etc.
- A very large number of web developers around the world

To build a web site that shows data from a database, you will need:

✓ An RDBMS database program (like MySQL)
✓ A server-side scripting language, like PHP
✓ To use SQL to get the data you want
✓ To use HTML / CSS to style the page

Installing MySQL

- **Step 1:** go to https:/ / dev. mysql. com/ downloads/ windows/ installer/
- **Step 2:** After that, you will see two options to Download. If you have internet connectivity then you can go forward and choose the *mysql-installer-web-community,* else you can choose the other one.

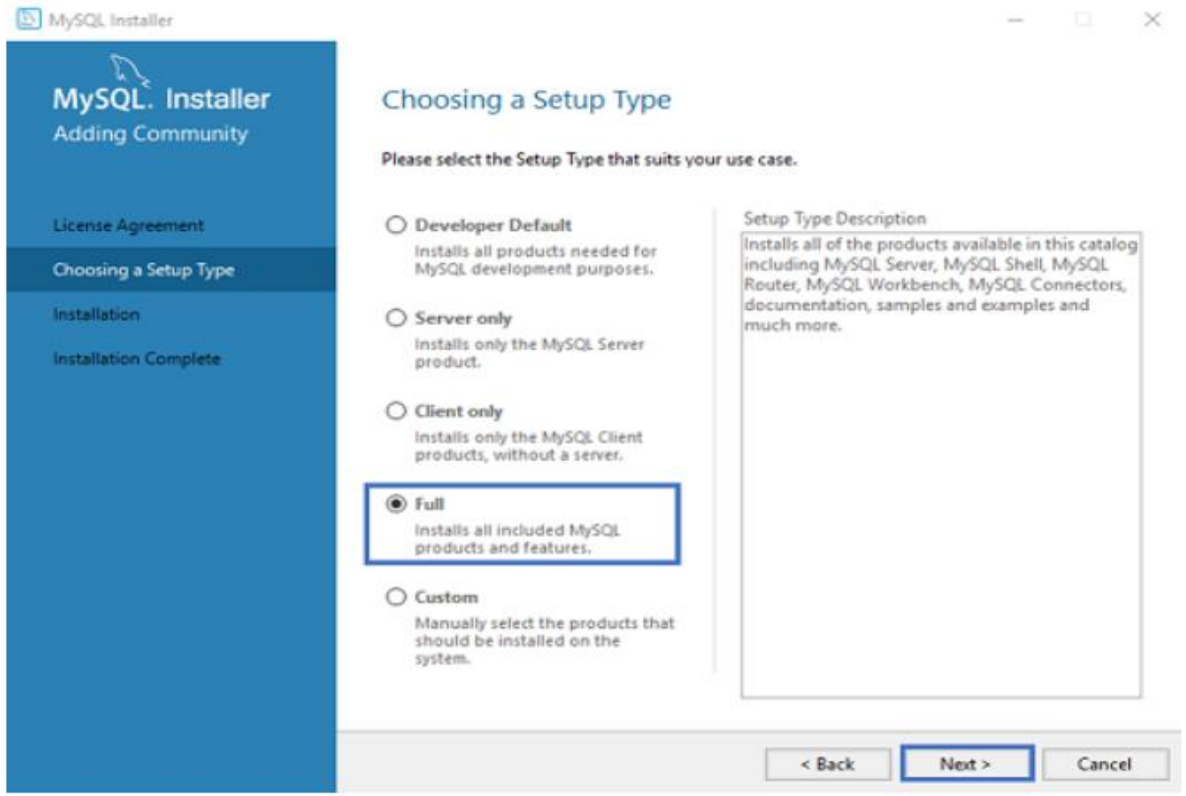
Installing MySQL cont.,

- **Step 3:** Once, you click on Download, you will be redirected to the following page: If you aren't interested in logging in or signing up, choose **No thanks, just start my download**

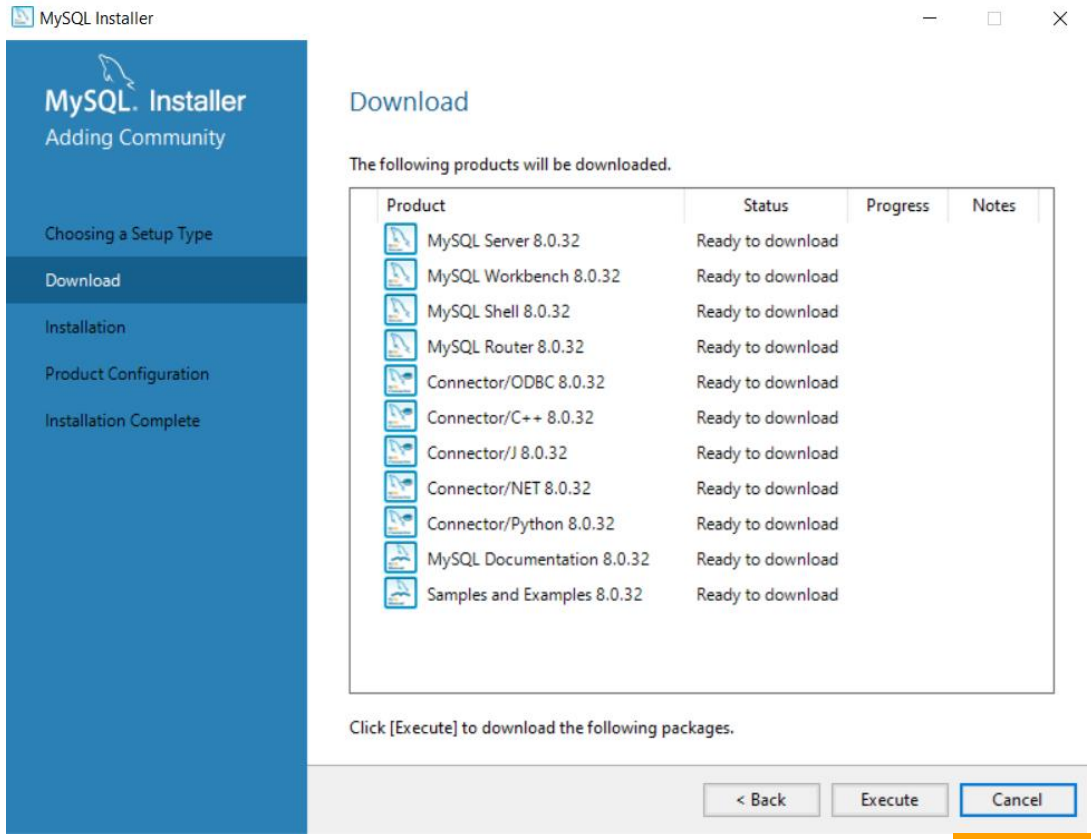
- **Step 4:** Install the file you just downloaded by clicking on it from your browser downloads or by double-clicking on the file in Windows Explorer.

Installing MySQL cont.,

- **Step 5:** In the next wizard, you have to choose the setup type. Here, I will choose the option FULL and click on Next.

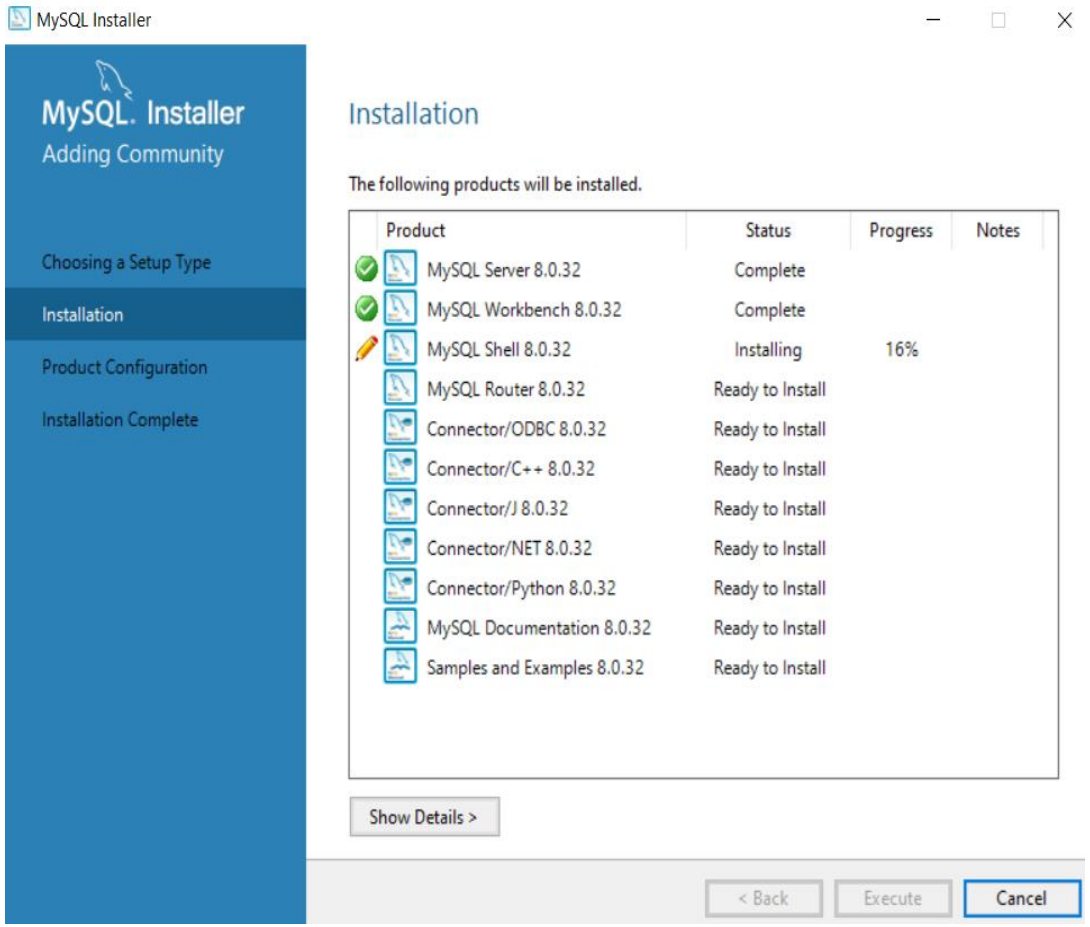


- **Step 6:** The products will be downloaded

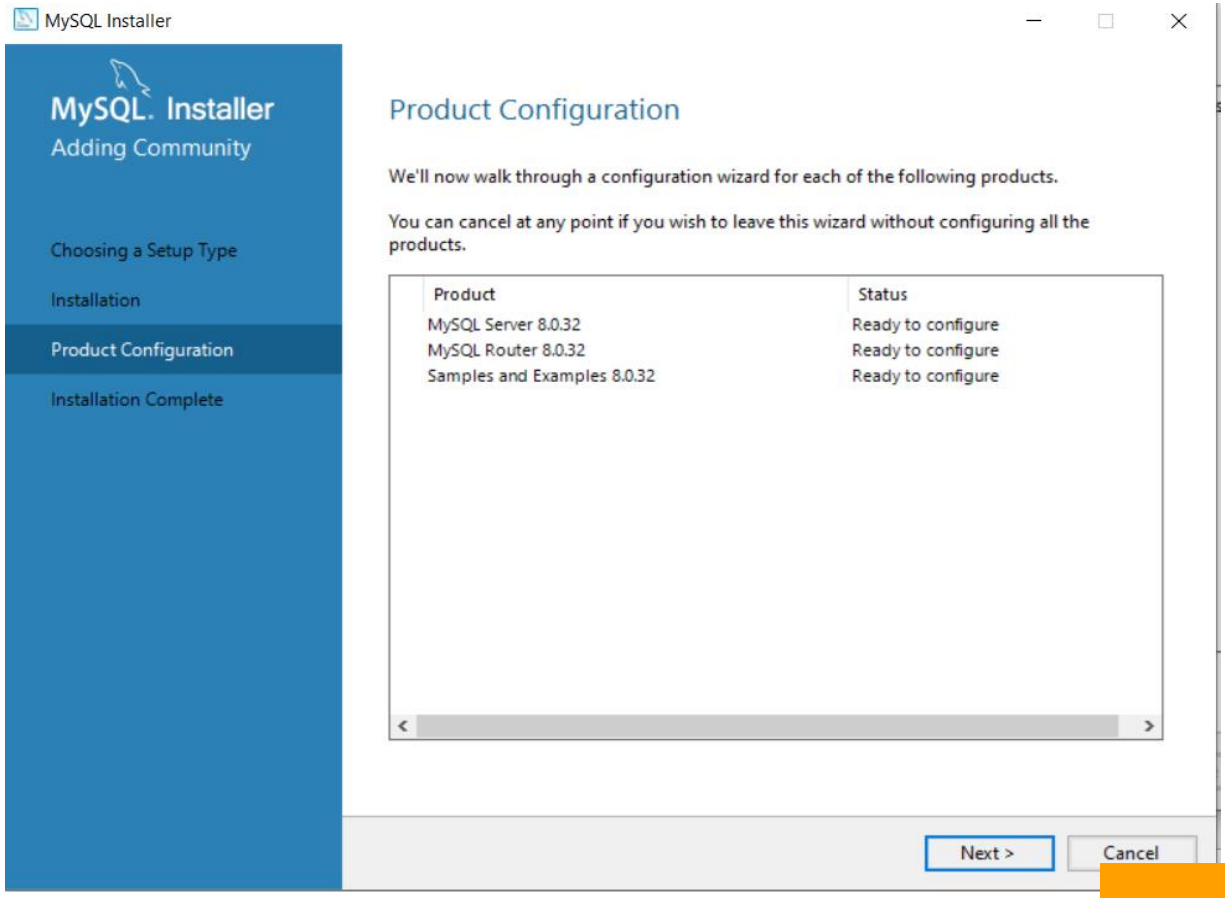


Installing MySQL cont.,

- **Step 7:** The products will be installed.

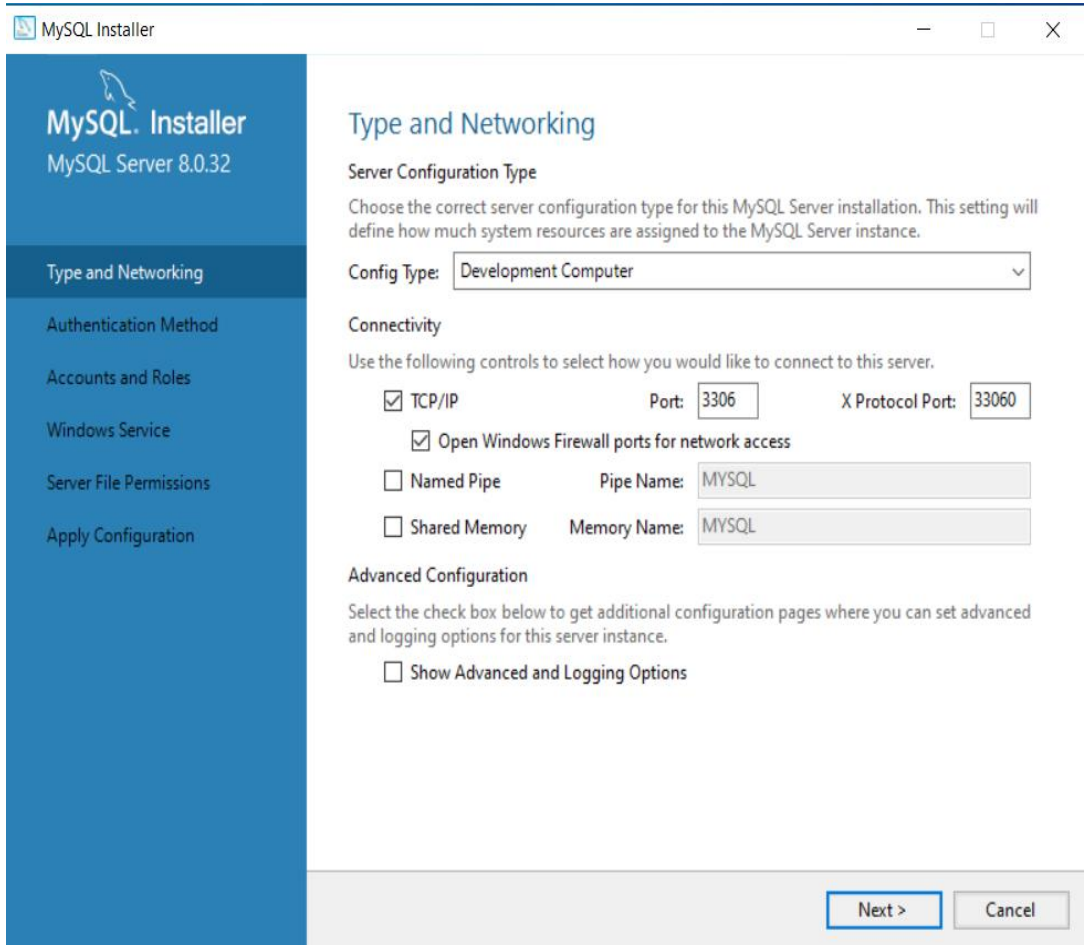


- **Step 8:** The products configuration

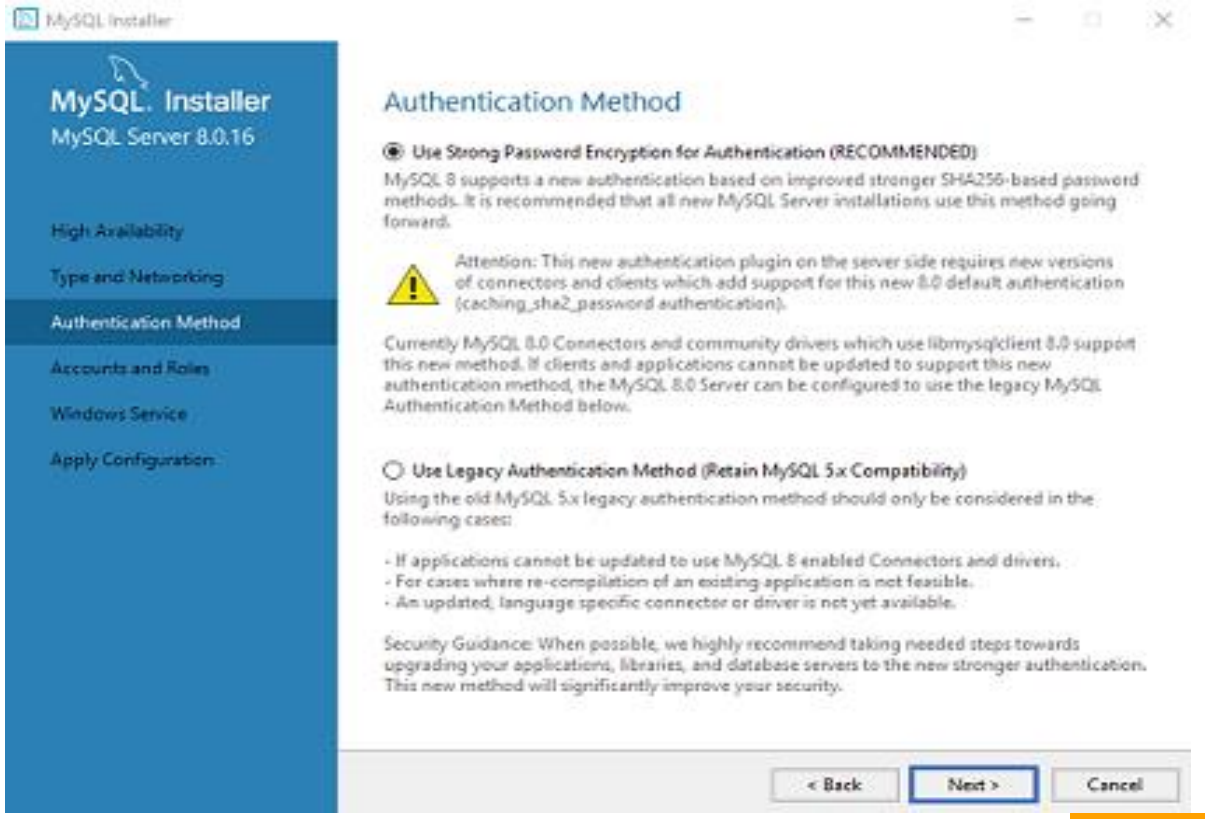


Installing MySQL cont.,

- **Step 9:** Type and networking. Click next

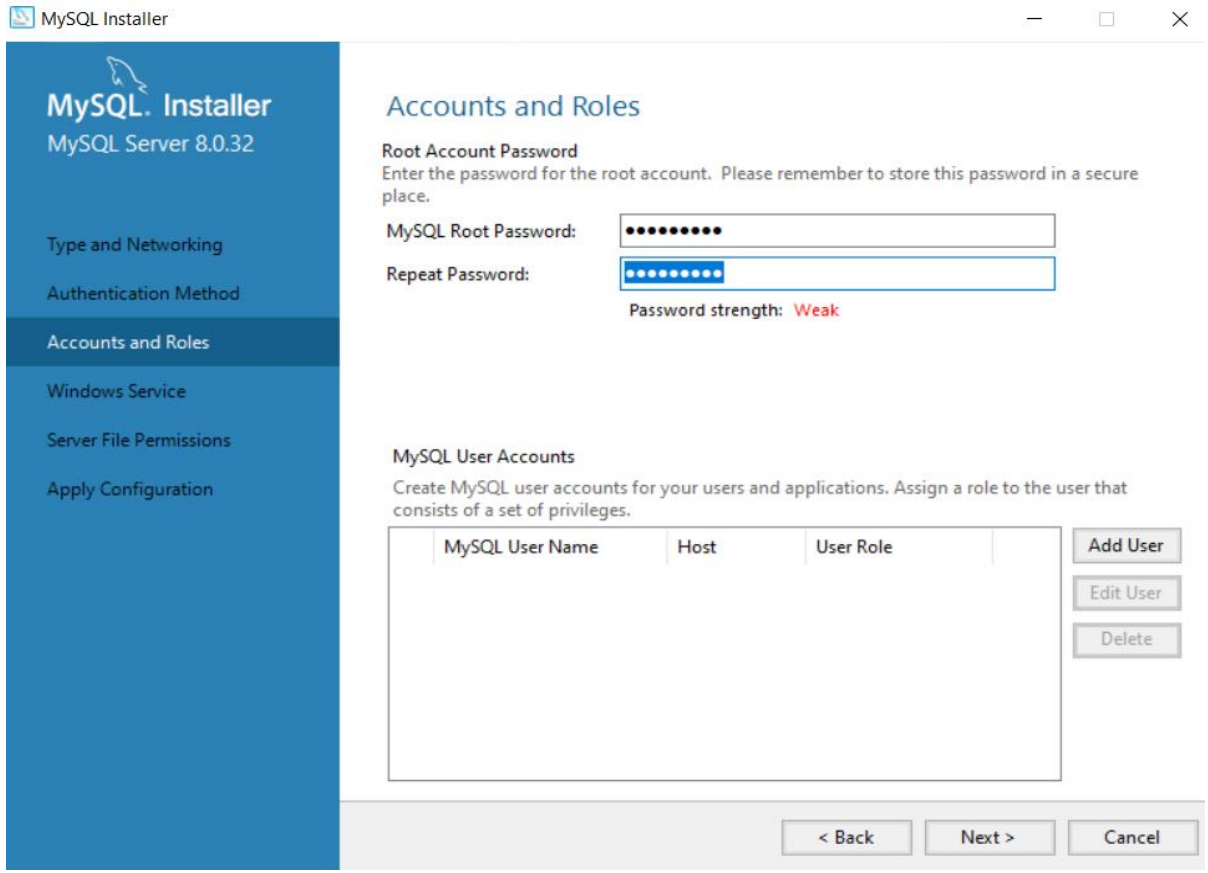


- **Step 10:**Now, you have to choose the authentication method. Here, I will choose the first option and click on **Next**.

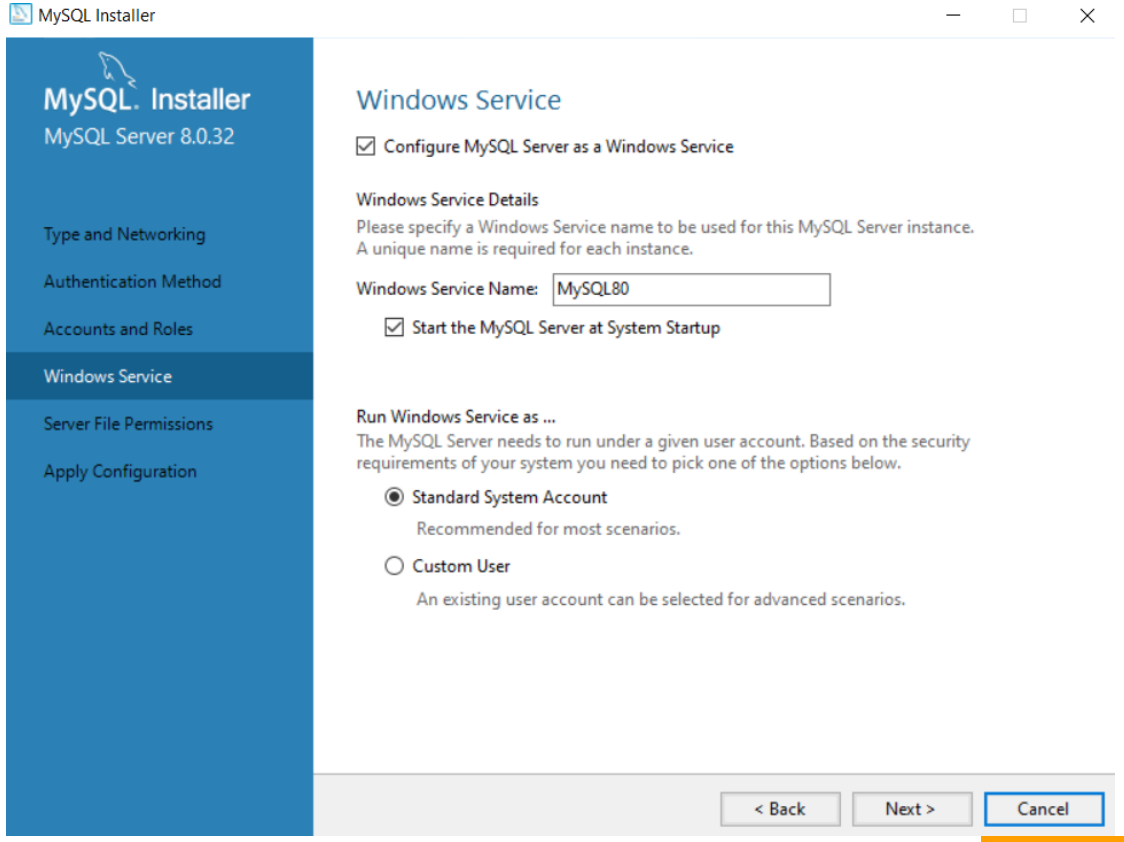


Installing MySQL cont.,

- **Step 11:** Next, you have to mention the MySQL Root Password and again click on **Next.**

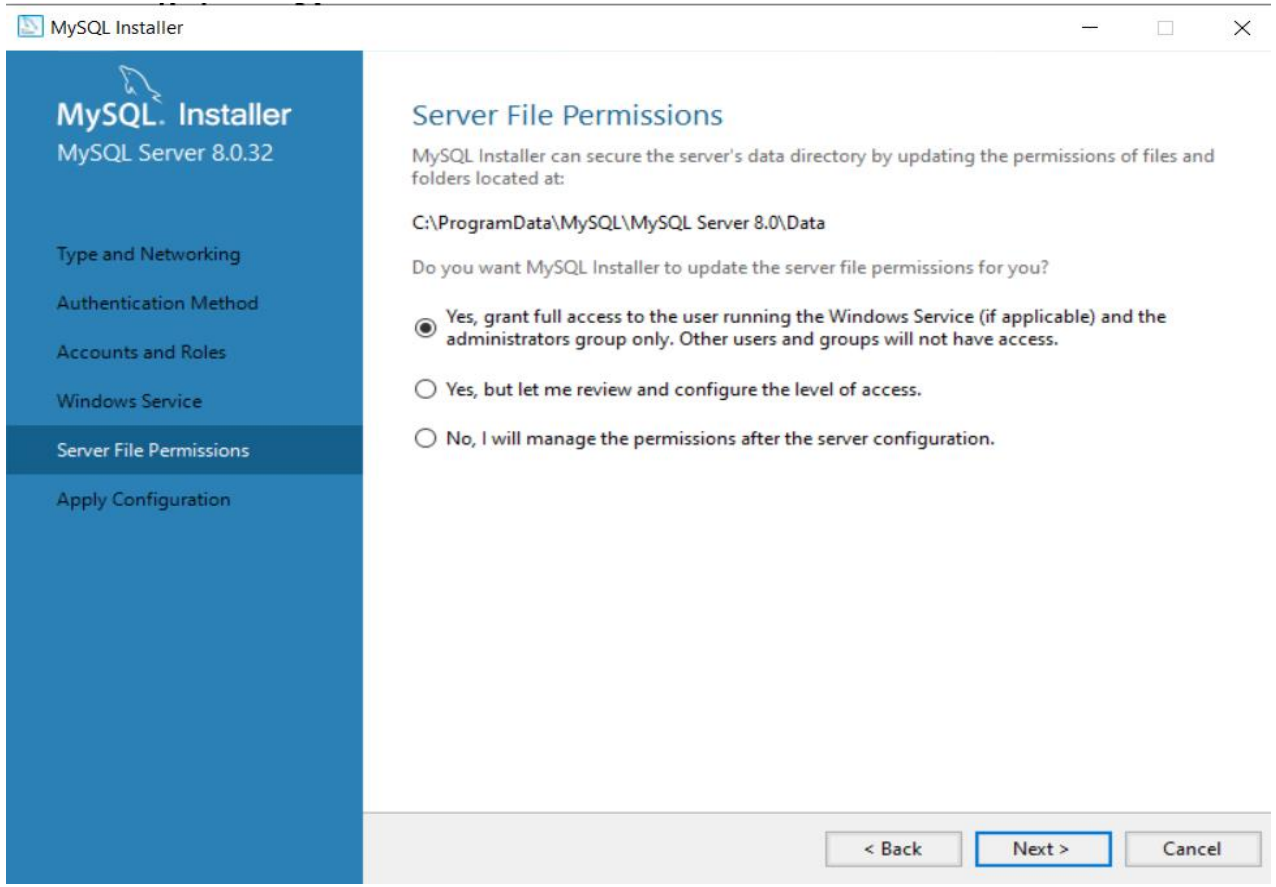


- **Step 12::** Finally, you have to choose whether you want to start the server or not. Then click on **Next**.

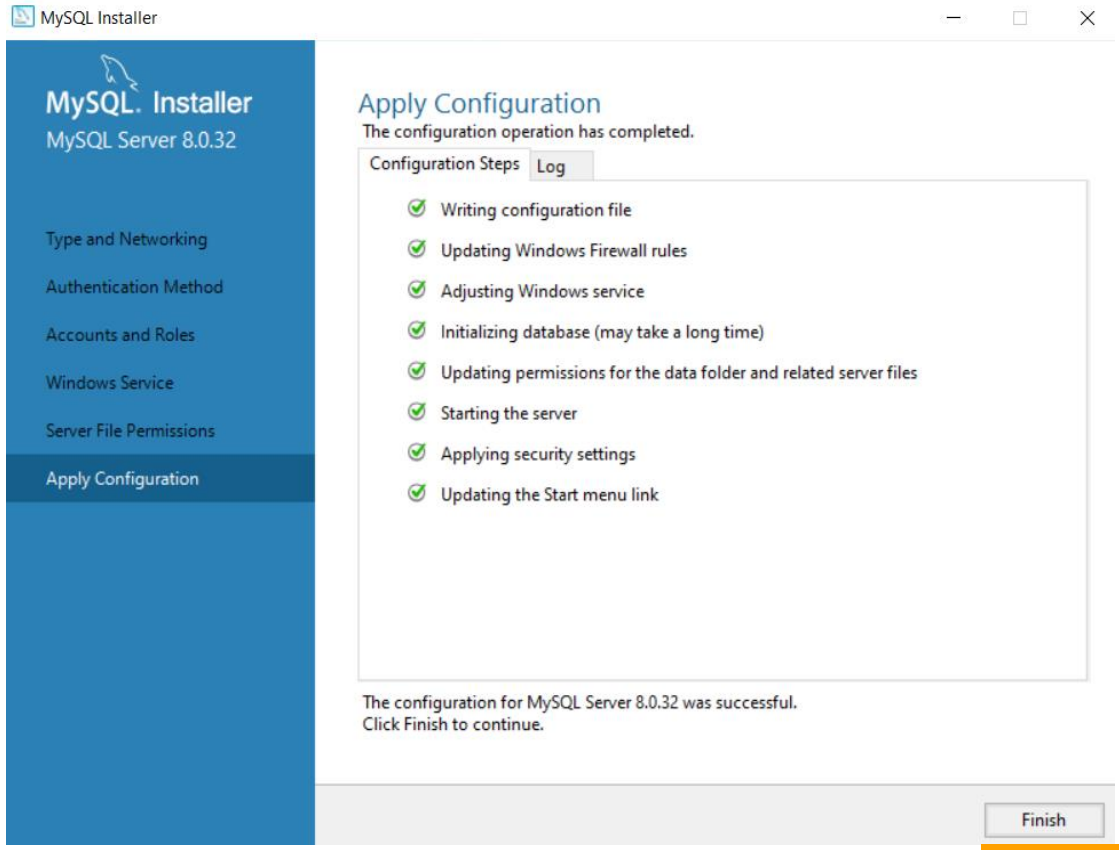


Installing MySQL cont.,

- **Step 13:** Next, you have to choose the server file permissions. Then click on **Next**

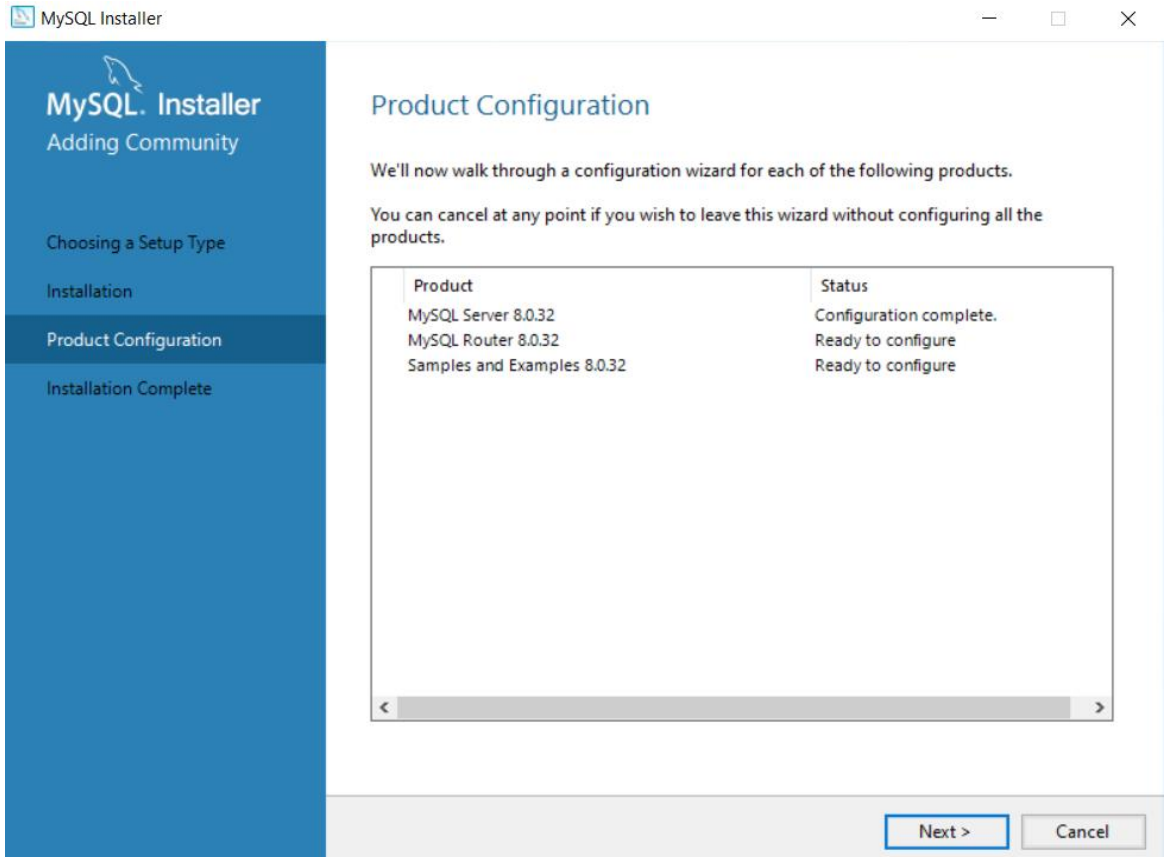


- **Step 14:** Finally, Apply Configuration Then click on **Execute** then Finish

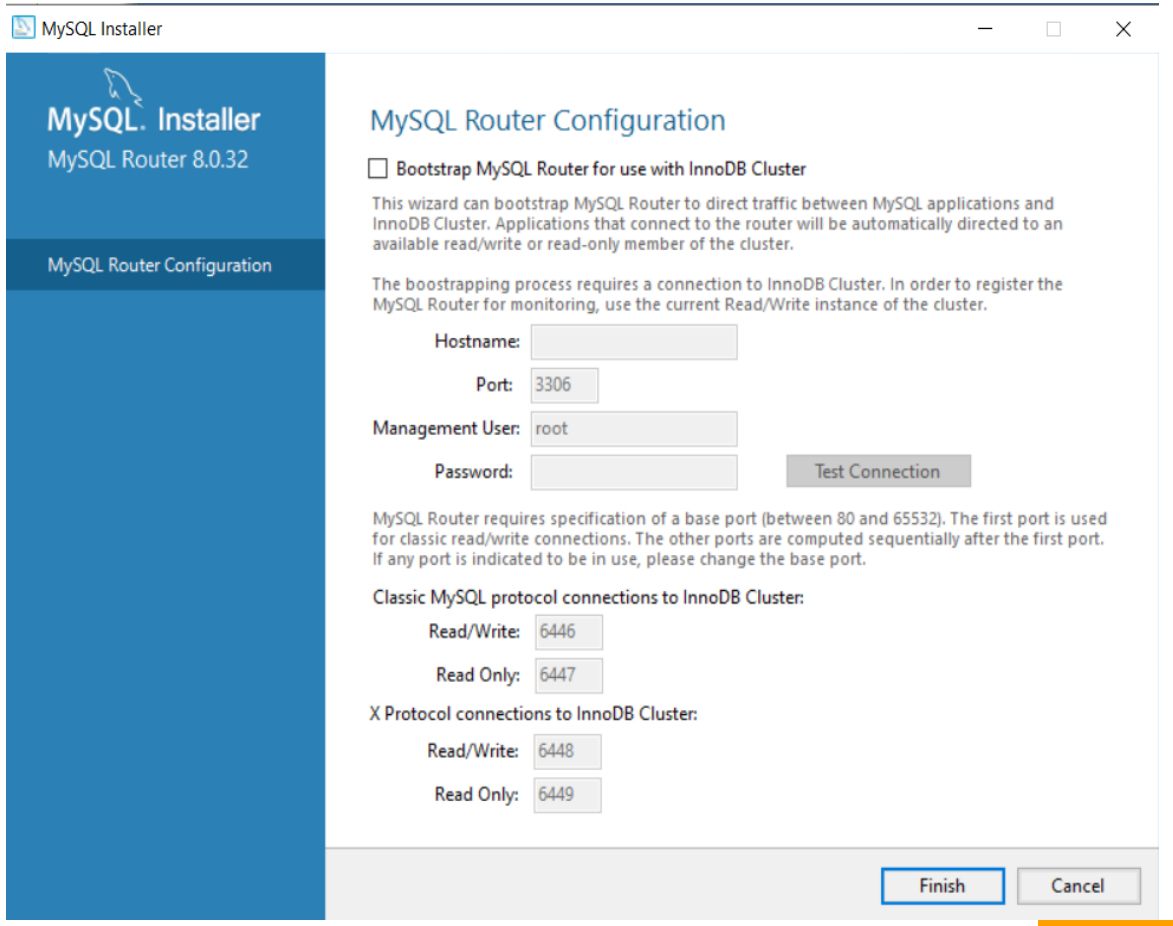


Installing MySQL cont.,

- **Step 15:** Next, you will configure MySQL Router. Click on **Next**

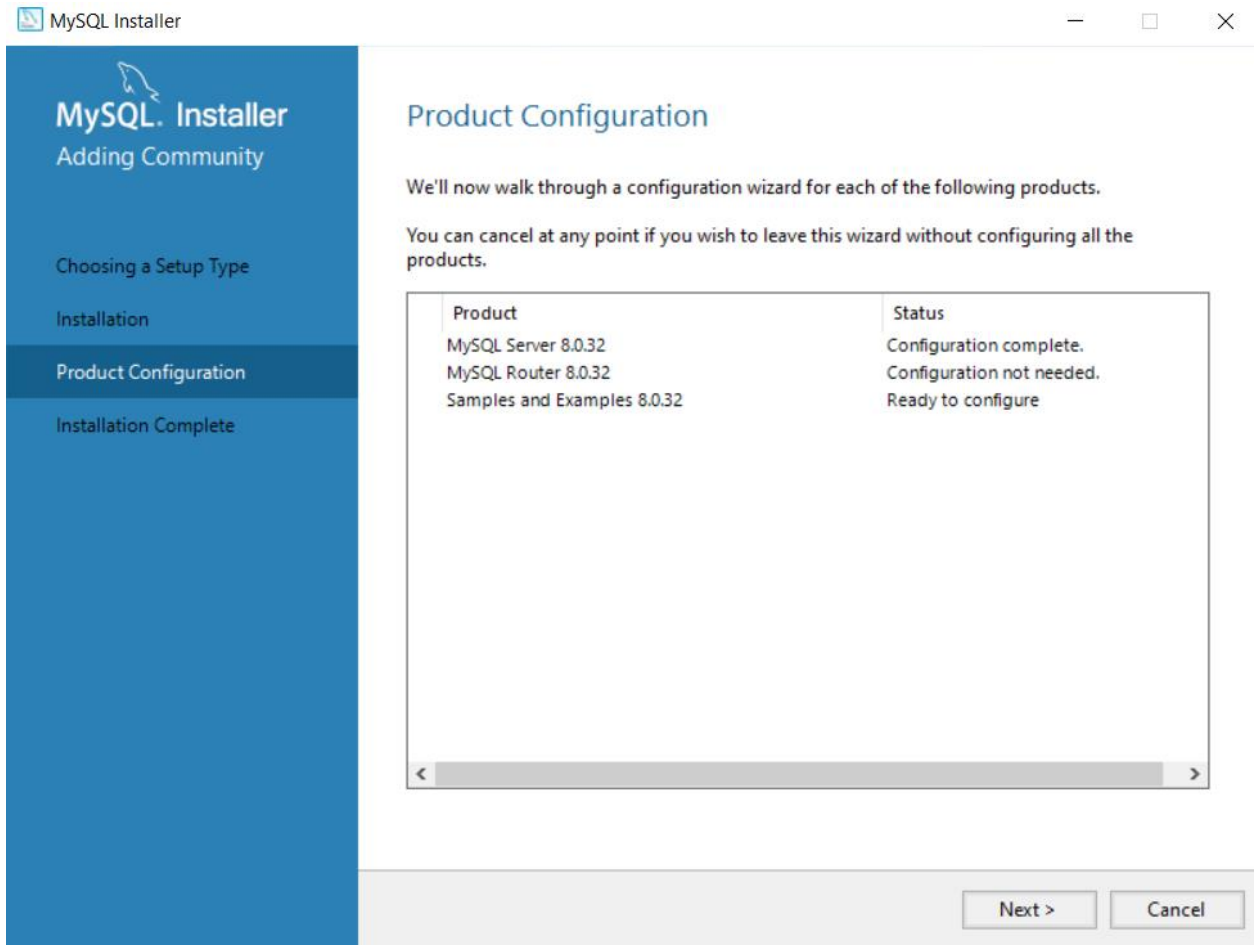


- **Step 16:** Click on Finish

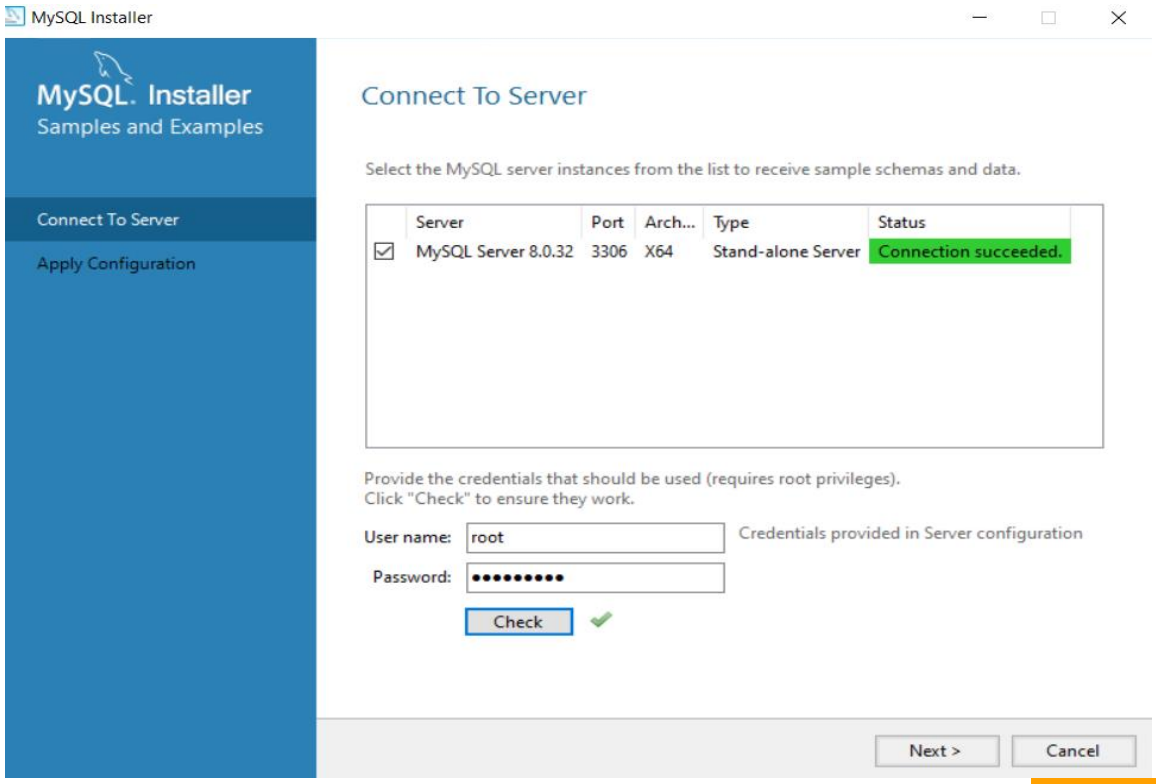


Installing MySQL cont.,

- **Step 17:** Next, you will configure Samples and examples. Click on **Next**

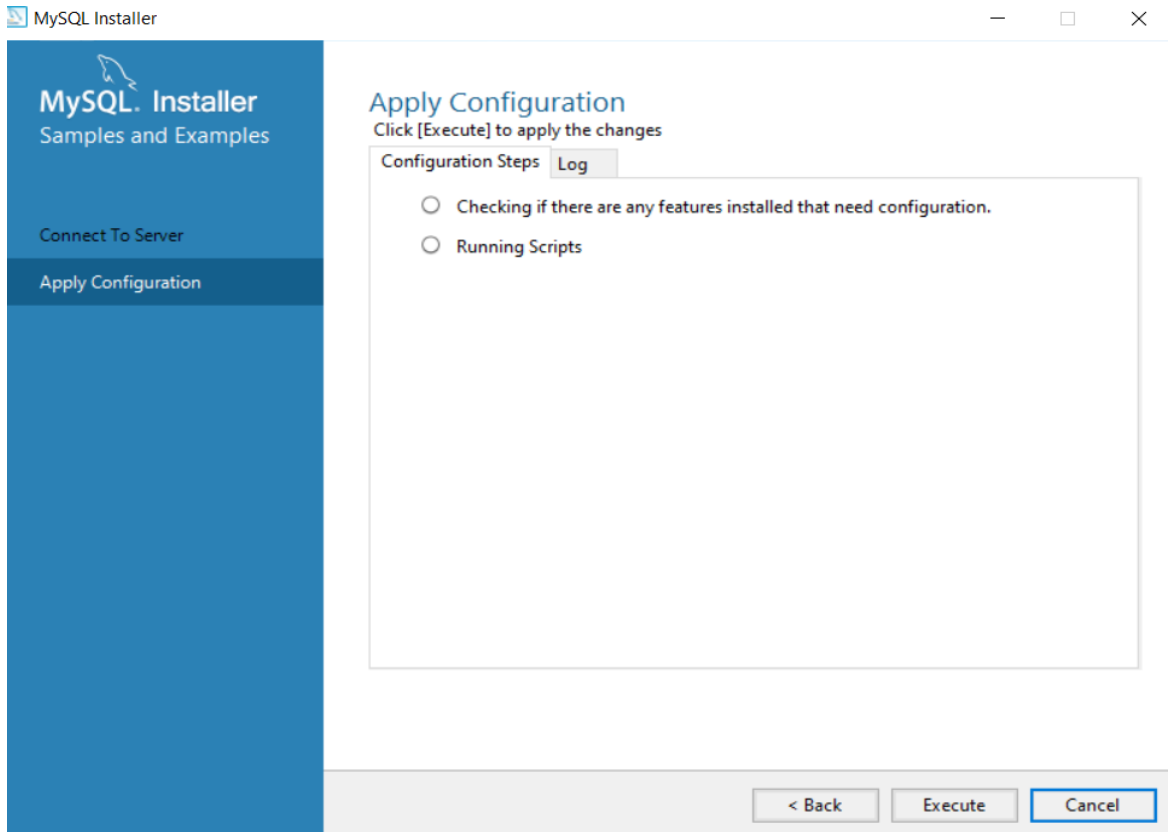


- **Step 18:** you will see the following wizard, to **Connect to server**. Here mention the root password, which you had set in the previous steps

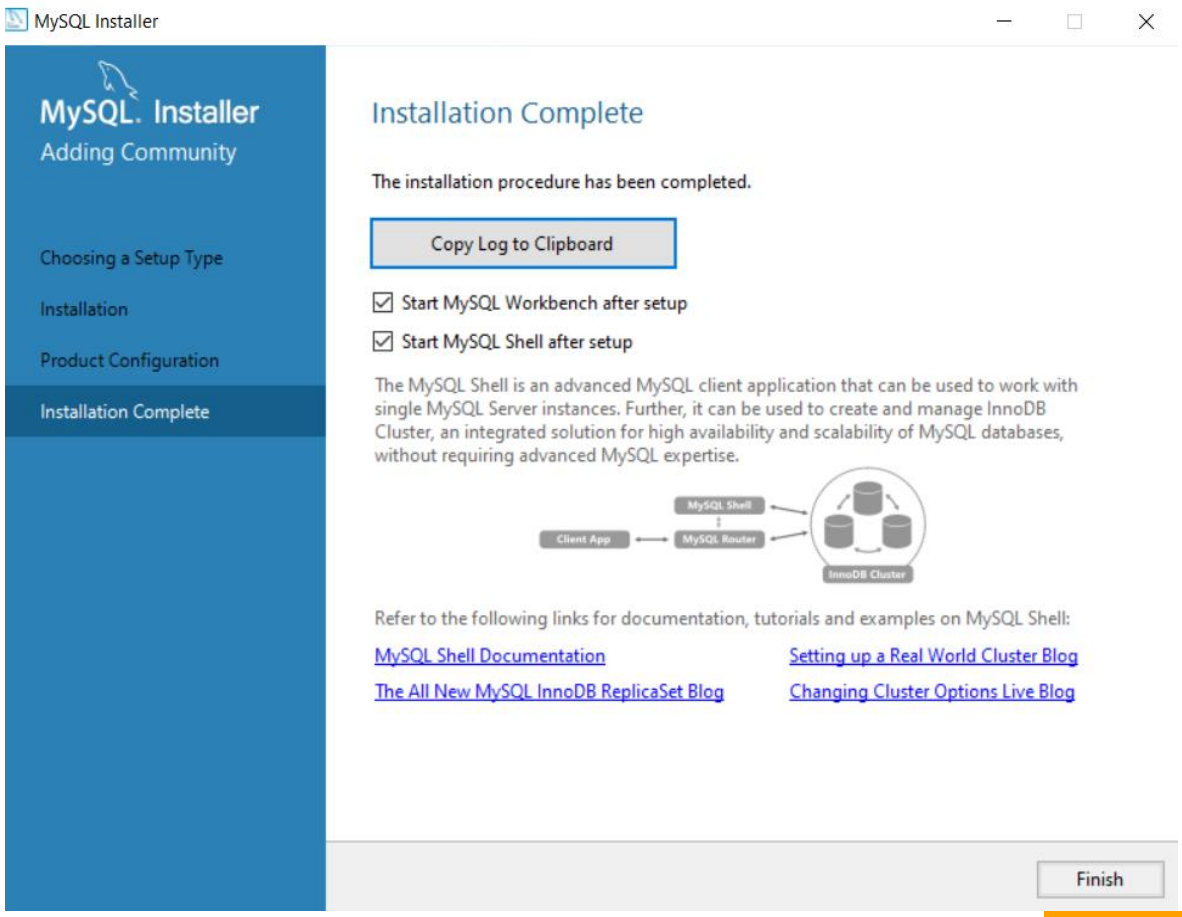


Installing MySQL cont.,

- **Step 19:** Once, you click on **Next**, choose the configurations applied and click on **Execute. Then click on finish**

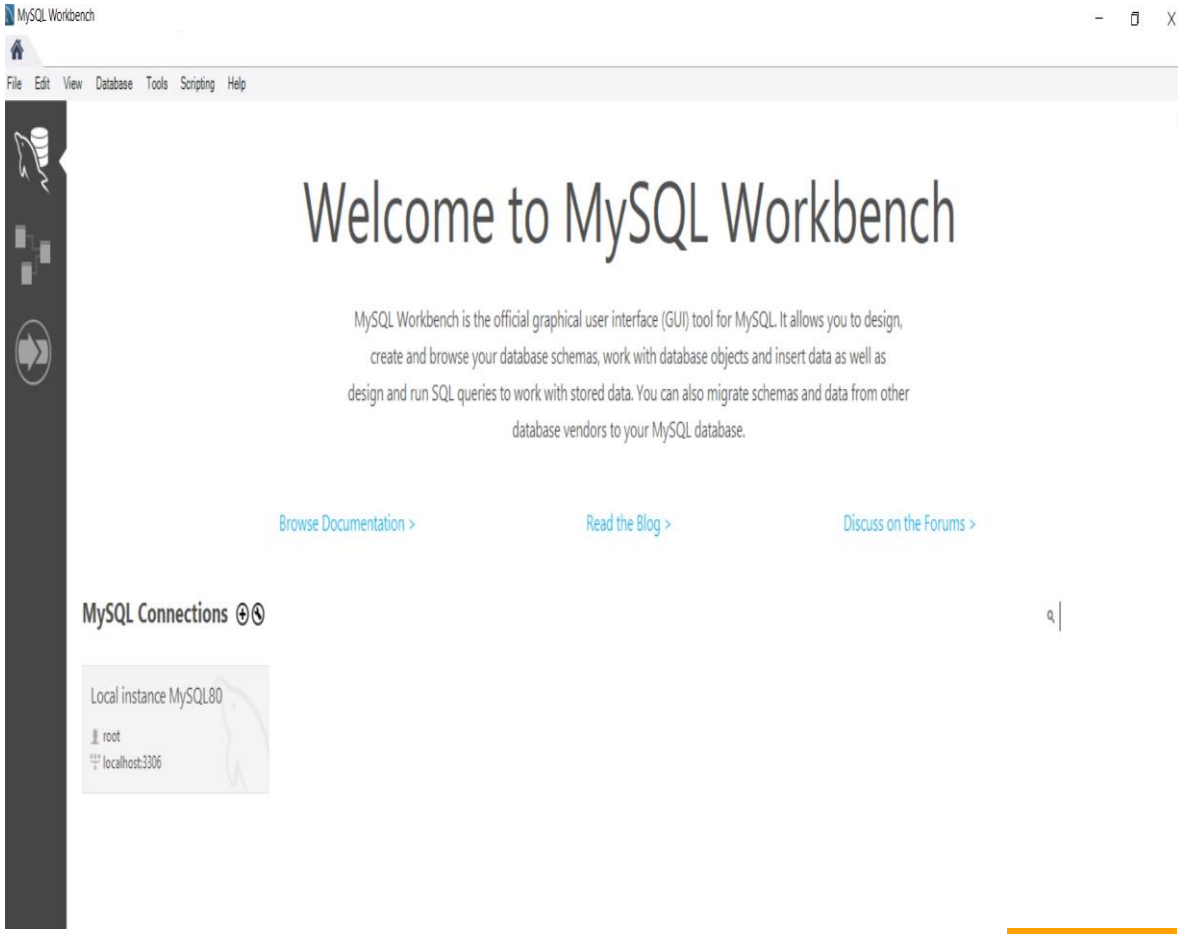


- **Step 20:** Installation complete. Click finish

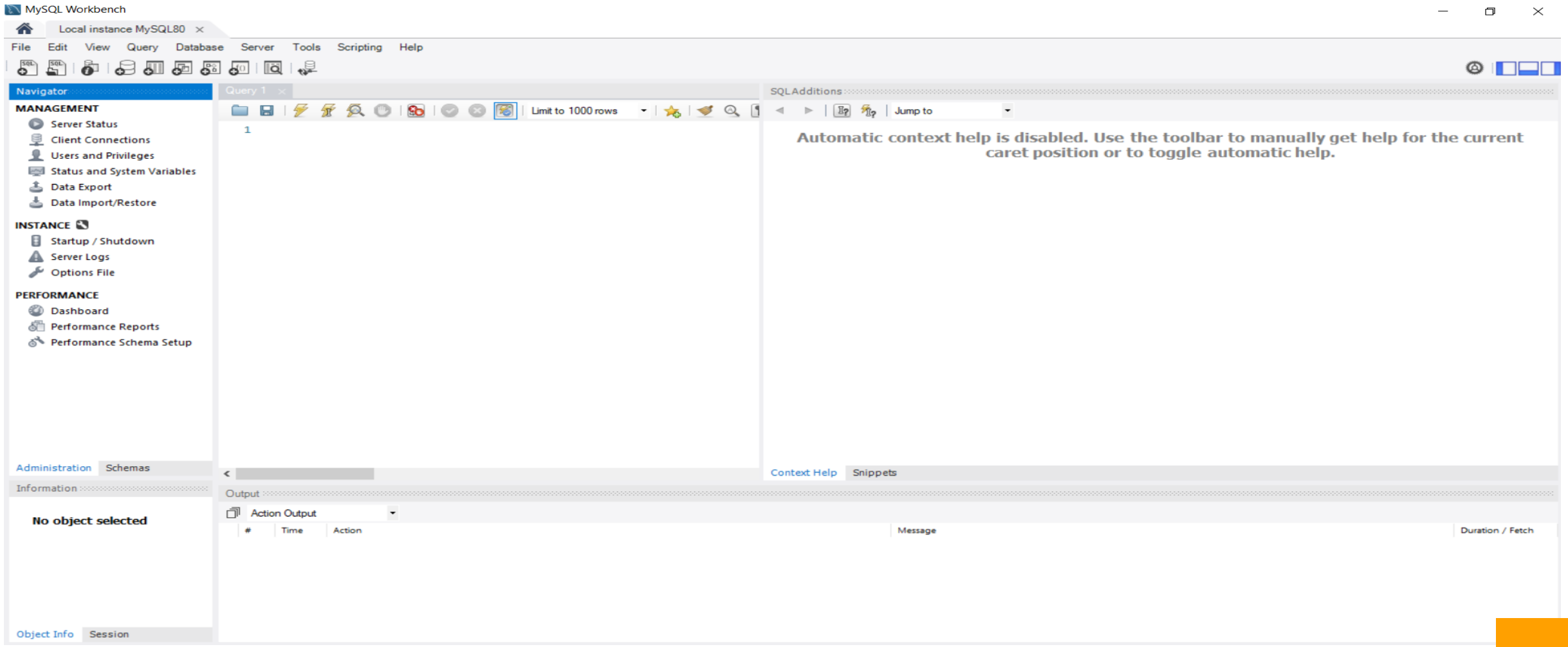


Installing MySQL cont.,

- **Step 21:** Start MySQL Shell and MySQL Workbench



Installing MySQL cont.,



Thank you