

COMPUTER ORGANIZATION AND ARCHITECTURE

Lecture 7

Introduction to SQL

Dr Victoria Mukami

INTRODUCTION

During the last couple of lectures, we have done a thorough introduction to databases. The lectures have all been aimed coming up with a database and more specifically, a well-designed database. Lecture five focused on the entity relationship modelling while lecture 6 focused on normalization. These two lectures were the preamble for the development phase. The two focused on the design phase whereas the next lectures will focus on the implementation to maintenance phase of the database development lifecycle. This lecture is a focus on the Structured Query Language (SQL). Specifically, during this lecture, we will focus on a bit of the history of SQL while outlining the importance of SQL in database creation. We will additionally learn about data definition languages (DDL) and data manipulation languages (DML). Finally, we will go ahead and learn the SQL syntax while outlining the various rules.

Learning objectives

By the end of this topic, you should be able to:

1. Understand the importance of the Structured Query Language (SQL)
2. Outline the difference between Data Definition Languages (DDL) and Data Manipulation Languages (DML)
3. Understand the syntax of the SQL language

OVERVIEW

So far, we have worked on understanding databases and the inner workings of the database through the various life cycle phases. What we have not yet done is the creation of the database itself. Once an organization has been able to design how their database will look like, it is then time to create the database and insert the organizations data. This is mainly done by a database administrator who is also in charge of the maintenance of the database. SQL is used to create a database, insert records, and even query the records. Before we get ahead of ourselves let us review what SQL is, what the use of SQL is and a bit of the history.

INTRODUCTION TO SQL

SQL stands for Structured Query language. SQL was developed because of the relational model development in the 70s'. SQL was not always known as SQL but as SEQUEL which stood for Structured English Query Language. A revised version of SEQUEL by IBM in 1974 led to the development of SQL [2] and led to numerous other

extensions by other companies. An extension is a feature or features that are provided on top of the existing standard by other vendors [2].

Why is SQL important? Well for one, SQL is widely accepted as a standard database language [2]. There has been great progress in the development of SQL, and this has led to wide acceptance and the normal standard used in databases. Second, SQL is a very easy language to learn. Third, SQL helps to describe structured data while allowing users to secure the database using permissions. There are several advantages of with using SQL.

- No programming knowledge is needed
- It provides high-speed processing of queries
- It is a standardized language that works on any platform
- It is a portable language that can be used on any device
- It allows for multiple views of the database to various users

Some disadvantages of SQL include:

- Some platforms and versions of SQL are costly
- Some companies have created versions of SQL that are proprietary. This means that users get locked into the company
- Finally, some platforms are complex making it difficult for novice users.

There are several objectives that a database language should allow a user to do. First, it should allow a user to create the database and relation structures [2]. Second, it should perform basic data management tasks such as insertion, manipulation, modification, and deletion of data [2]. Third, the language should allow for simple and complex queries [2]. In addition, a database language should be relatively easy to learn. SQL as a database language satisfies all the requirements.

There are four main categories where SQL fits. These are explained below:

Data Manipulation Language

Data Manipulation Language (DML) allows for various manipulation commands. SQL includes commands such as INSERT, UPDATE, DELETE and RETRIEVE within a database [1]. The SQL statements that are considered as data manipulation include SELECT, INSERT, UPDATE and DELETE commands.

Data Definition Language

Data Definition Language (DDL) are commands that are used to define the structure of the database. SQL includes commands to create database objects such as tables, indexes, and views [1]. The SQL commands that are used during data definition include CREATE, ALTER, and DROP.

Transaction Control Language

The Transaction Control Language (TCL) are commands that are executed within a transaction [1]. We will not review TCL during this series of lectures as it is an introduction to databases.

Data Control Language

The Data Control Language (DCL) are commands used to control access to data objects, such as giving users permission to objects [1].

SQL SYNTAX

SQL is a language that is easy to learn as its vocabulary is less than 100 words. SQL is also known as a procedural language. A procedural language is one where the user commands what is to be done and does not care on how it will be done [1]. The following is an example of an SQL statement.

```
SELECT * FROM teachers;
```

The statement has two keywords, SELECT and FROM. SQL is not case sensitive where SELECT and select can be used interchangeably. However, for this unit we will use all capital letters for SQL reserved keywords to differentiate them from user-defined names.

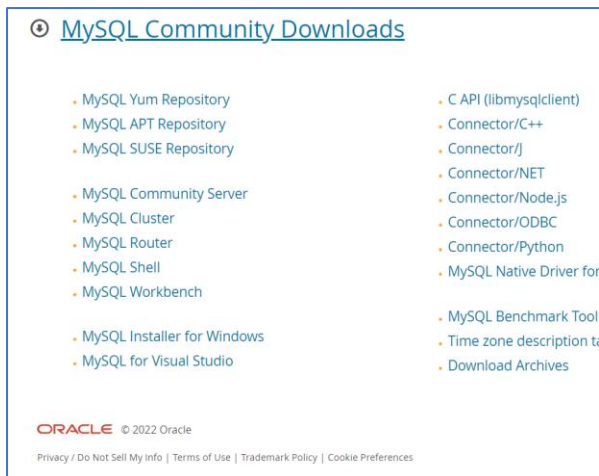
A semicolon is used at the end of every statement. Some databases do not require a semicolon at the end of each statement. For this unit we will use semicolons at the end of our SQL statements. We will officially begin learning SQL statements from the next lecture.

SQL INSTALLATION

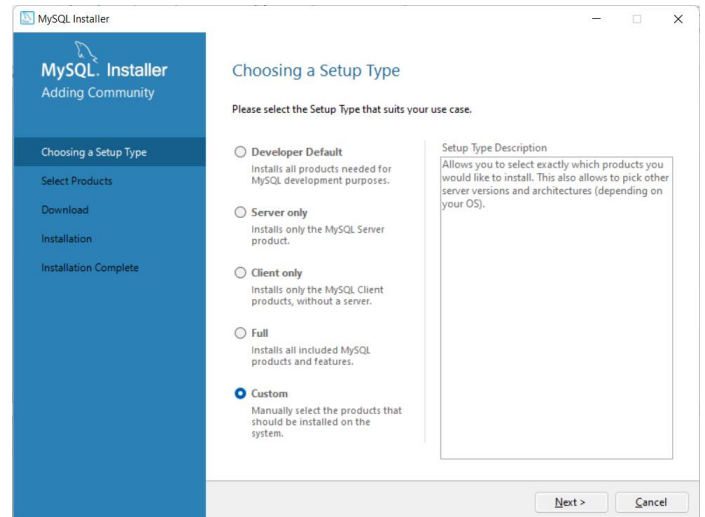
There are many versions of SQL that one can use when creating and developing a database. Examples include SQL Server, SQL Lite, MySQL Workbench, phpMyAdmin

and many others. For this lecture, we will focus on MySQL Workbench and on this section, we will learn how to install the software.

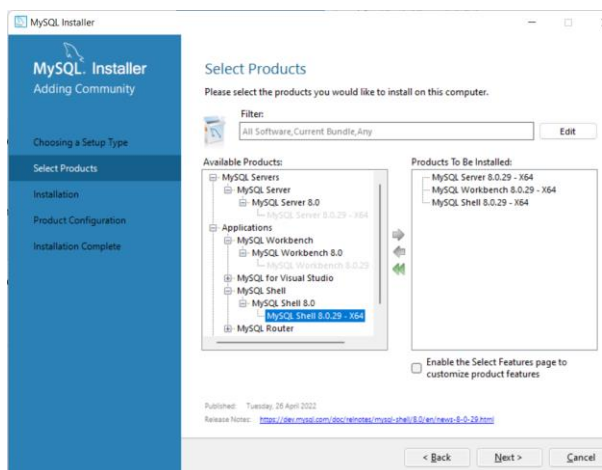
The first step is to visit the MySQL Workbench by Oracle website [HERE](#) and download the MySQL installer for Windows.



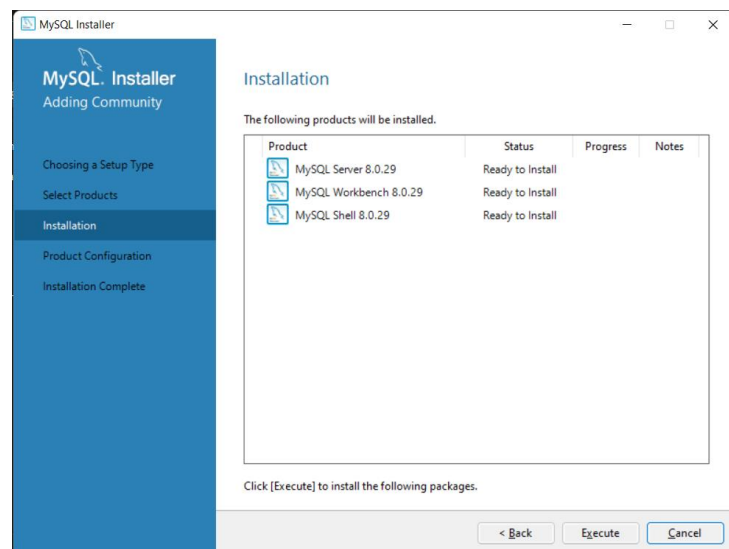
Once the download is done, we will go ahead and open it from the downloads folder and run it. We will then select a custom installation.



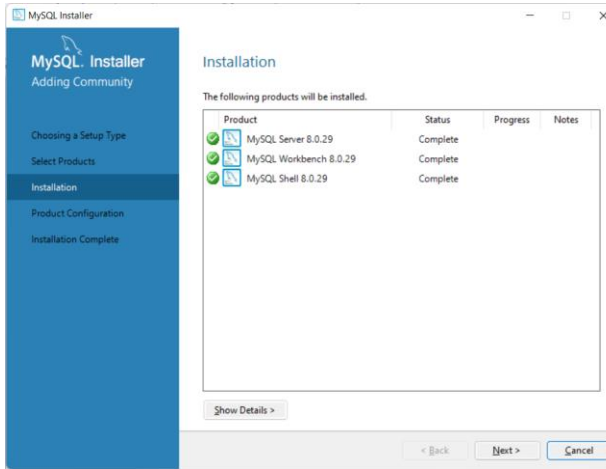
On the next screen we will select the MySQL server, MySQL Workbench, and MySQL shell that we will install.



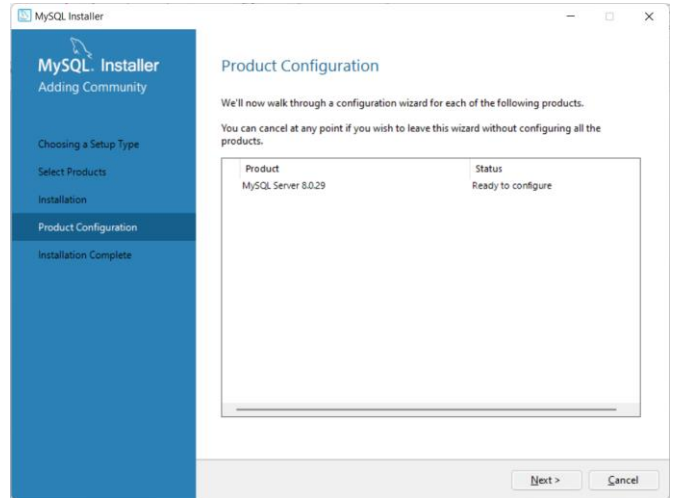
Click execute to install.



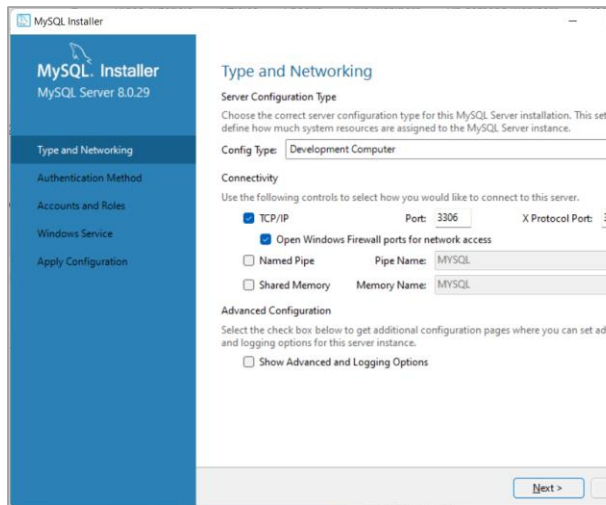
Once it executes the status will change to completed.



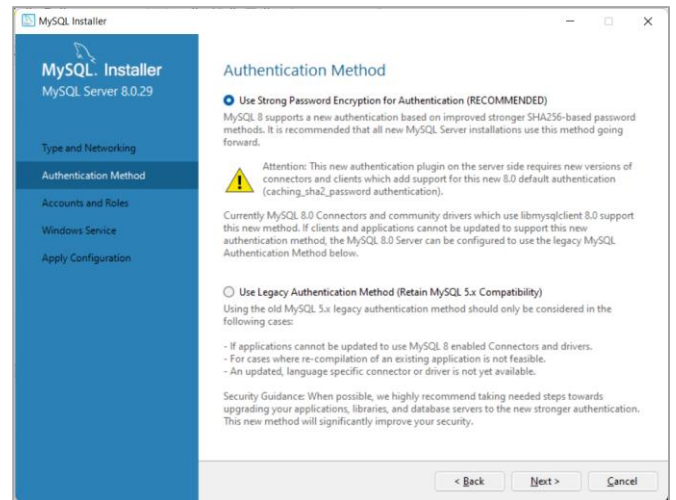
Once it is executed you will click next.



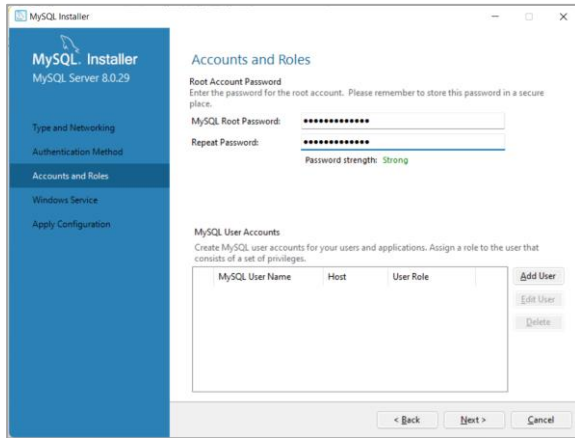
Leave the defaults and click next.



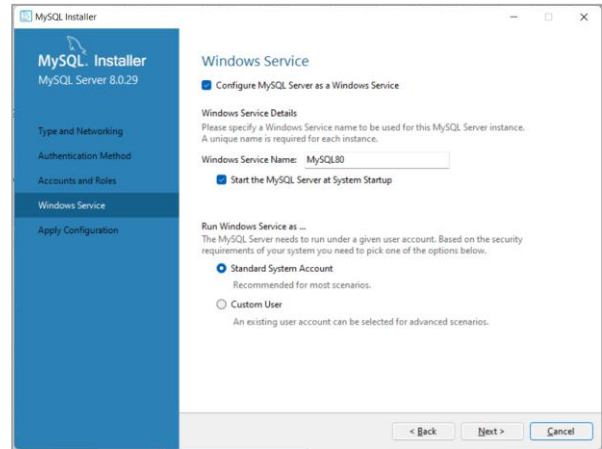
Select Use Strong Password Encryption for Authentication (RECOMMENDED)



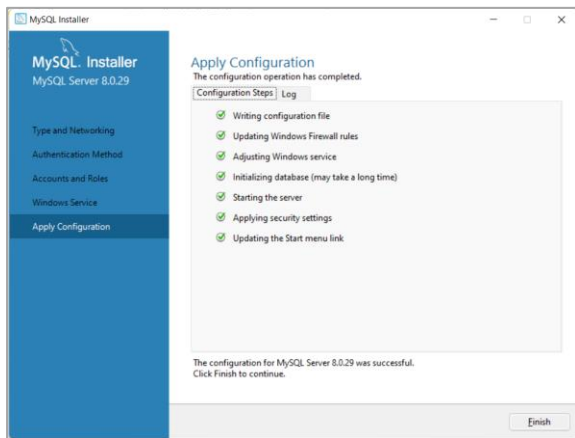
Type in your MySQL root password and click next



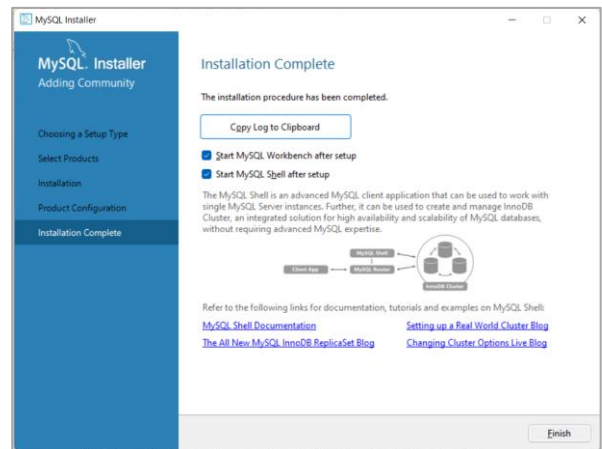
Leave the default settings and click next



Click Execute then Finish.

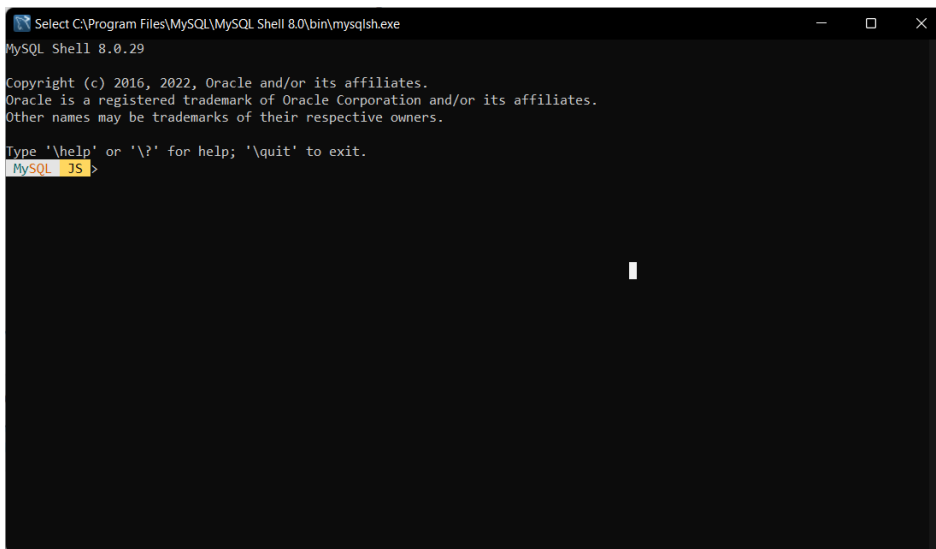
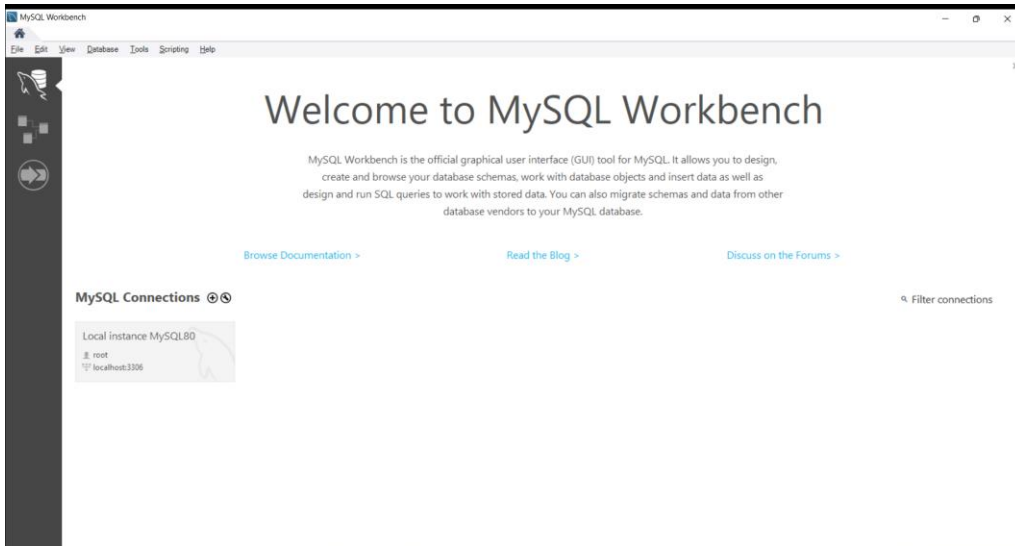


Click Next on Product configuration then Click Finish on Installation Complete screen.

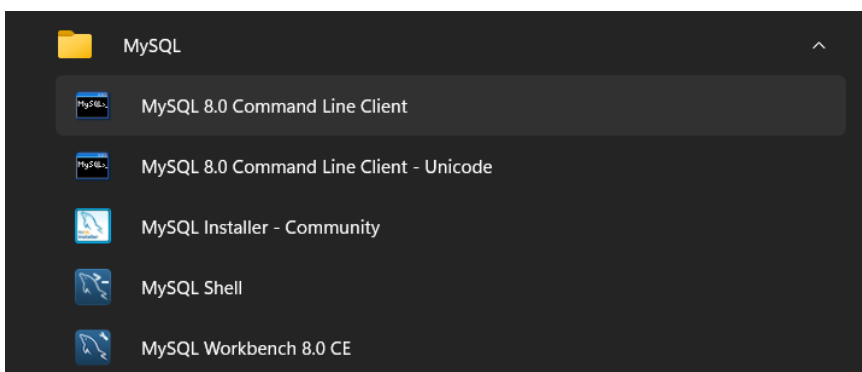


USING MYSQL COMMAND LINE

When you complete the installation, the MySQL workbench and MySQL Shell will open.



For this unit we will be running our code from MySQL 8.0 Command Line. To access, you click on the MySQL folder from the start menu and select MySQL 8.0 Command Line Client as shown below.



Once open the screen will request for the root password. For this class, we will create our databases directly on root. We will focus on creating other users during the database administration unit.

SUMMARY

Throughout this lecture, we have introduced SQL. We first started by defining the term SQL, and then going through the history of SQL. We listed some advantages and disadvantages of SQL before we reviewed the general syntax of SQL. Finally, we reviewed how to install and use MySQL Workbench on a windows computer. Next lesson we will begin with the data definition language commands.

DISCUSSION TOPIC

This lecture will not have a discussion topic, however, each student will be required to install MySQL Workbench on their computers in readiness for the next lecture on SQL where we will be writing queries.

REFERENCES

- [1] Database systems: design, implementation, and management, Coronel, C., & Morris, S, Cengage Learning, 2019.
- [2] Database Systems: A Practical Approach to Design, Implementation, and Management, Connolly, T., & Begg, C., Pearson, 2015.
- [3] Fundamentals of database systems, Elmasri, R., & Navathe, S. B., Pearson Education Limited, 2016.