Experiment 1

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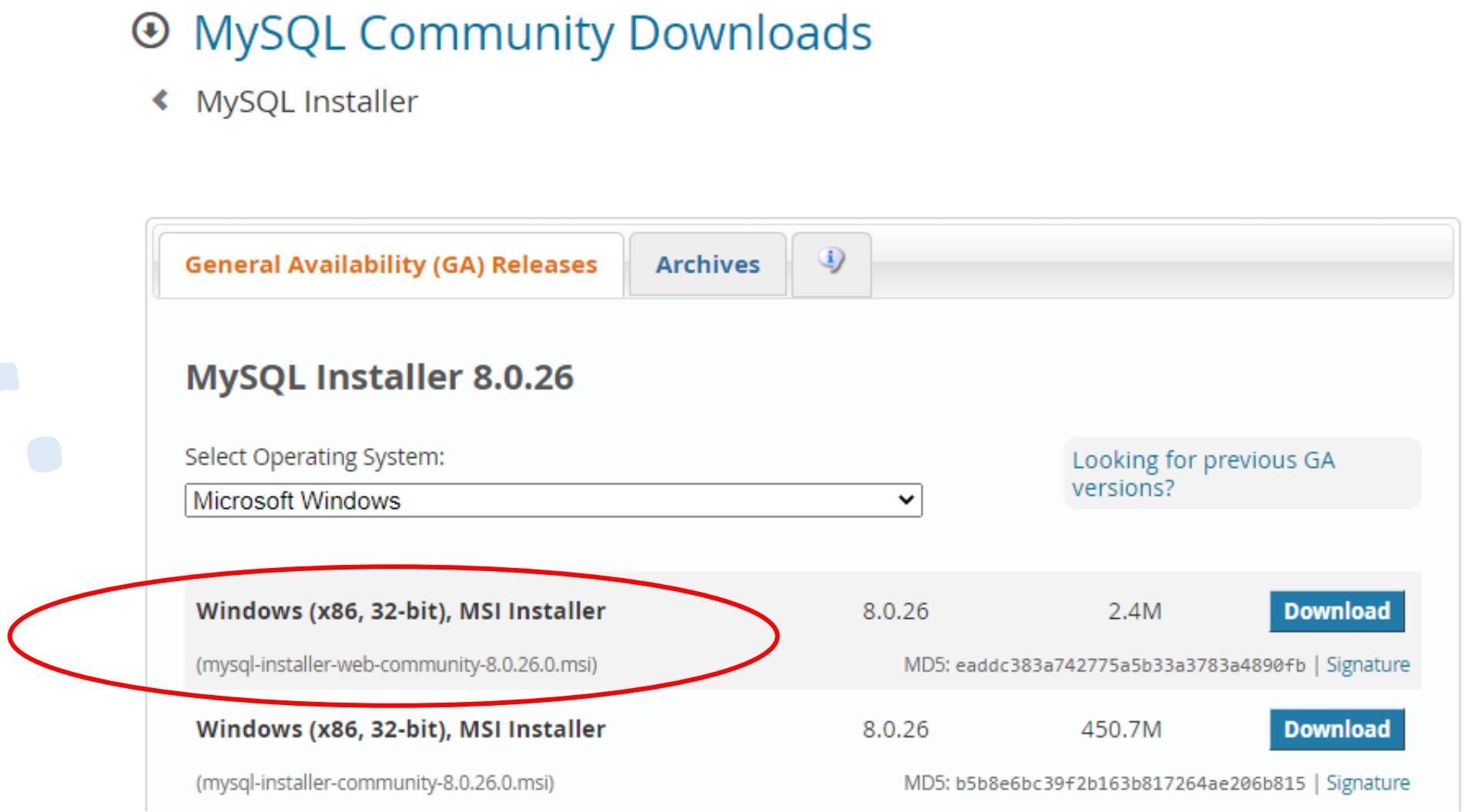
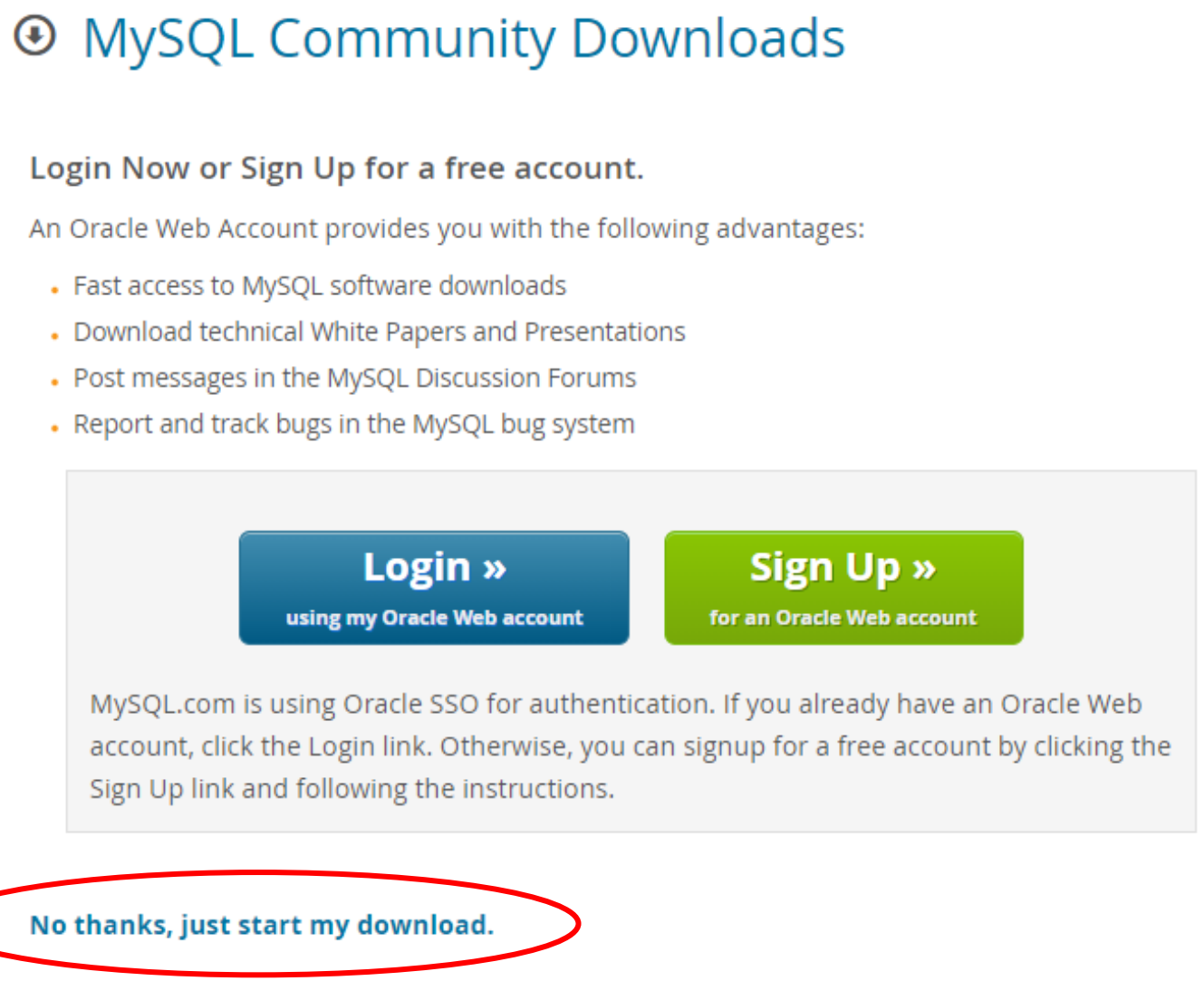
Installation: Download MySQL Installer

- If you want to install MySQL on the Windows environment, using MySQL installer is the easiest way.
- To download MySQL installer, go to the following link http://dev.mysql.com/downloads/installer/. There are two installer files:
- If you are connecting to the internet while installing MySQL, you can choose the online installation version mysql-installer-web-community-<version>.exe .
- In case you want to install MySQL offline, you can download the mysql-installer-community-<version>.exe file.

Installation

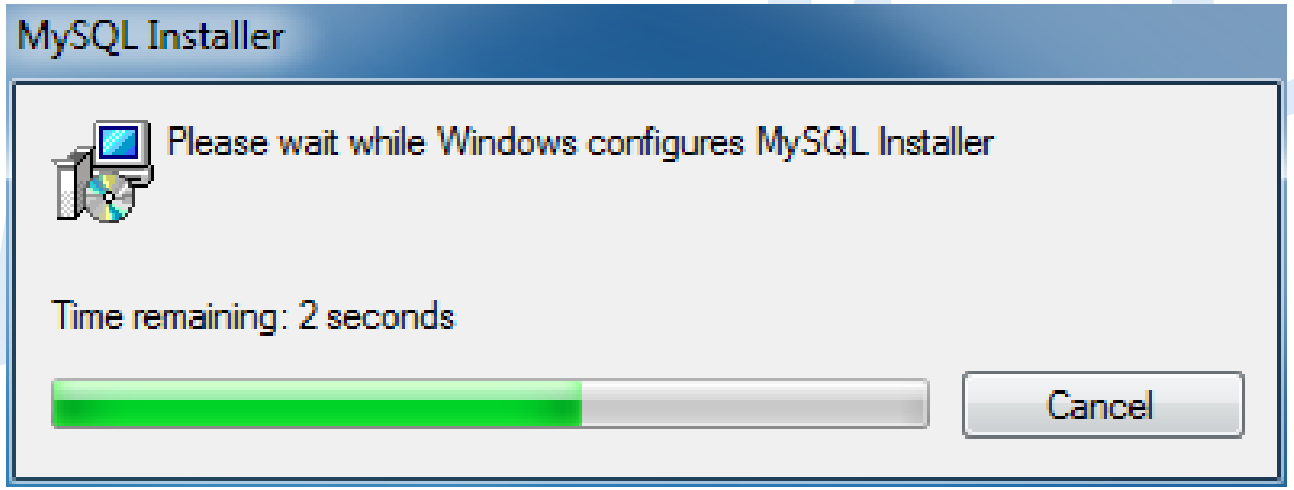


Installation

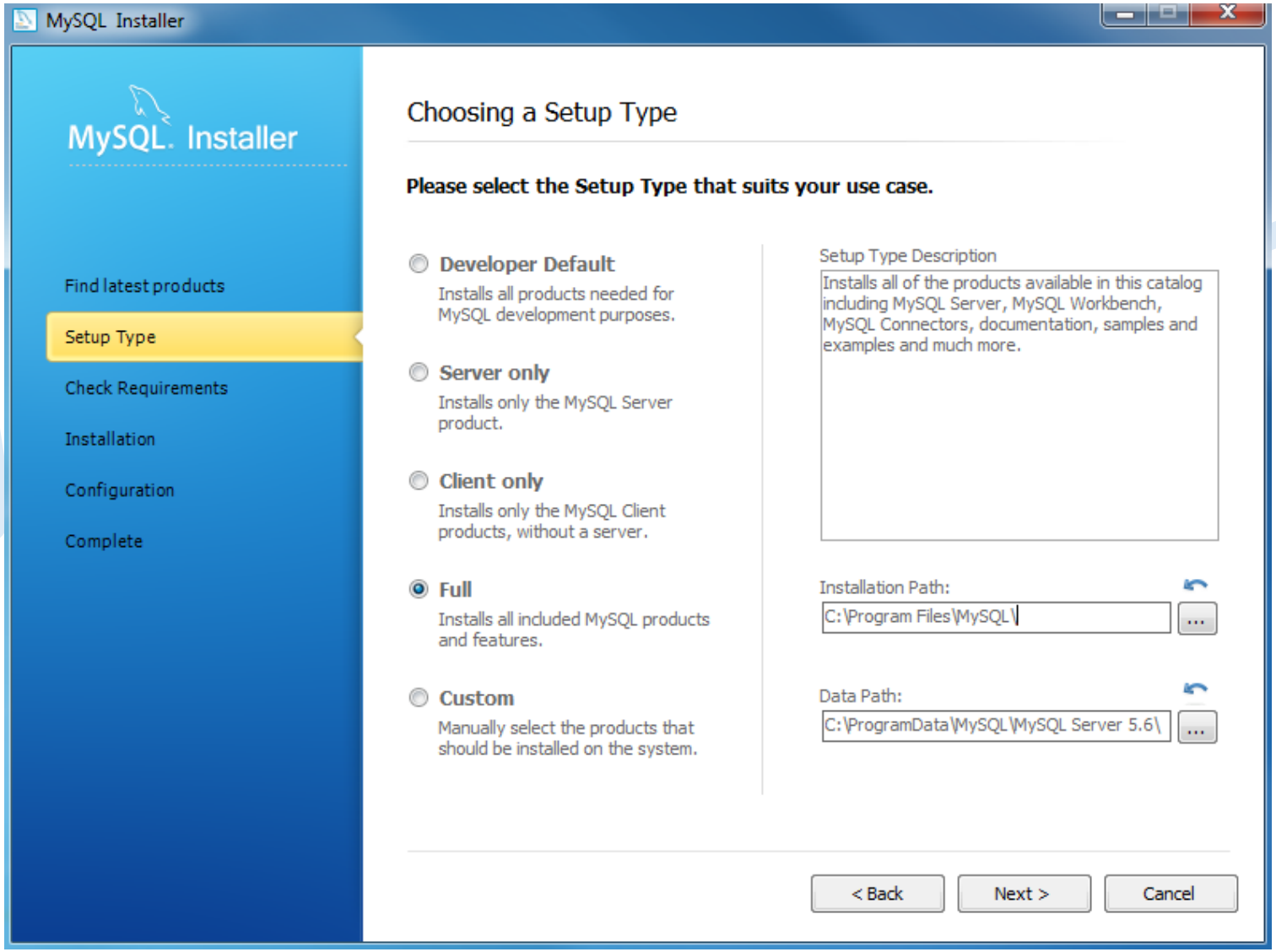


Installation: Install MySQL via MySQL Installer

- To install MySQL using the MySQL installer, double-click on the MySQL installer file and follow the steps below:



Installation: Setup Type



Installation

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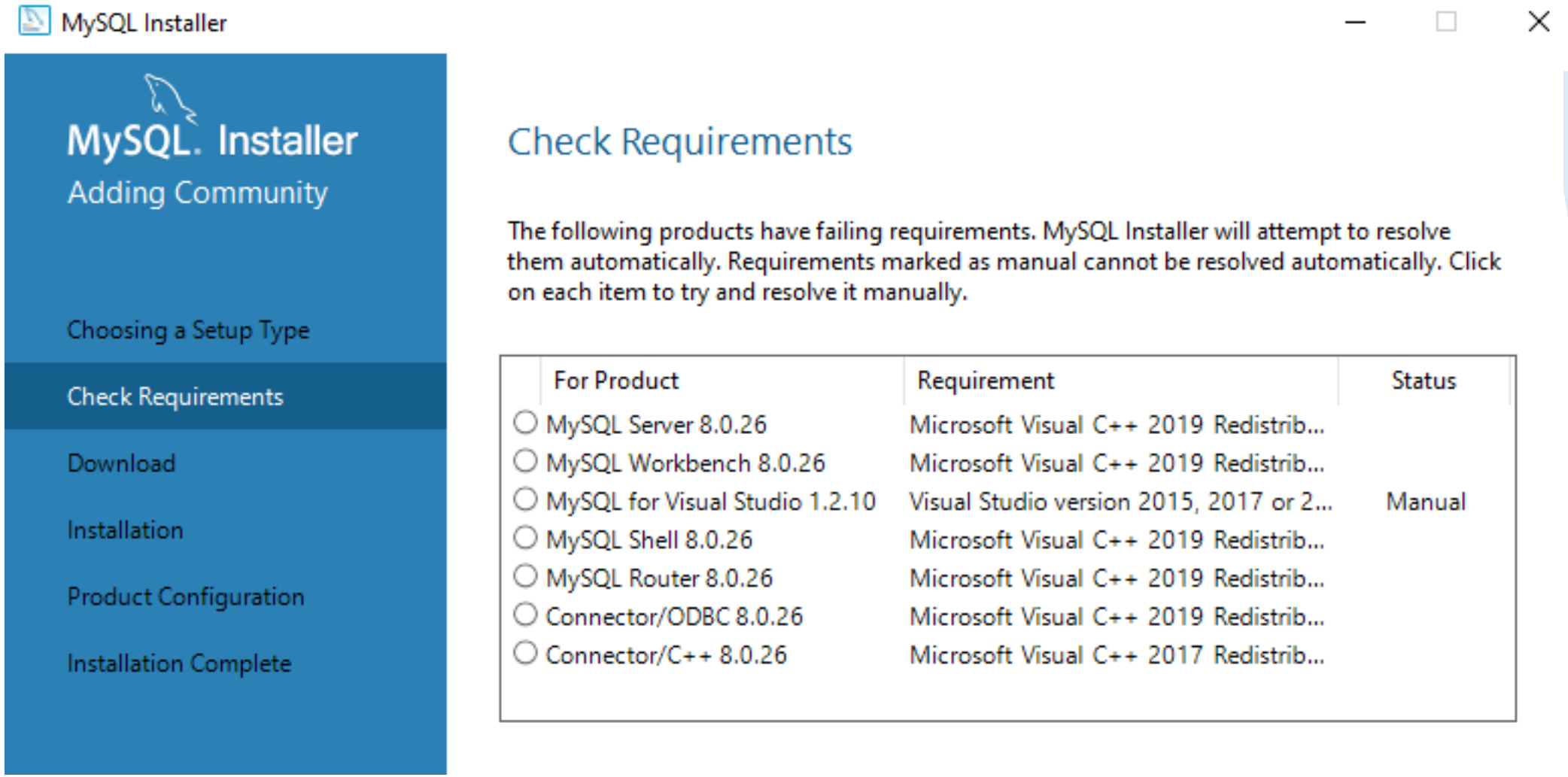
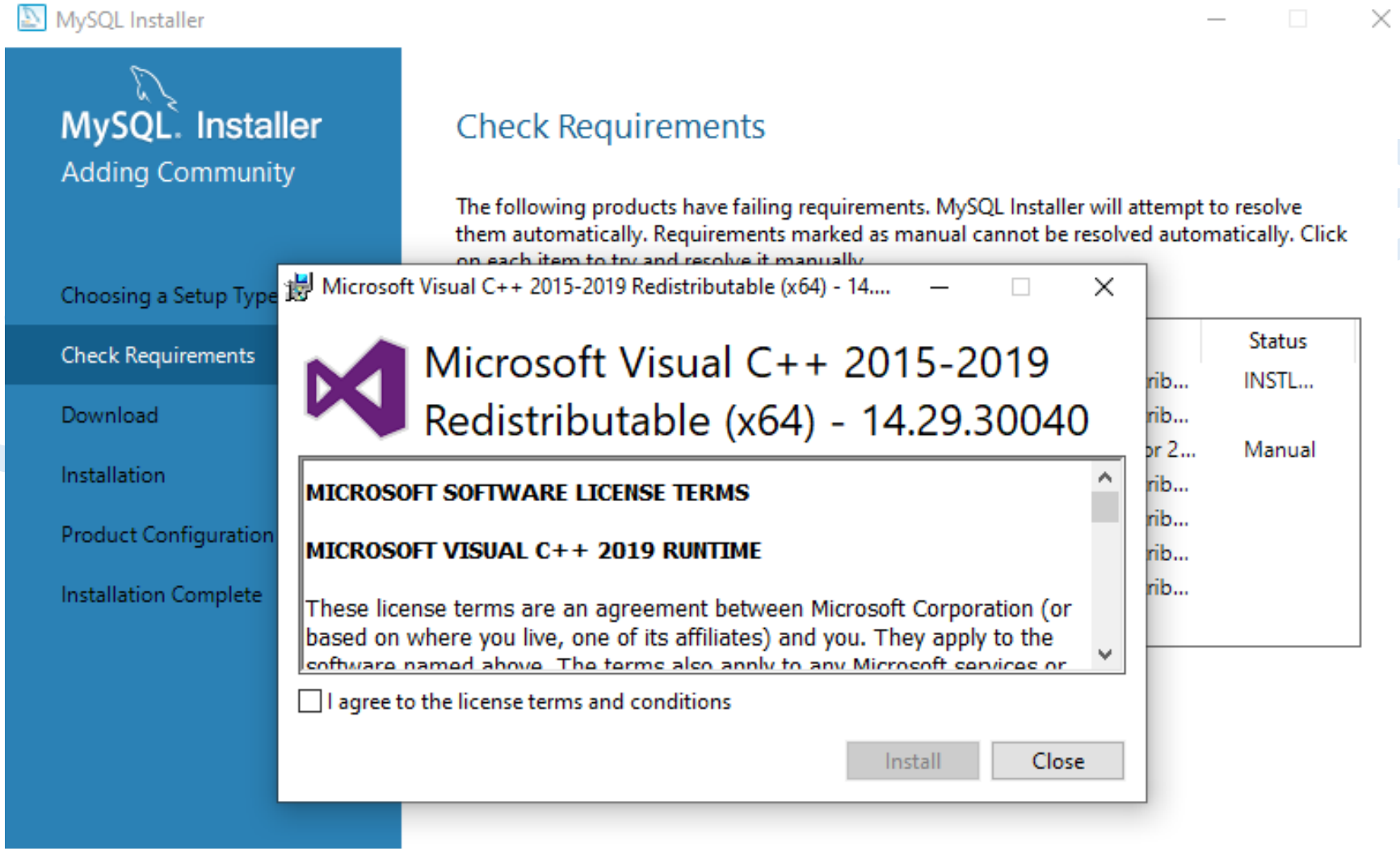


Installation

Select I agree, then Next



Installation

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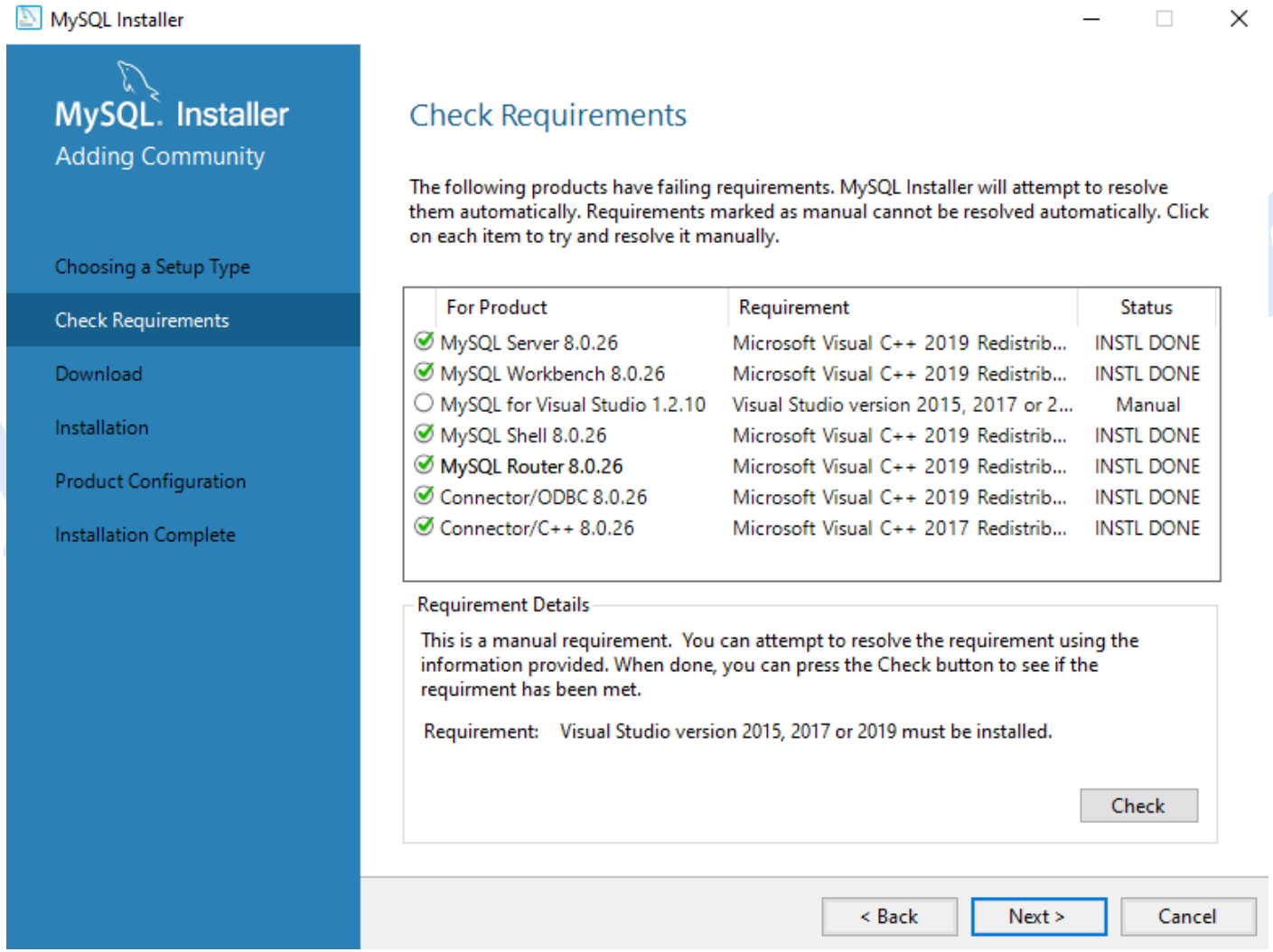

Installation

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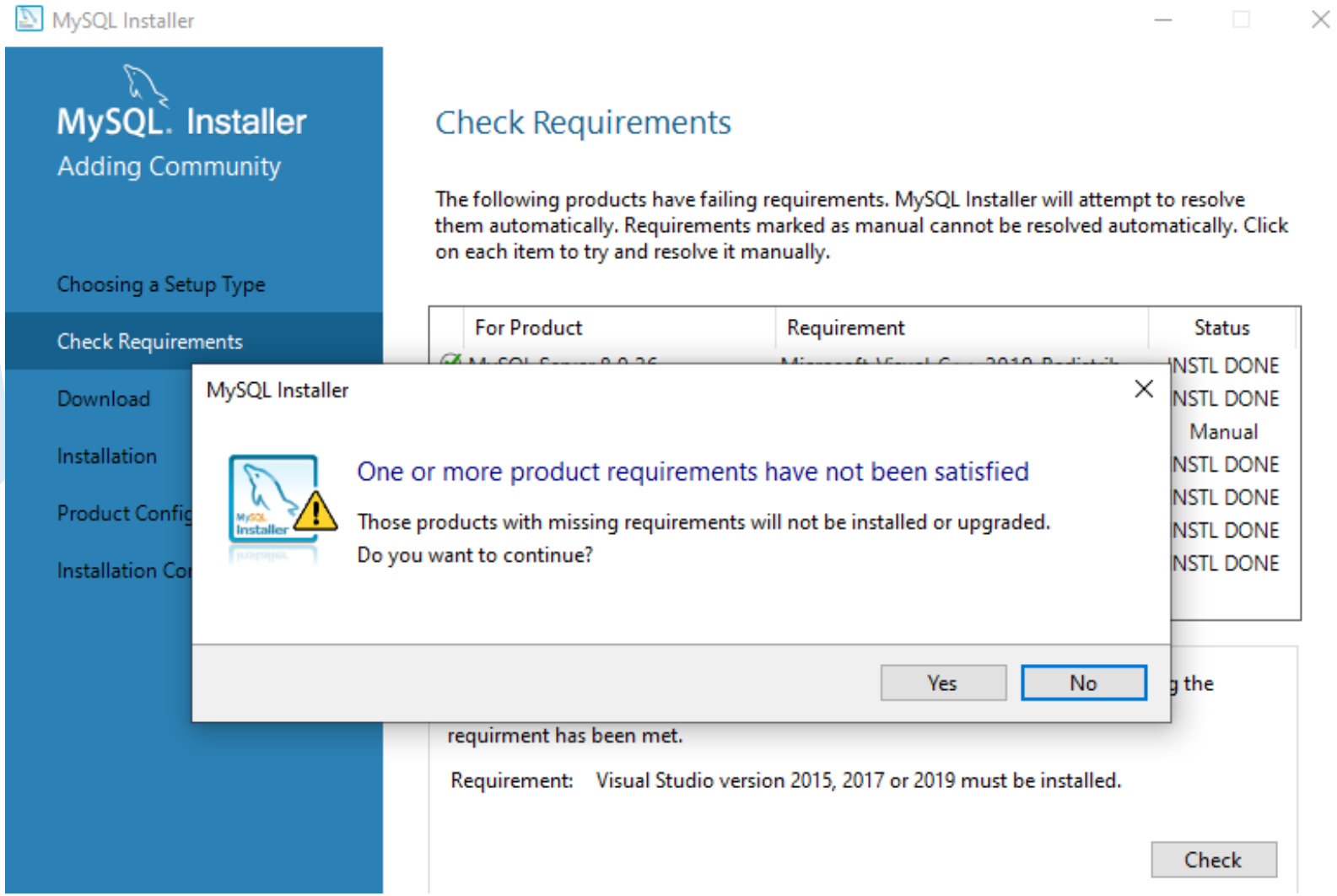

Installation

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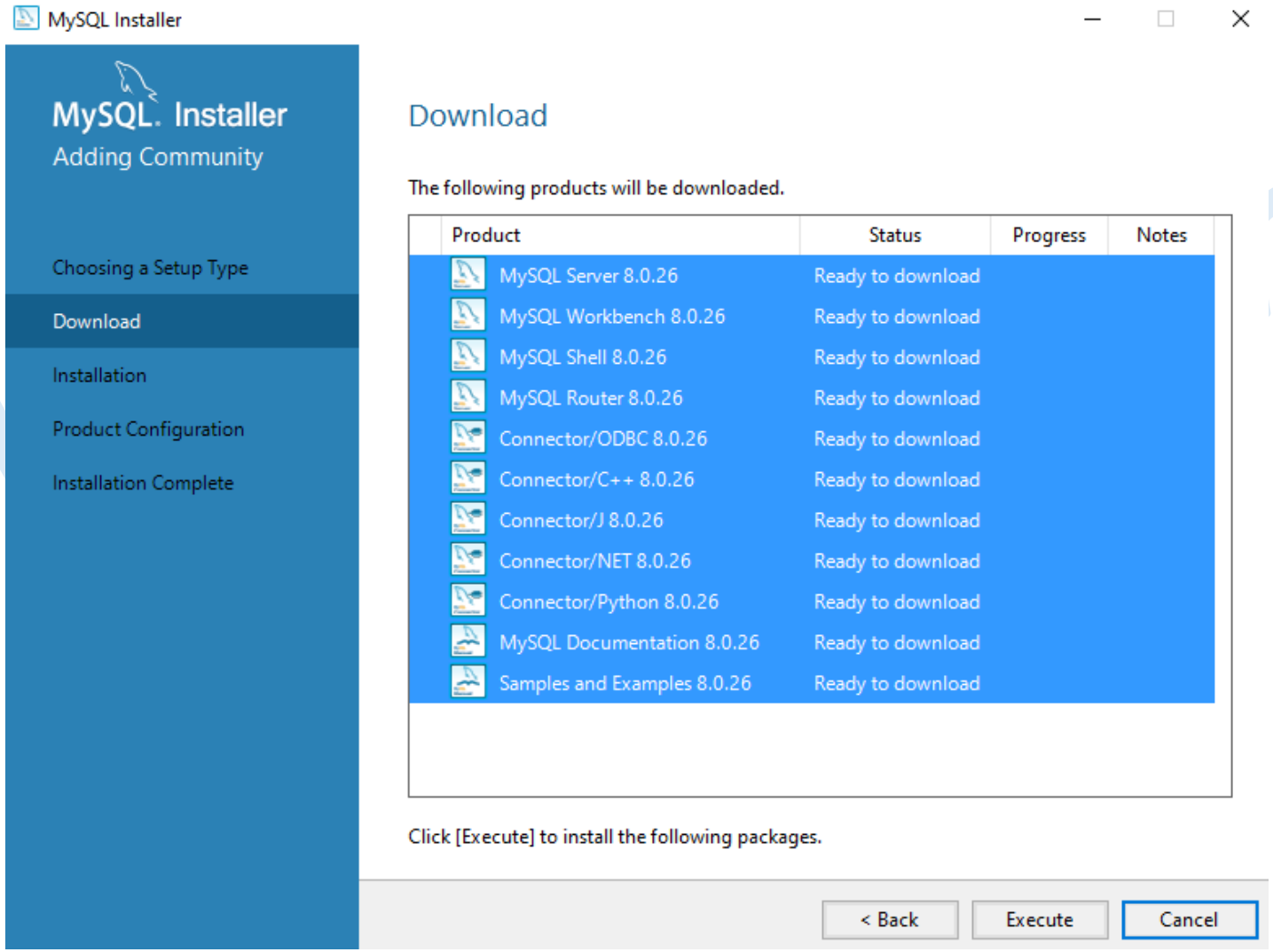

Installation

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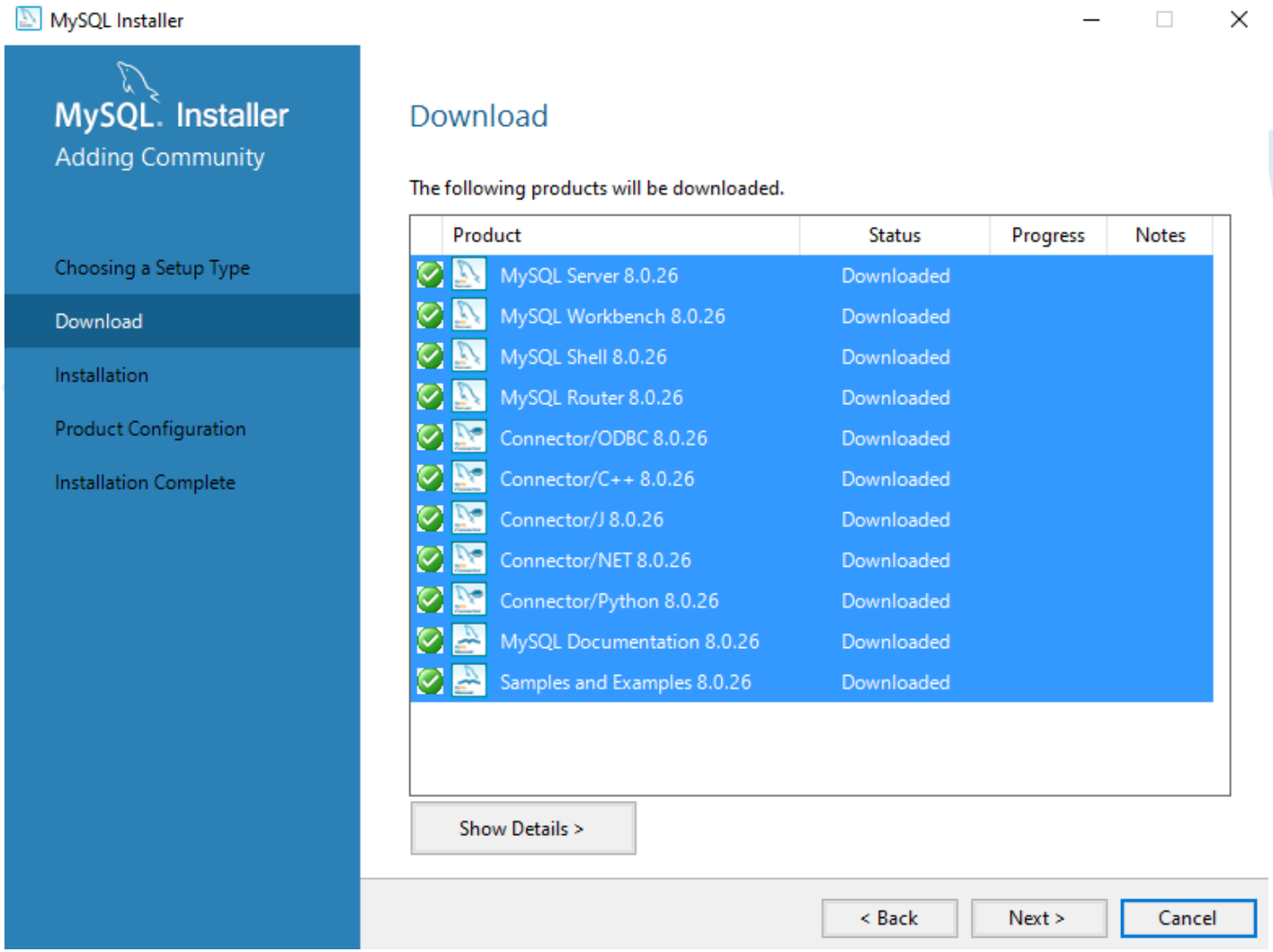

Installation

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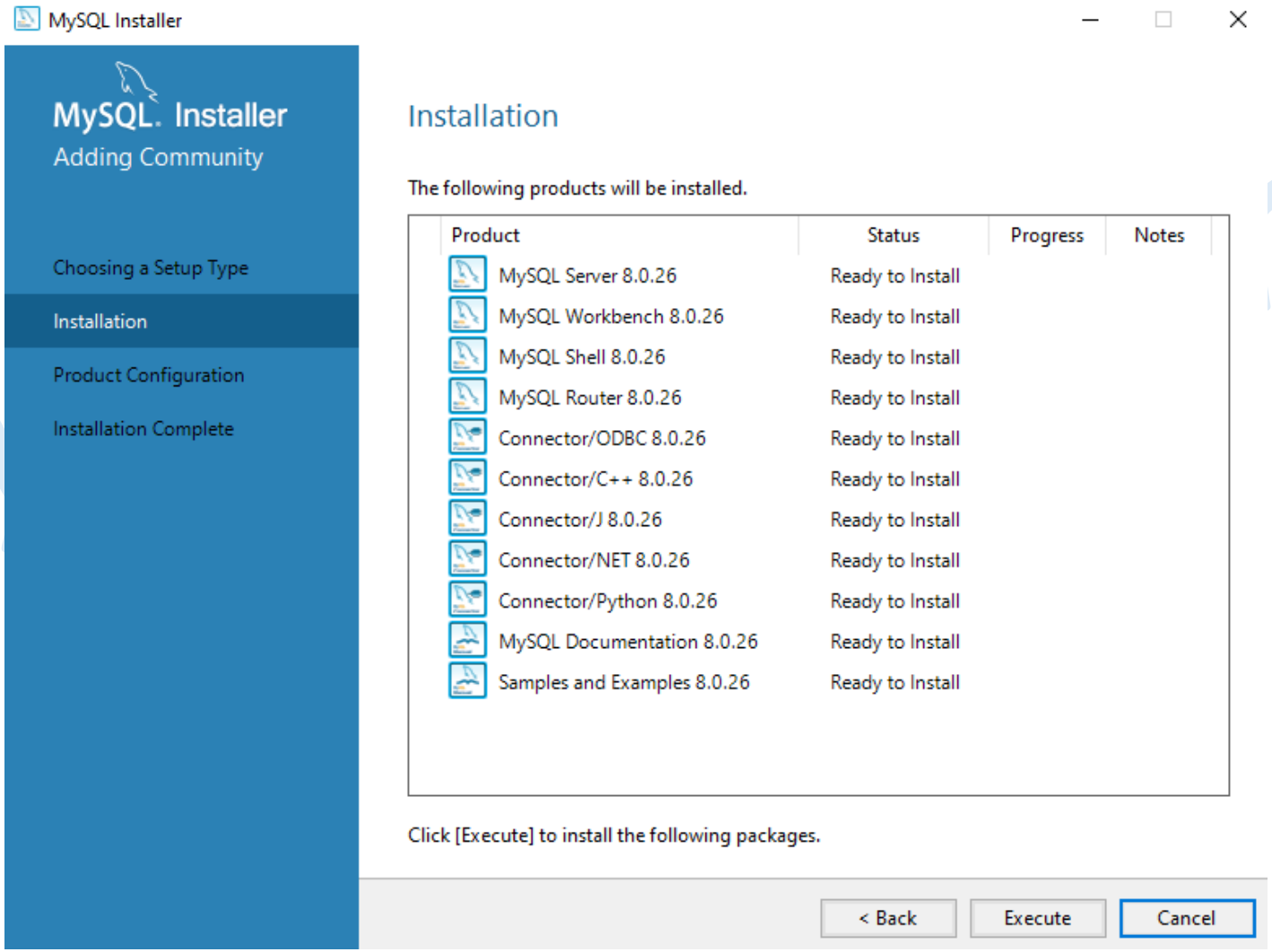

Installation

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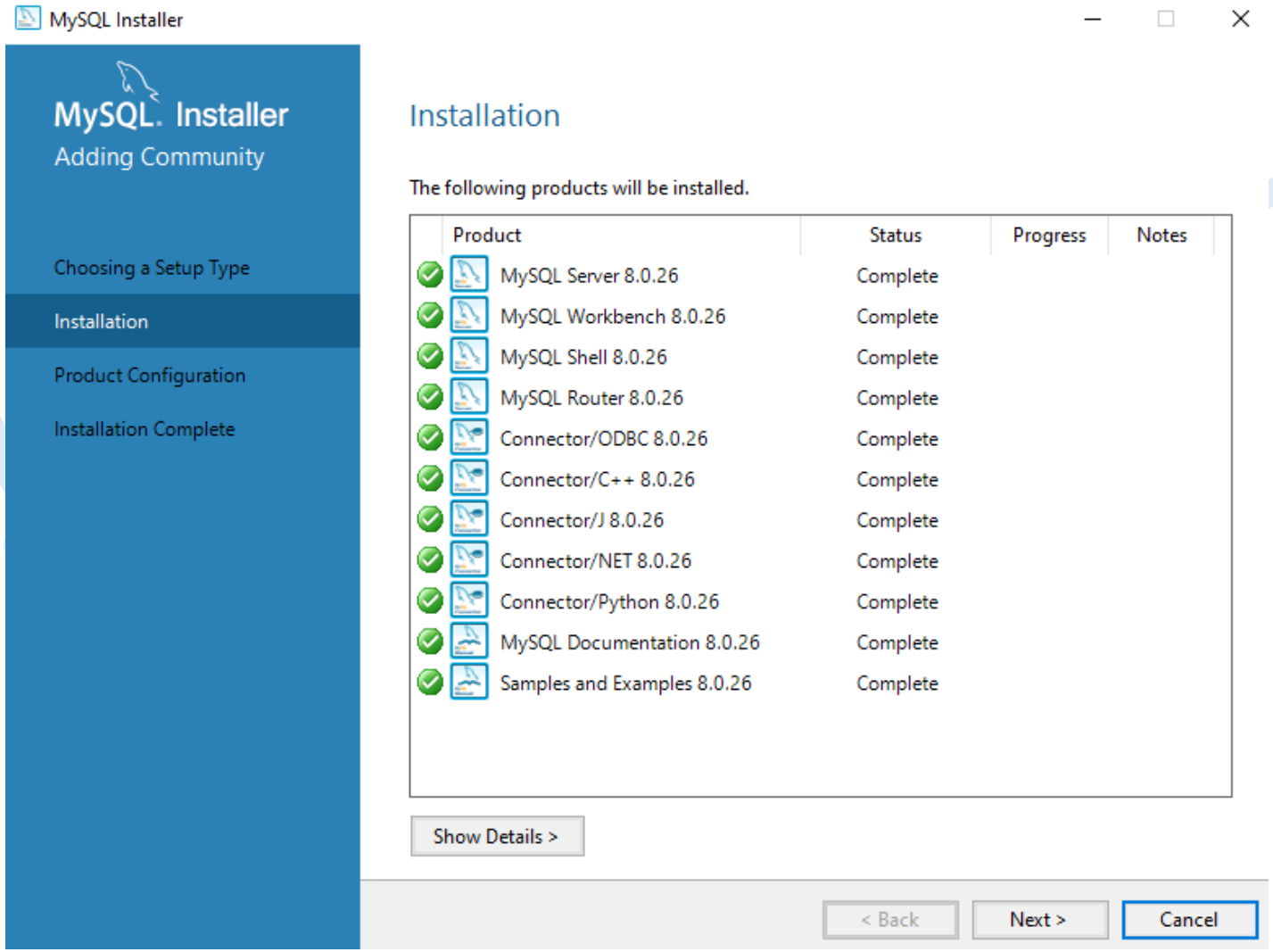

Installation

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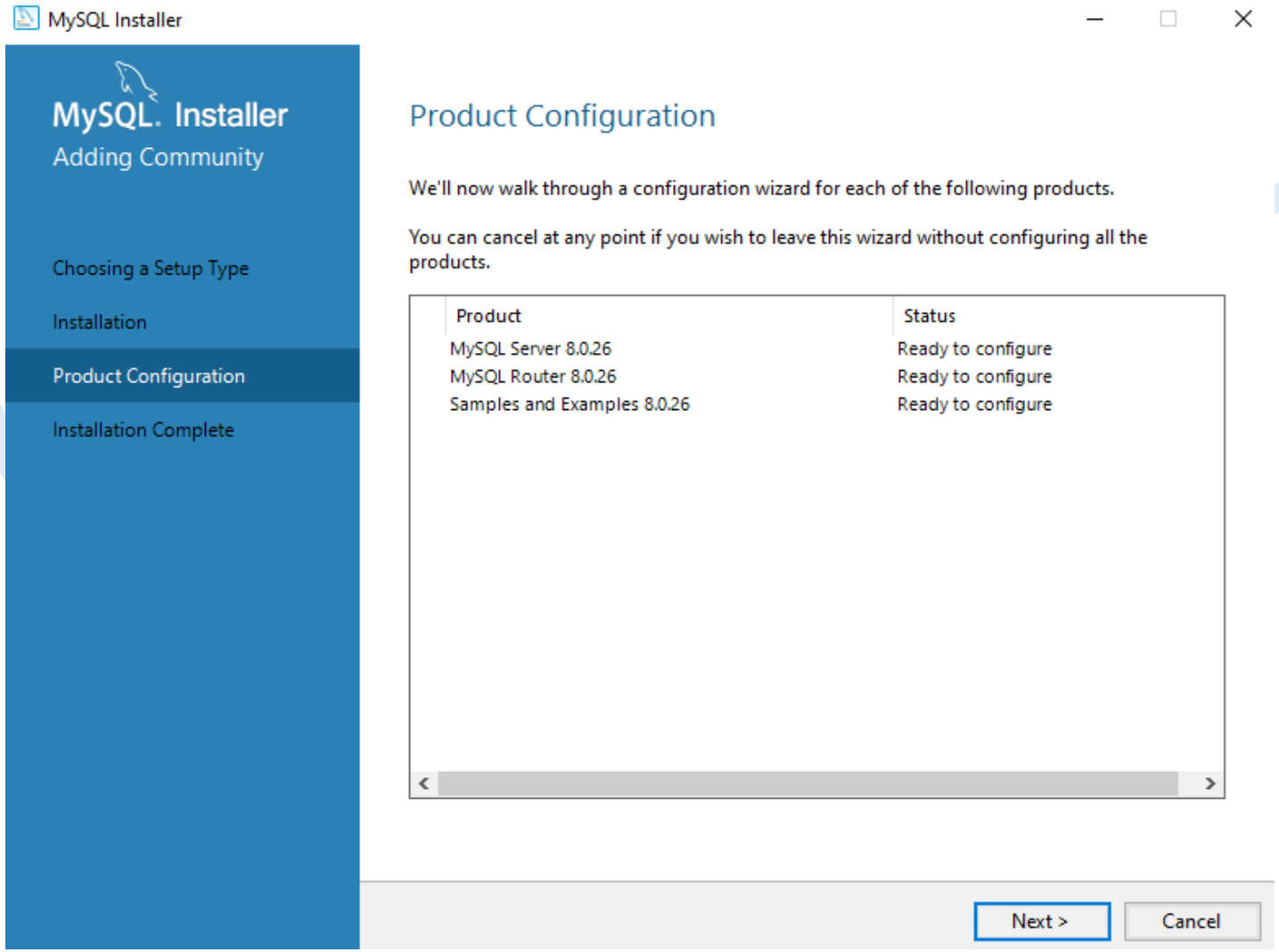

Installation

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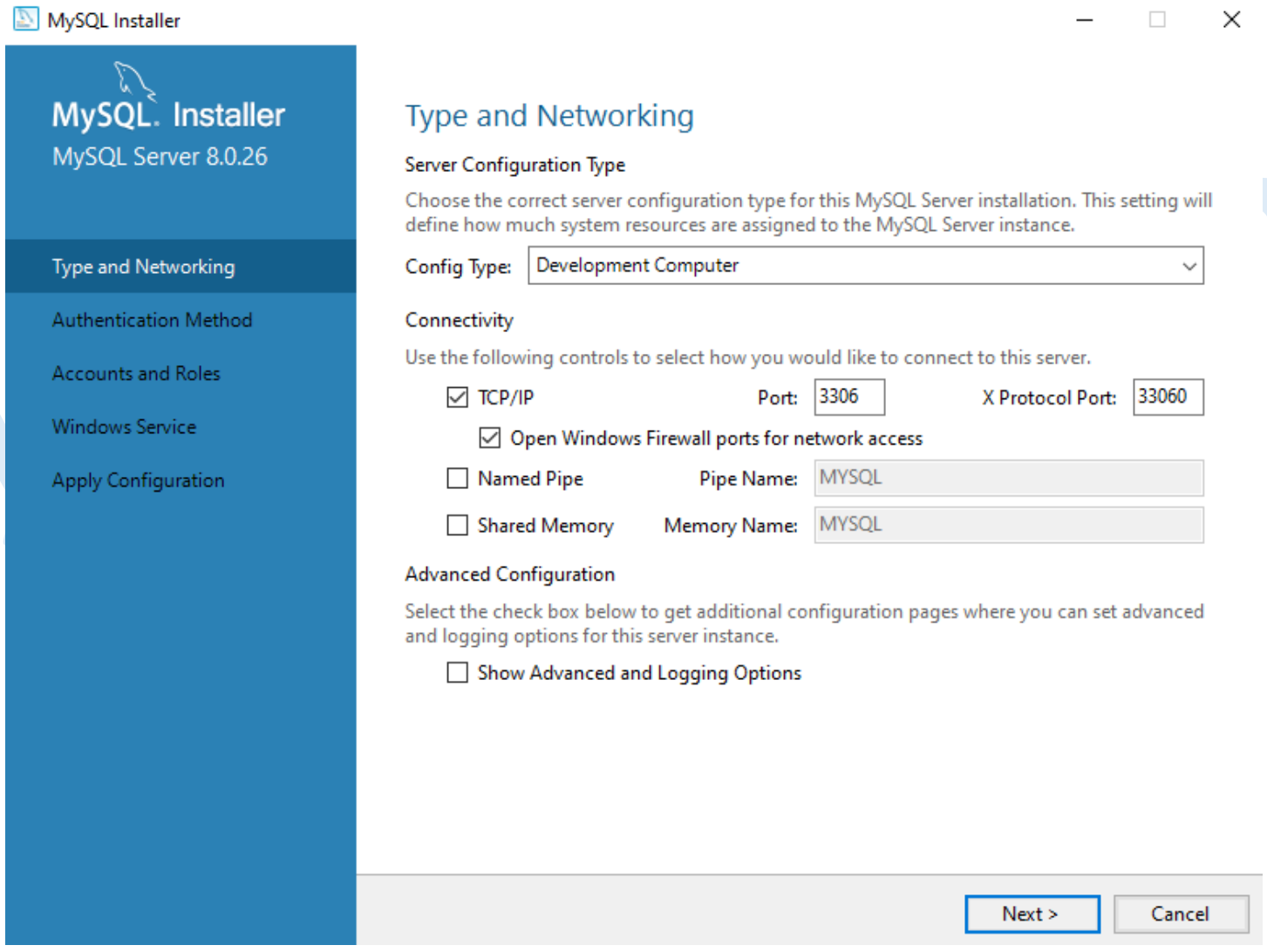

Installation

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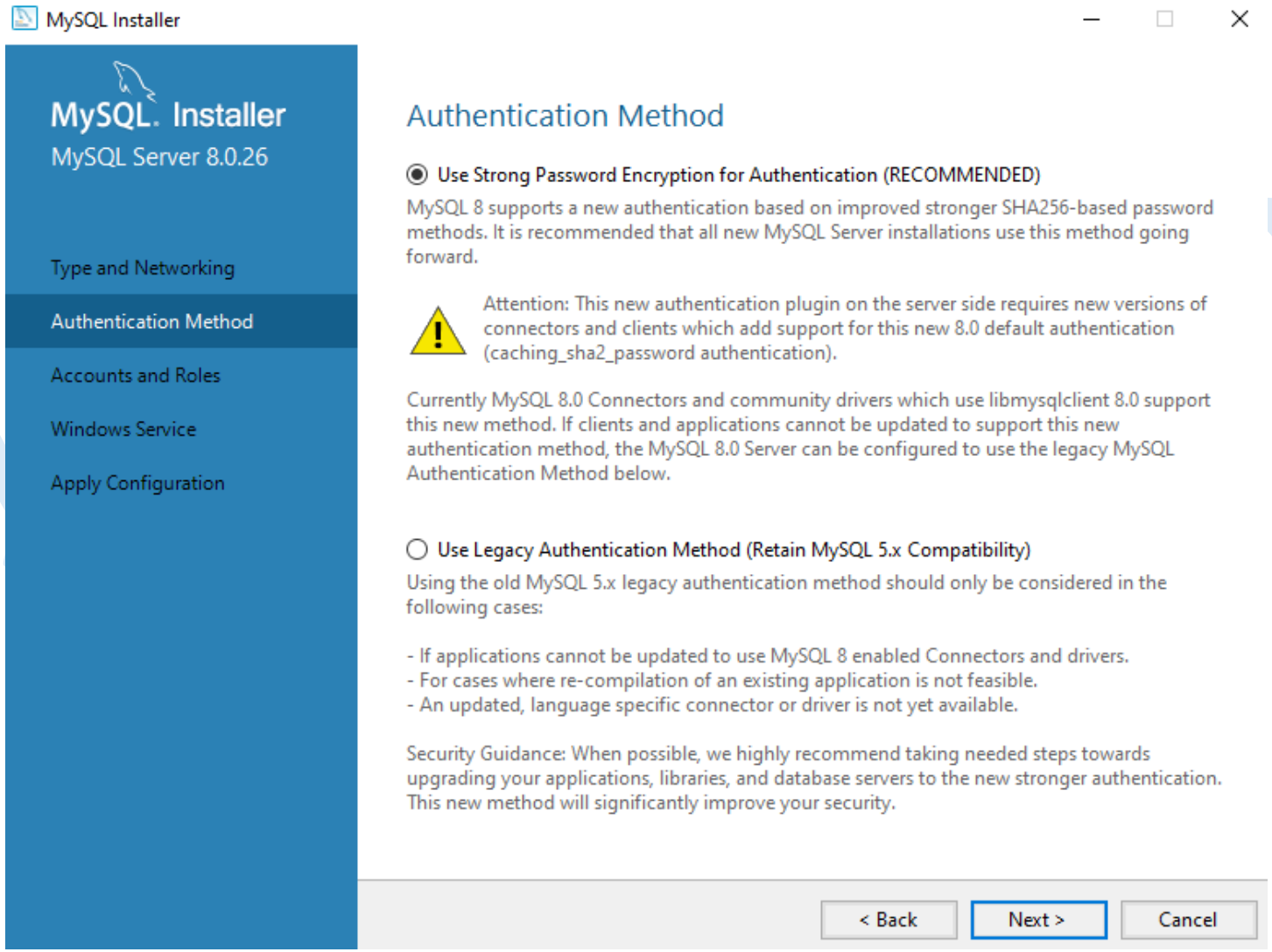

Installation

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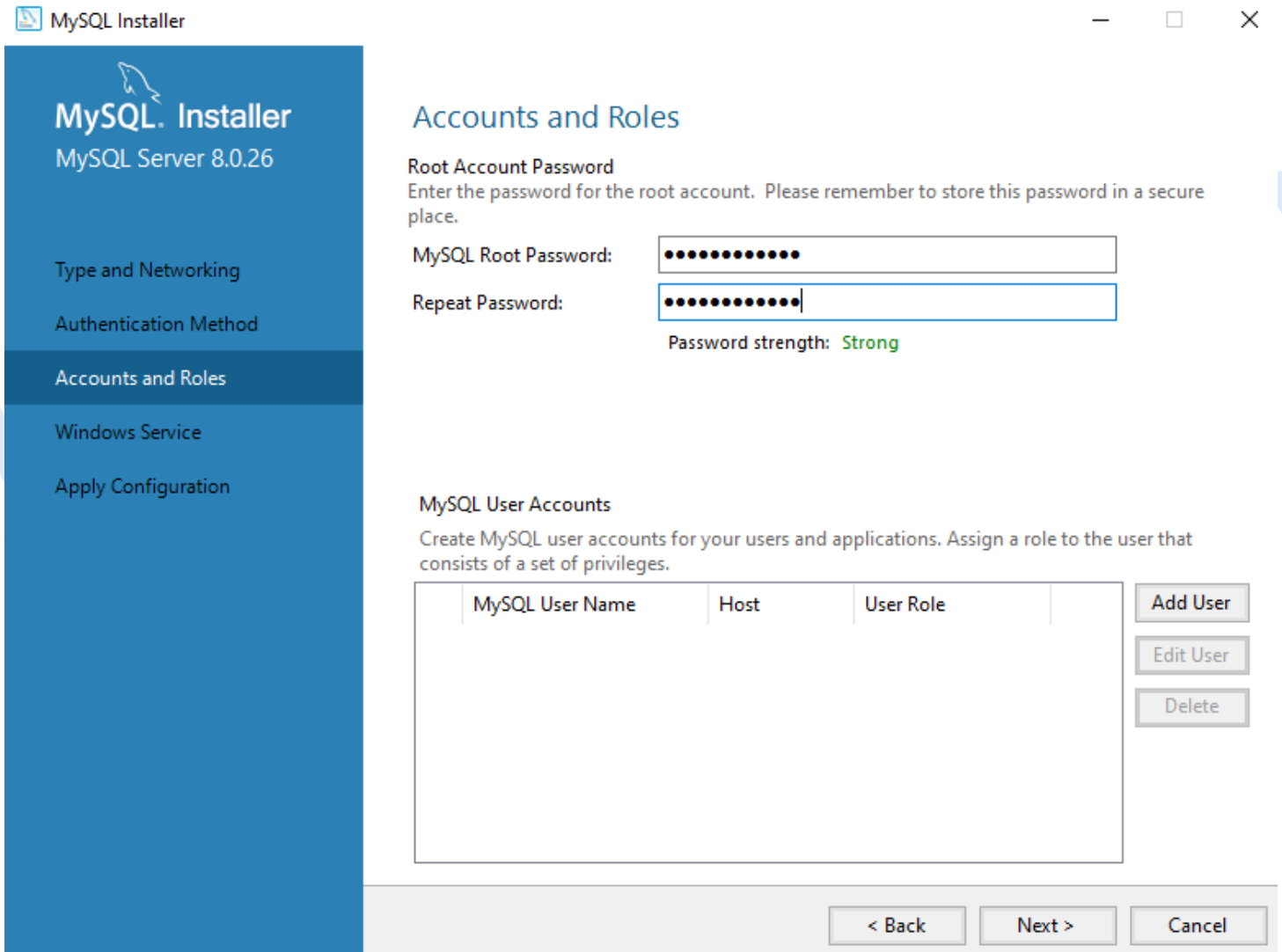

Installation

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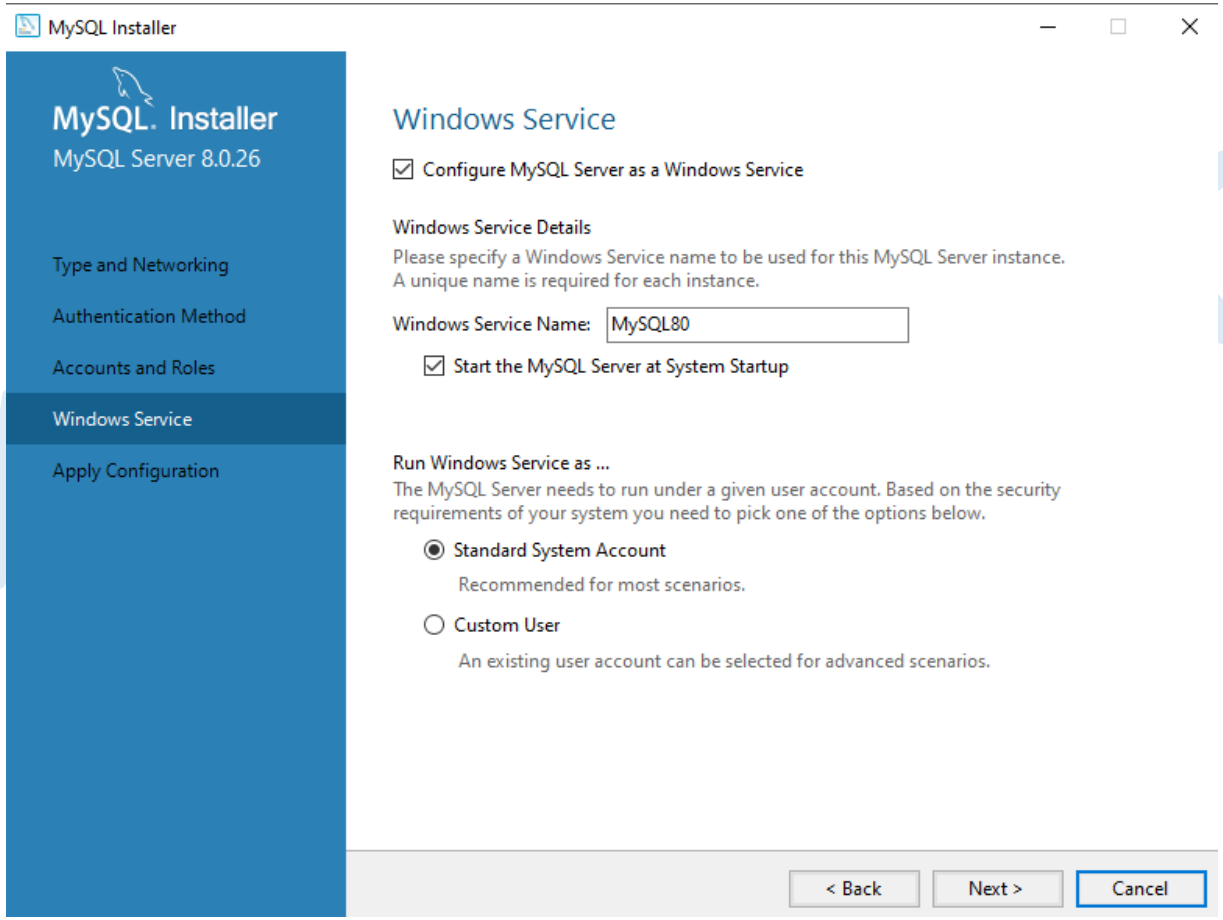

Installation

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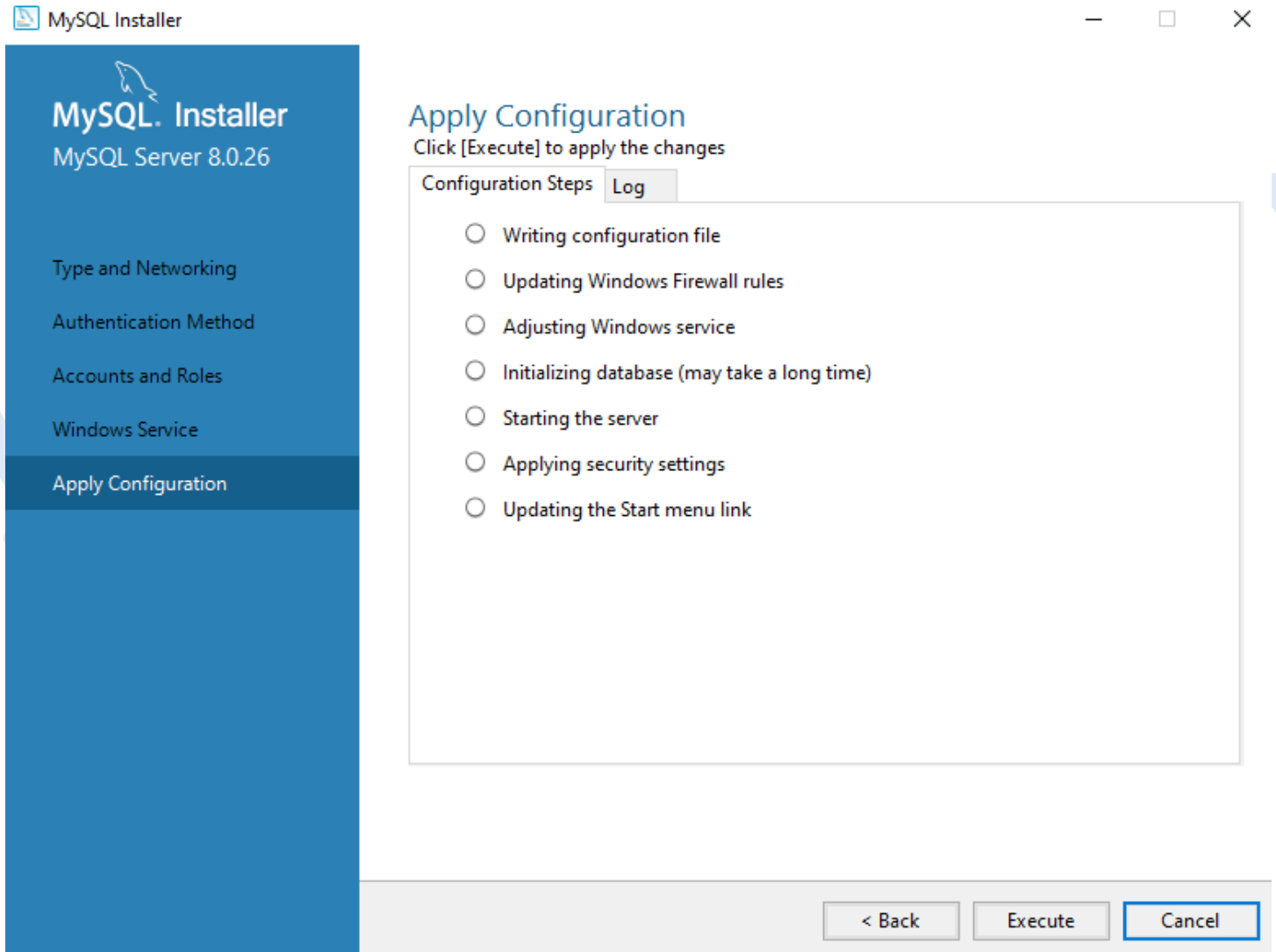
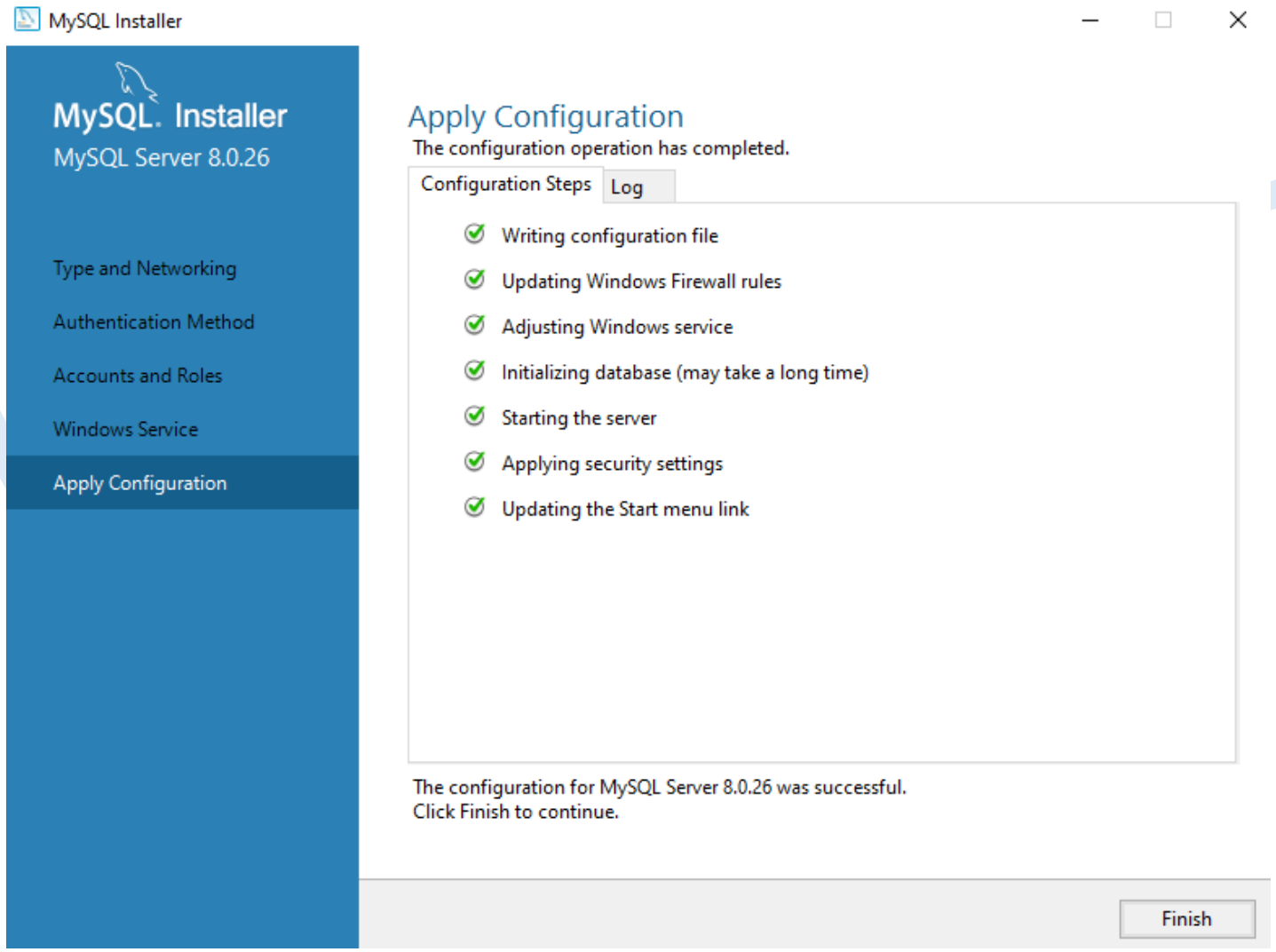


Installation

Select Finish



Installation

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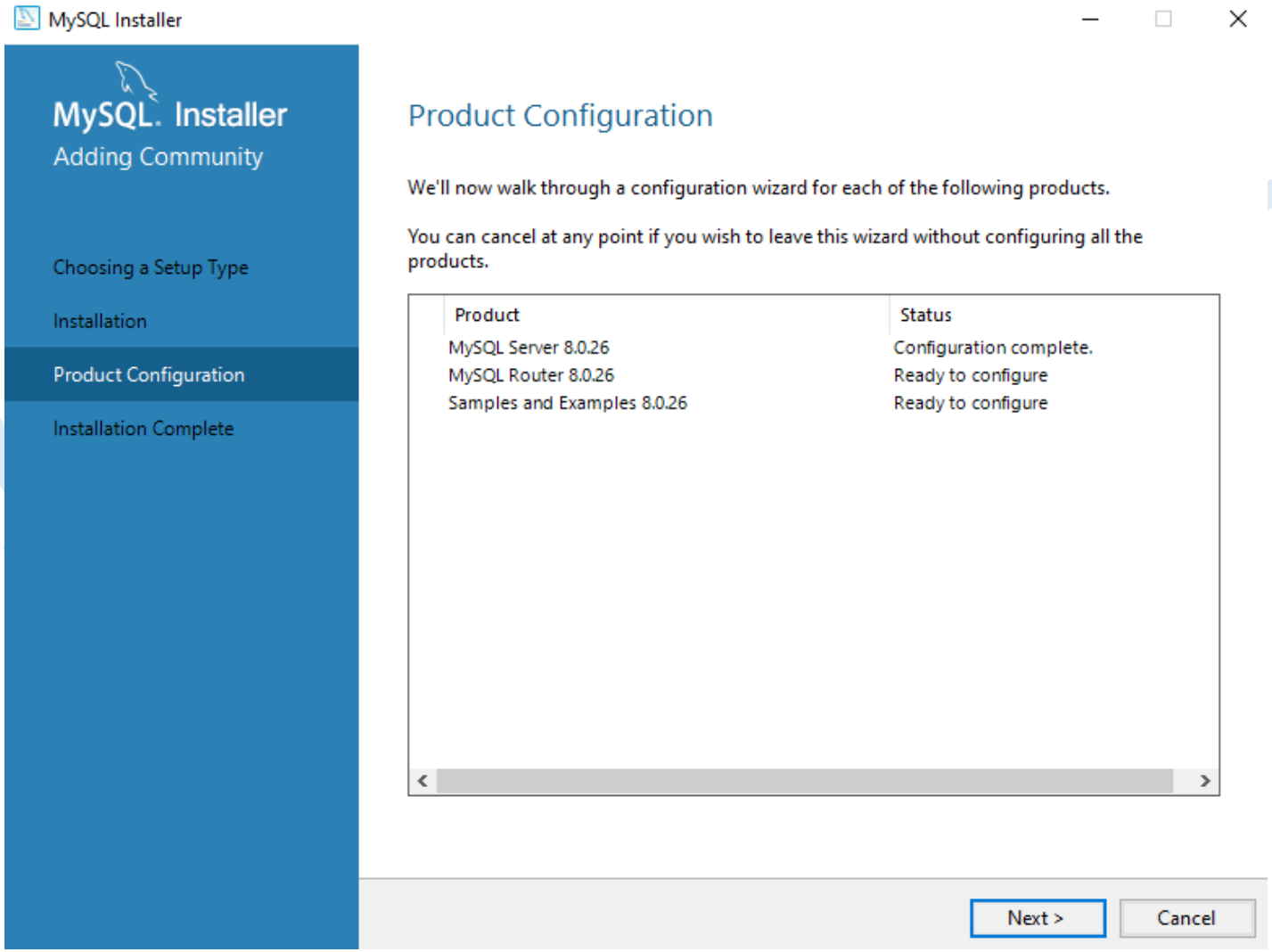

Installation

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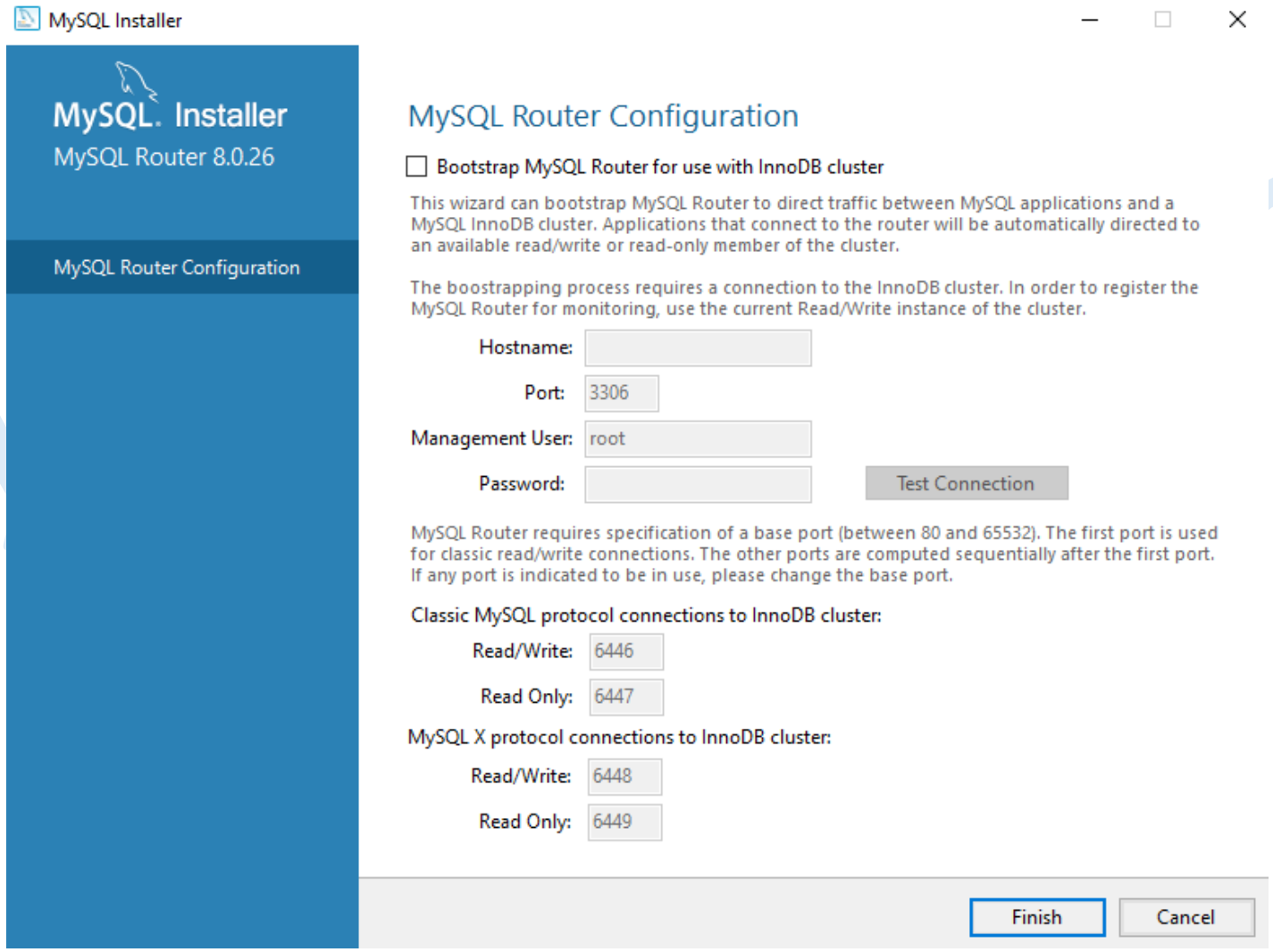

Installation

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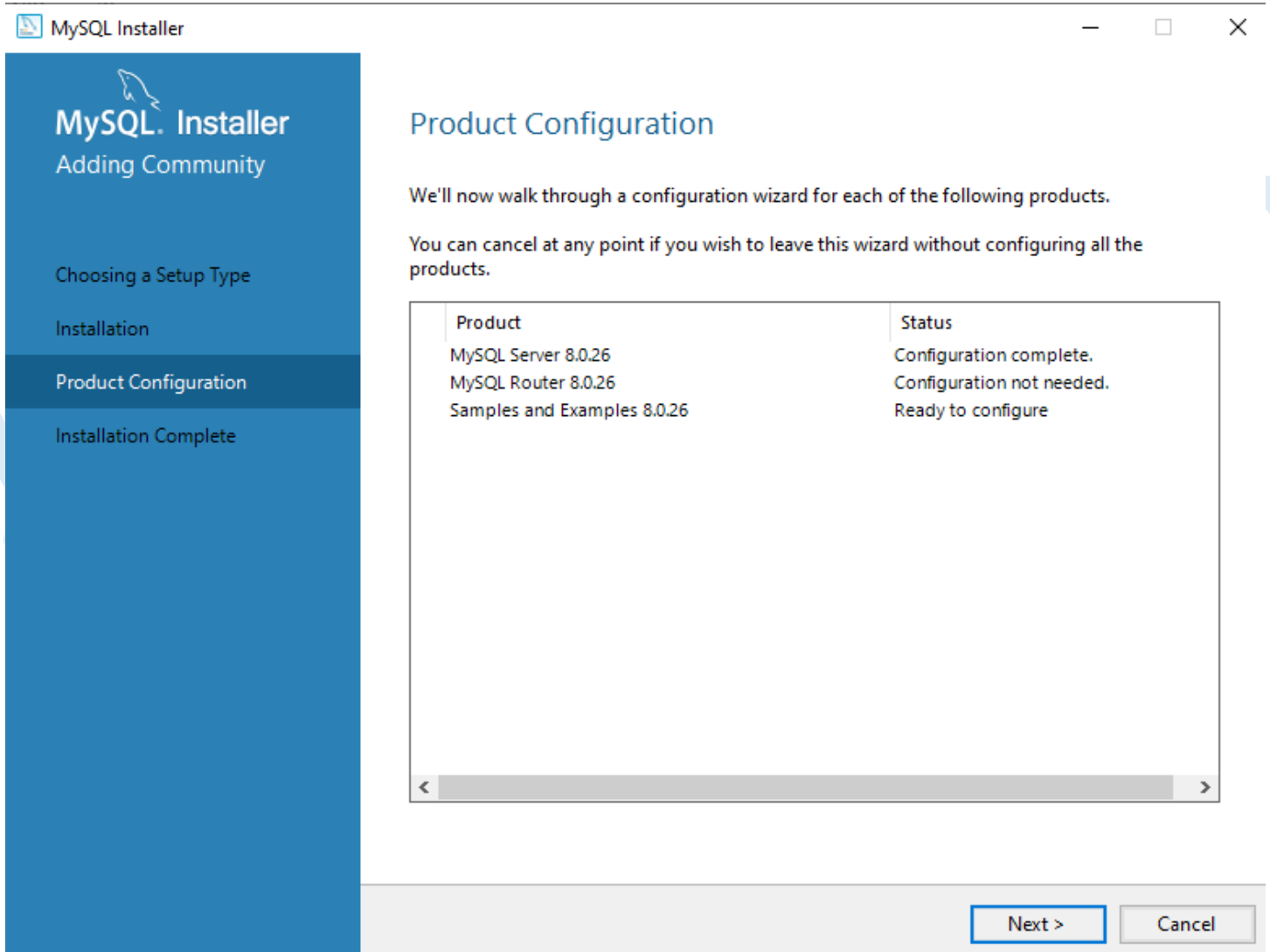
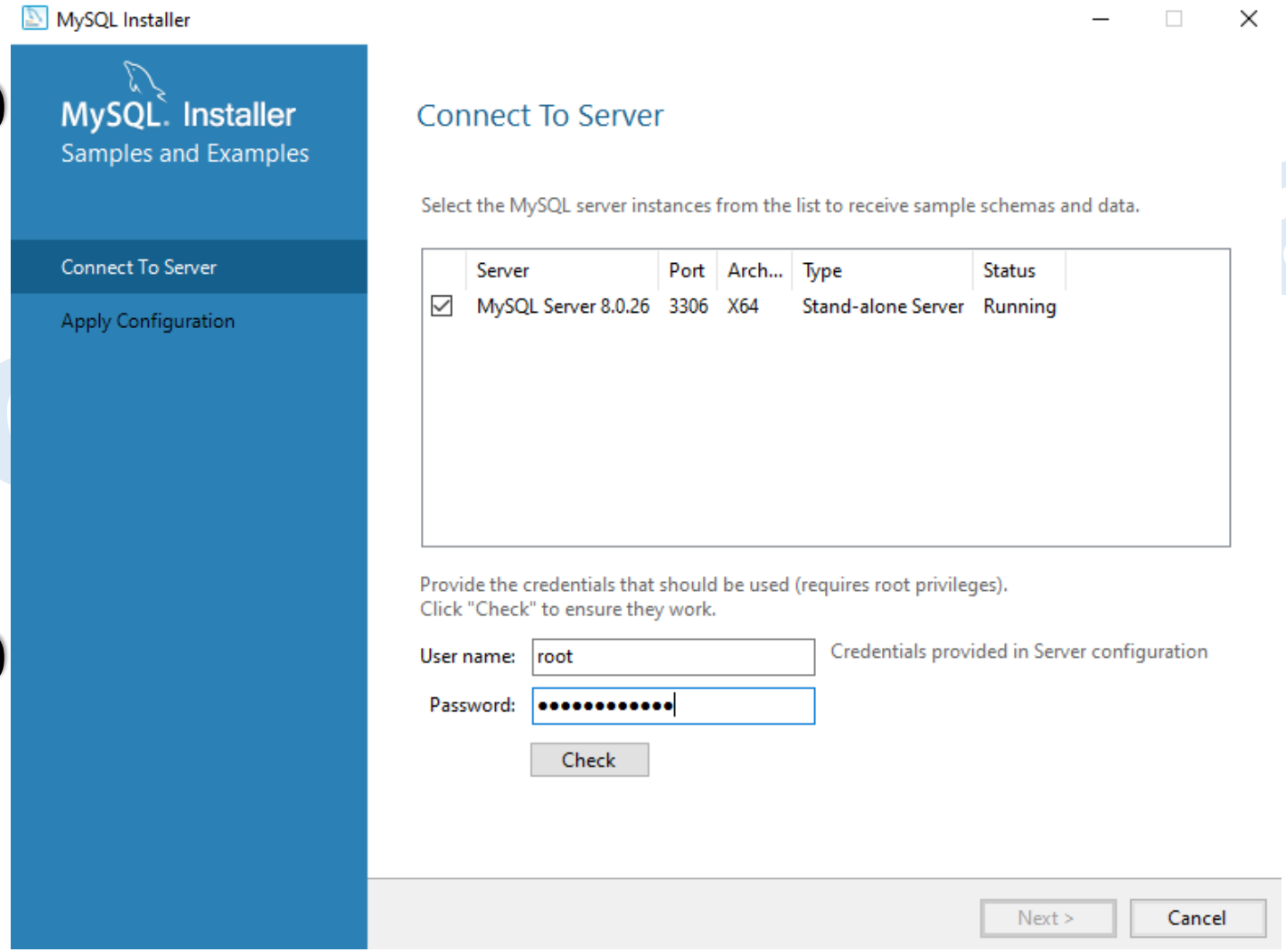


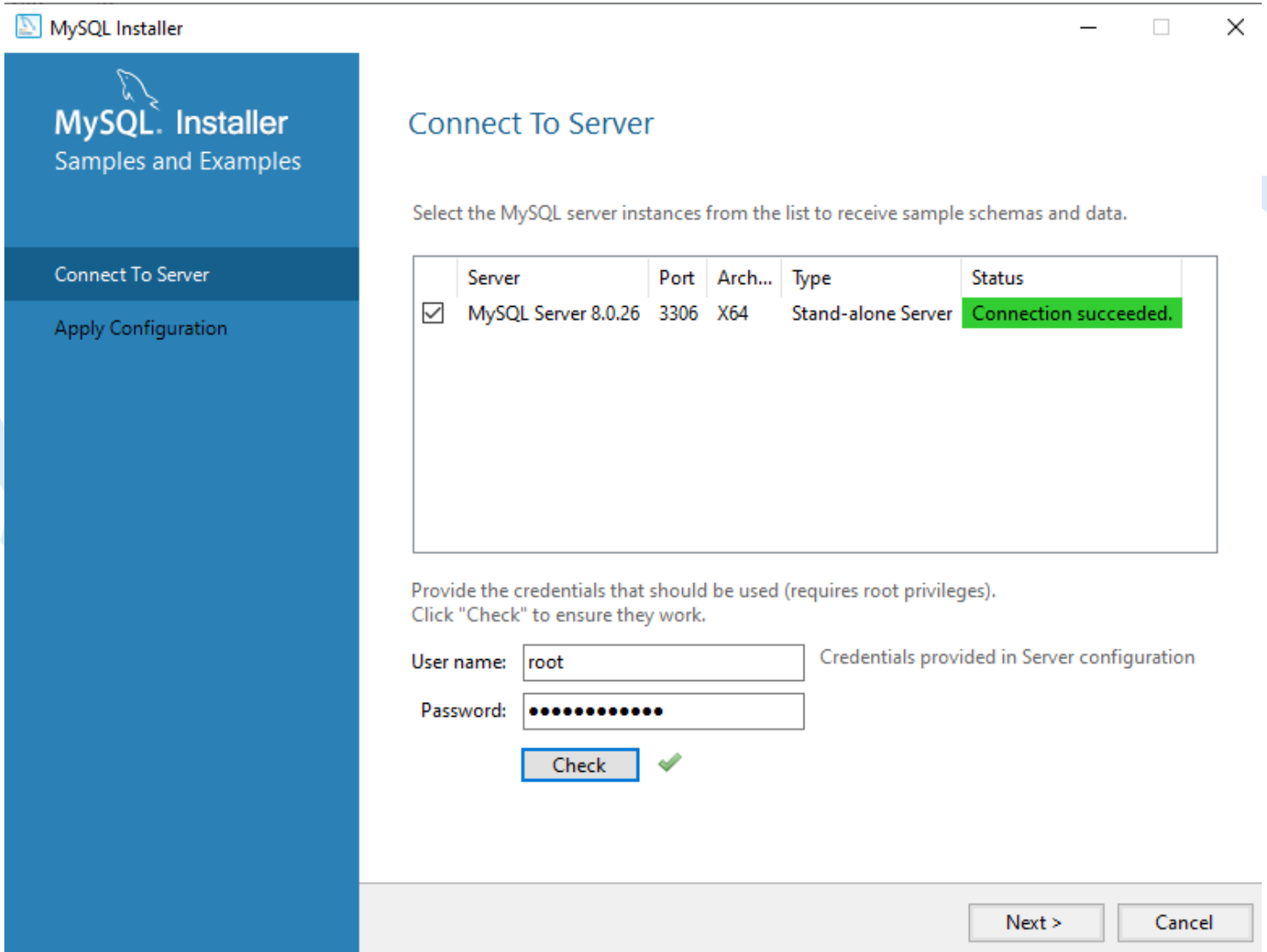
Installation

Type the same password you already entered in your Server Configuration stage



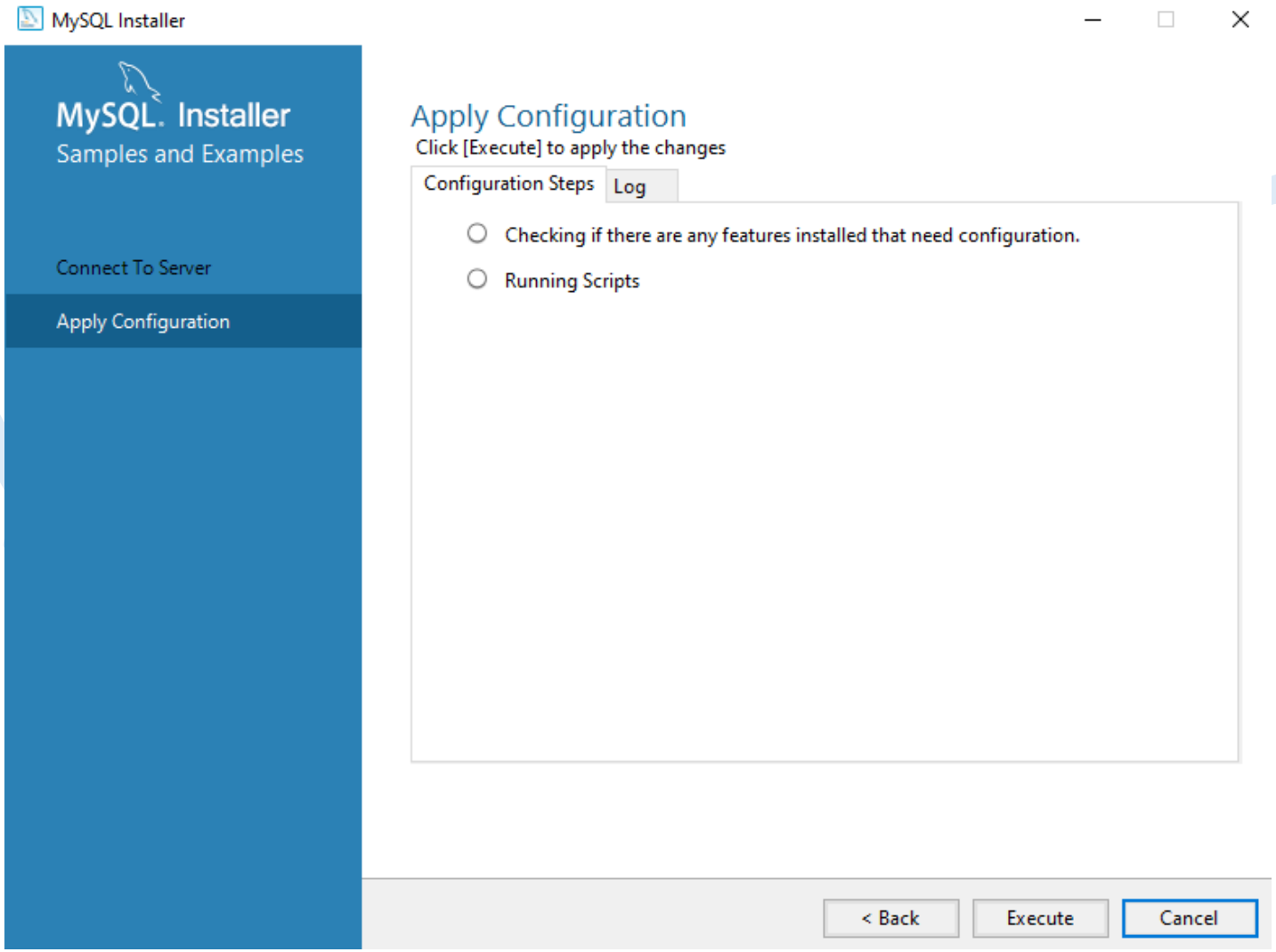
Installation

Select Check and then Next



Installation

Select Execute



Installation

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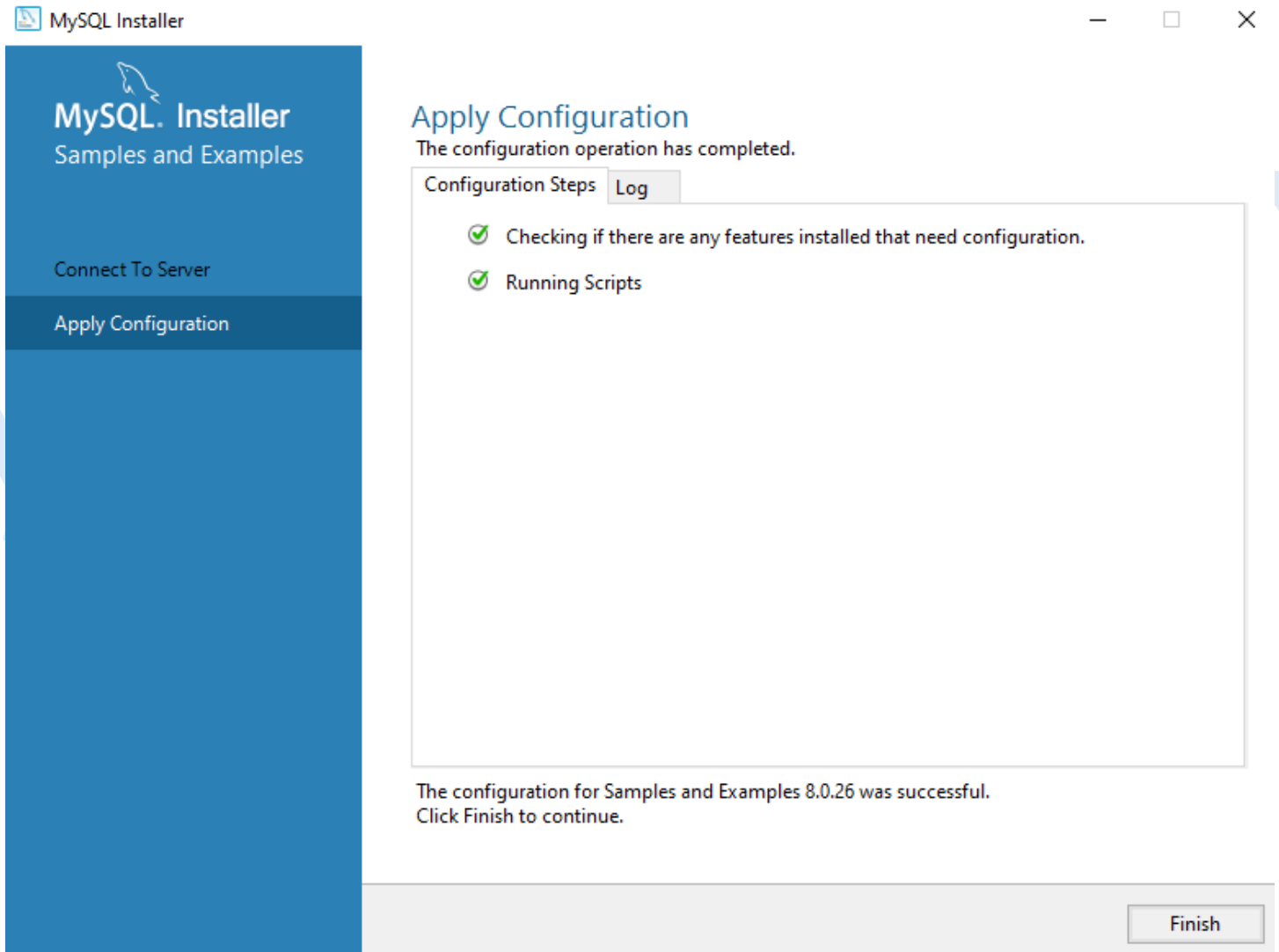

Installation

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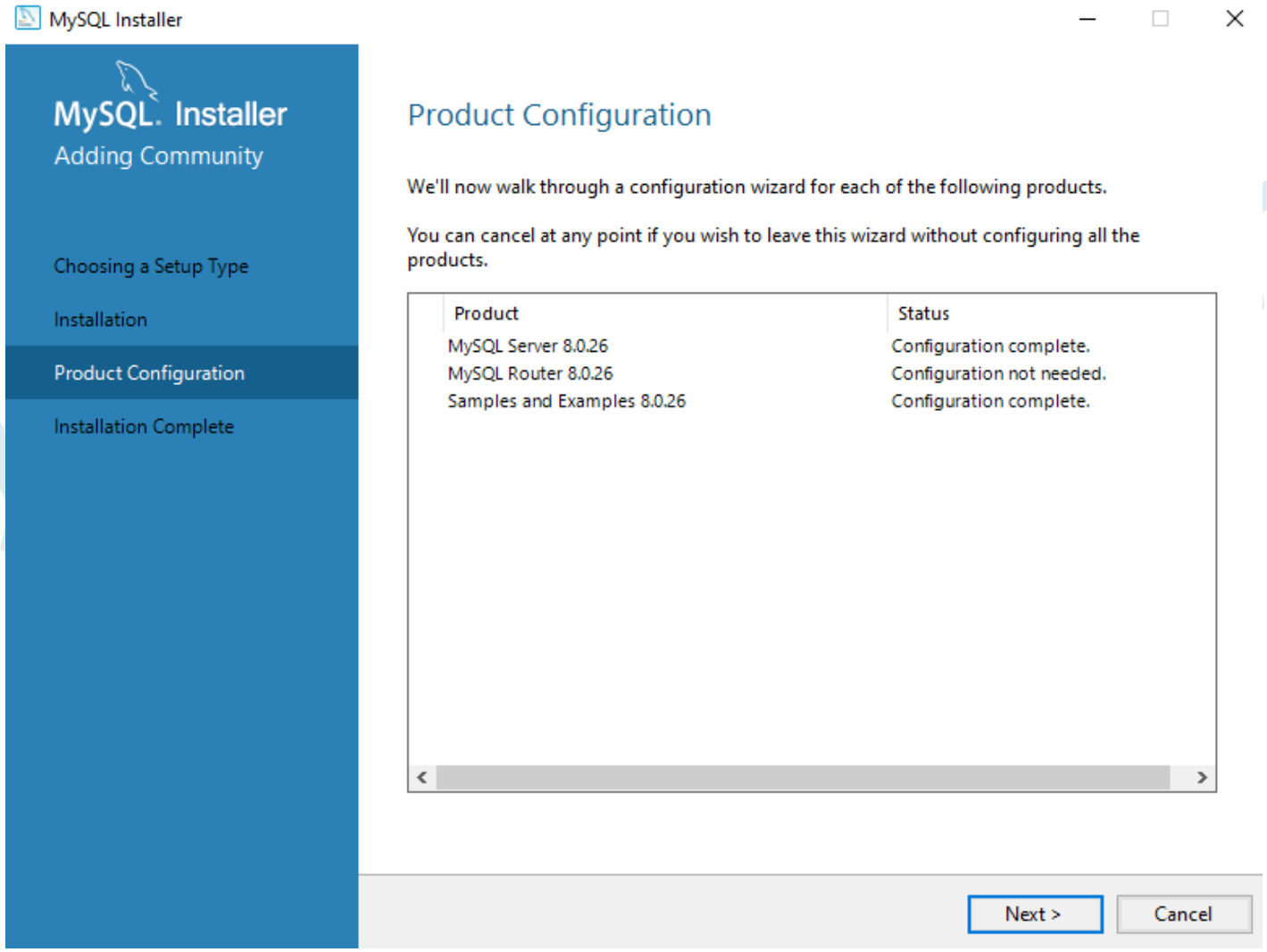

Installation

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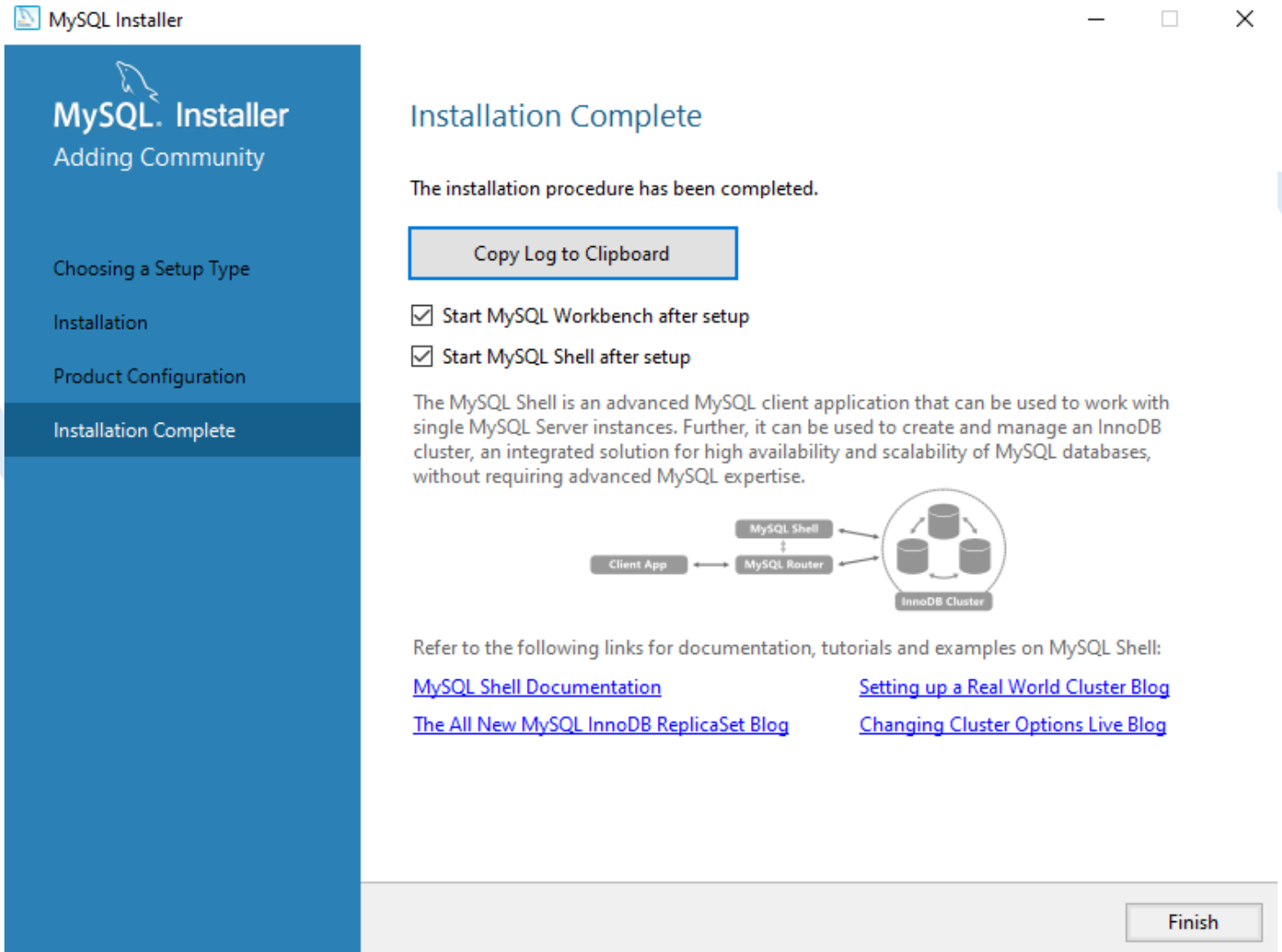
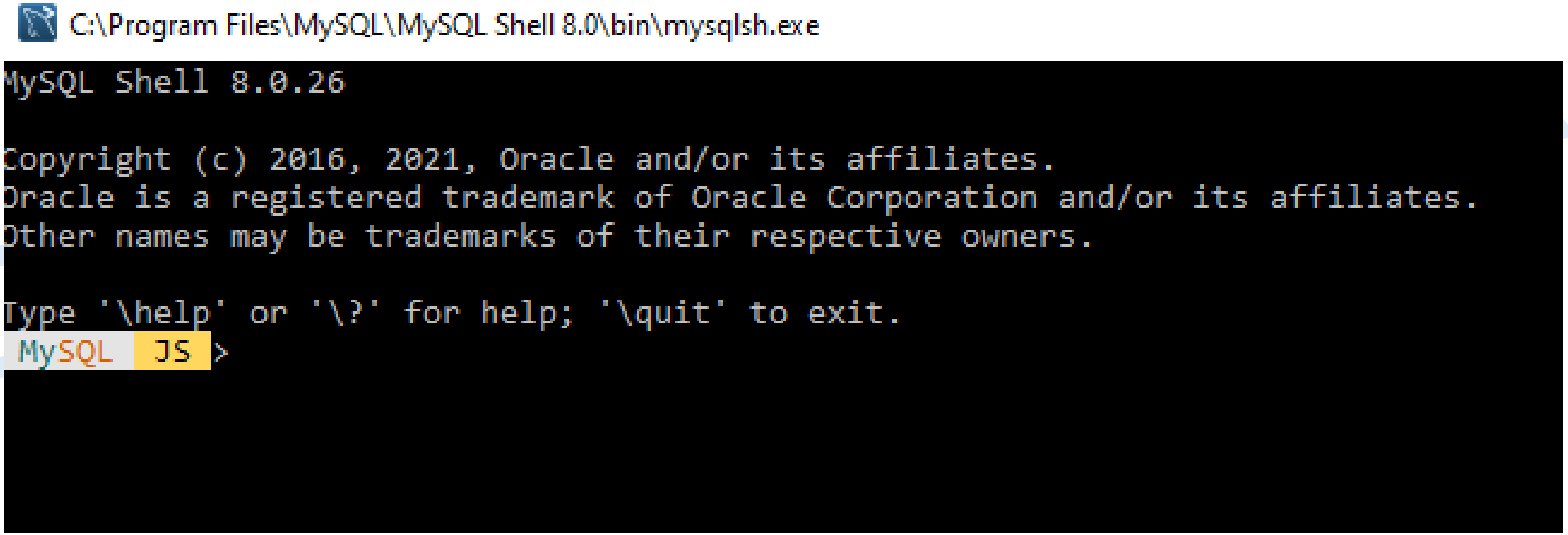
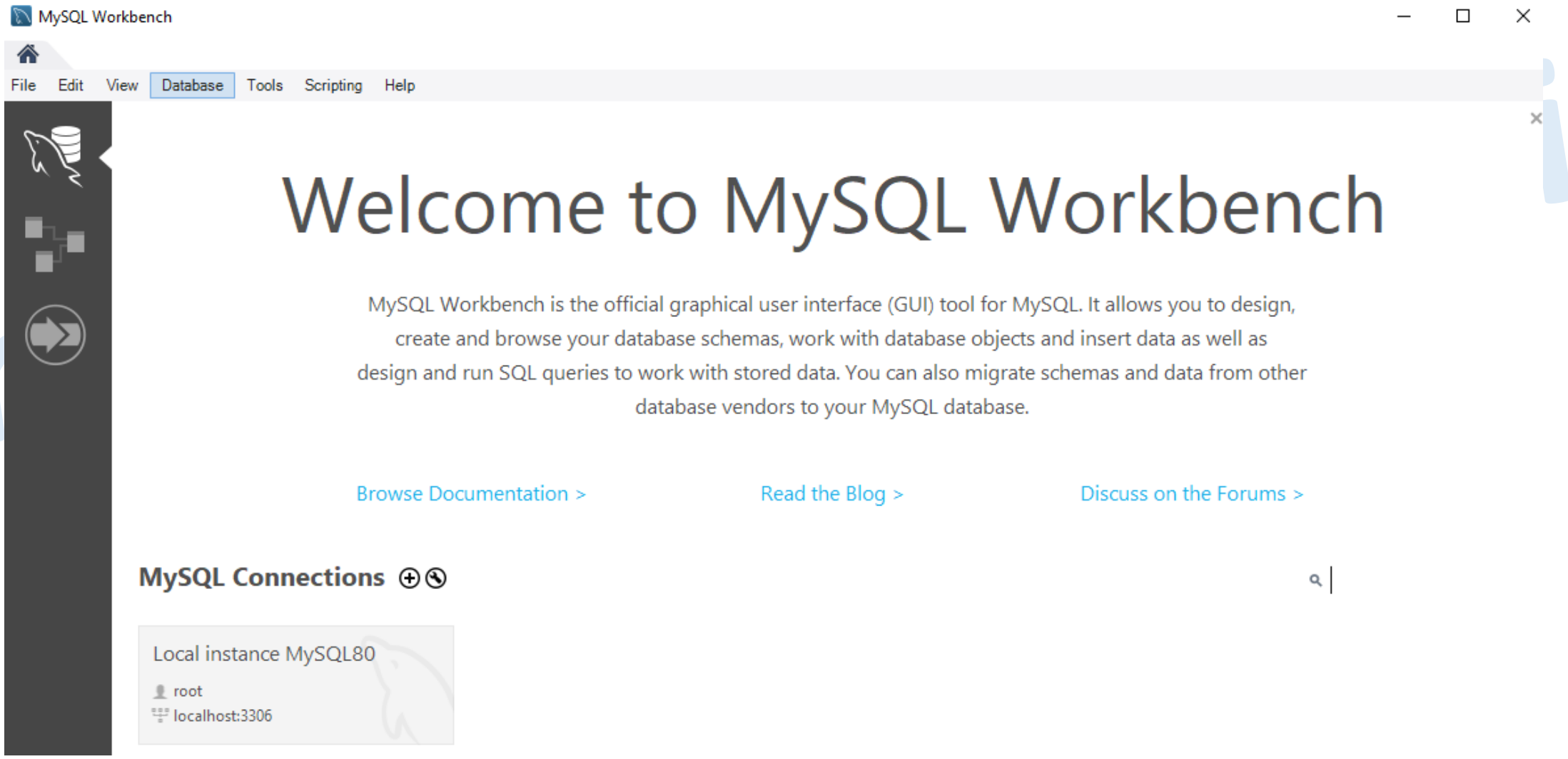


Installation: View of Shell



Installation: View of Workbench



SQL: Data Definition Language (DDL)

- The DDL commands in SQL are used to create database schema and to define the type and structure of the data that will be stored in a database.
- SQL DDL commands are further divided into the following major categories:
  - CREATE: The CREATE query is used to create a database or objects such as tables, views, stored procedures, etc.
  - ALTER: alters the structure of the existing database
  - DROP: delete objects from the database
  - TRUNCATE: remove all records from a table, including all spaces allocated for the records are removed

SQL: DDL: CREATE

- Database
  - `CREATE DATABASE LibraryDB;`
- Table
  - CREATE TABLE Books
    (
    Id INT (1),
    Name VARCHAR (50),
    Price INT (10)
    );

Data type

- A Data Type in SQL server is defined as the type of data that any column or variable can store.
- It is a type of data that an object holds like integer, character, string, etc.
- An SQL developer must decide what type of data that will be stored inside each column when creating a table.
- While creating any table or variable, in addition to specifying the name, you also set the Type of Data it will store.
- The data type is a guideline for SQL to understand what type of data is expected inside of each column, and it also identifies how SQL will interact with the stored data.
- In MySQL there are three main data types: string, numeric, and date and time.

Data Type: String

Data type	Description
CHAR(size)	A FIXED length string (can contain letters, numbers, and special characters). The *size* parameter specifies the column length in characters - can be from 0 to 255. Default is 1
VARCHAR(size)	A VARIABLE length string (can contain letters, numbers, and special characters). The *size* parameter specifies the maximum column length in characters - can be from 0 to 65535
BINARY(size)	Equal to CHAR(), but stores binary byte strings. The *size* parameter specifies the column length in bytes. Default is 1
VARBINARY(size)	Equal to VARCHAR(), but stores binary byte strings. The *size* parameter specifies the maximum column length in bytes.
TINYBLOB	For BLOBs (Binary Large OBjects). Max length: 255 bytes
TINYTEXT	Holds a string with a maximum length of 255 characters

Data Type: String

TEXT(size)	Holds a string with a maximum length of 65,535 bytes
BLOB(size)	For BLOBs (Binary Large OBjects). Holds up to 65,535 bytes of data
MEDIUMTEXT	Holds a string with a maximum length of 16,777,215 characters
MEDIUMBLOB	For BLOBs (Binary Large OBjects). Holds up to 16,777,215 bytes of data
LONGTEXT	Holds a string with a maximum length of 4,294,967,295 characters
LONGBLOB	For BLOBs (Binary Large OBjects). Holds up to 4,294,967,295 bytes of data
ENUM(val1, val2, val3, ...)	A string object that can have only one value, chosen from a list of possible values. You can list up to 65535 values in an ENUM list. If a value is inserted that is not in the list, a blank value will be inserted. The values are sorted in the order you enter them
SET(val1, val2, val3, ...)	A string object that can have 0 or more values, chosen from a list of possible values. You can list up to 64 values in a SET list

Data Type: Numeric

Data type	Description
BIT(*size*)	A bit-value type. The number of bits per value is specified in *size*. The *size* parameter can hold a value from 1 to 64. The default value for *size* is 1.
TINYINT(*size*)	A very small integer. Signed range is from -128 to 127. Unsigned range is from 0 to 255. The *size* parameter specifies the maximum display width (which is 255)
BOOL	Zero is considered as false, nonzero values are considered as true.
BOOLEAN	Equal to BOOL
SMALLINT(*size*)	A small integer. Signed range is from -32768 to 32767. Unsigned range is from 0 to 65535. The *size* parameter specifies the maximum display width (which is 255)
MEDIUMINT(*size*)	A medium integer. Signed range is from -8388608 to 8388607. Unsigned range is from 0 to 16777215. The *size* parameter specifies the maximum display width (which is 255)
INT(*size*)	A medium integer. Signed range is from -2147483648 to 2147483647. Unsigned range is from 0 to 4294967295. The *size* parameter specifies the maximum display width (which is 255)

Data Type: Numeric

INTEGER(*size*)	Equal to INT(size)
BIGINT(*size*)	A large integer. Signed range is from -9223372036854775808 to 9223372036854775807. Unsigned range is from 0 to 18446744073709551615. The *size* parameter specifies the maximum display width (which is 255)
FLOAT(*size*, *d*)	A floating point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter. This syntax is deprecated in MySQL 8.0.17, and it will be removed in future MySQL versions
FLOAT(*p*)	A floating point number. MySQL uses the *p* value to determine whether to use FLOAT or DOUBLE for the resulting data type. If *p* is from 0 to 24, the data type becomes FLOAT(). If *p* is from 25 to 53, the data type becomes DOUBLE()
DOUBLE(*size*, *d*)	A normal-size floating point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter
DOUBLE PRECISION(*size*, *d*)	
DECIMAL(*size*, *d*)	An exact fixed-point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter. The maximum number for *size* is 65. The maximum number for *d* is 30. The default value for *size* is 10. The default value for *d* is 0.
DEC(*size*, *d*)	Equal to DECIMAL(size,d)

Data Type: Date and Time

Data type	Description
DATE	A date. Format: YYYY-MM-DD. The supported range is from '1000-01-01' to '9999-12-31'
DATETIME(*fsp*)	A date and time combination. Format: YYYY-MM-DD hh:mm:ss. The supported range is from '1000-01-01 00:00:00' to '9999-12-31 23:59:59'. Adding DEFAULT and ON UPDATE in the column definition to get automatic initialization and updating to the current date and time
TIMESTAMP(*fsp*)	A timestamp. TIMESTAMP values are stored as the number of seconds since the Unix epoch ('1970-01-01 00:00:00' UTC). Format: YYYY-MM-DD hh:mm:ss. The supported range is from '1970-01-01 00:00:01' UTC to '2038-01-09 03:14:07' UTC. Automatic initialization and updating to the current date and time can be specified using DEFAULT CURRENT_TIMESTAMP and ON UPDATE CURRENT_TIMESTAMP in the column definition
TIME(*fsp*)	A time. Format: hh:mm:ss. The supported range is from '-838:59:59' to '838:59:59'
YEAR	A year in four-digit format. Values allowed in four-digit format: 1901 to 2155, and 0000. MySQL 8.0 does not support year in two-digit format.

Primary Key Constraint

- The PRIMARY KEY constraint uniquely identifies each record in a table.
- Primary keys must contain UNIQUE values, and cannot contain NULL values.
- A table can have only ONE primary key; and in the table, this primary key can consist of single or multiple columns (fields).

SQL: DDL: ALTER

- The ALTER command in SQL DDL is used to modify the structure of an already existing table.
- Add primary key:
  - ALTER TABLE Books
    ADD PRIMARY KEY (Id);
- Add new column:
  - ALTER TABLE Books
    ADD Year year;

```
ALTER TABLE Books
ADD Publisher varchar(50),
ADD AuthorName varchar(50);
```

- Modify the data type of a column:
  - ALTER TABLE Books
    MODIFY COLUMN Price float(10,2);

SQL: DDL: ALTER

- Modify the column name:
  - ALTER TABLE Books
    RENAME COLUMN AuthorName TO FirstName,
    ADD LastName varchar(50);
- Modify table name:
  - ALTER TABLE Books RENAME Book_Details;
- Drop a column:
  - ALTER TABLE Book_Details
    DROP COLUMN Publisher;
- Add NOT NULL constraint:
  - ALTER TABLE Book_Details
    MODIFY Name varchar(50) NOT NULL;

SQL: DDL: DROP and TRUNCATE

- Drop a column:
  - ALTER TABLE Book_Details
    DROP COLUMN Publisher;
- The DROP TABLE statement is used to drop an existing table in a database.
  - DROP TABLE Book_Details;
- Drop the database:
  - DROP DATABASE libraryDB;
- The TRUNCATE TABLE statement is used to delete the data inside a table, but not the table itself.
  - TRUNCATE TABLE Book Details;

SQL: DML

- DML is short name of **Data Manipulation Language** which deals with data manipulation and includes most common SQL statements such as
  - SELECT: Used to query or fetch selected fields or columns from a database table.
  - INSERT: Used to insert new data records or rows in the database table
  - UPDATE: Used to set the value of a field or column for a particular record to a new value
  - DELETE: Used to remove one or more rows from the database table

SQL: DML: INSERT

- Specify both the column names and the values to be inserted:
  - INSERT INTO *table_name* (*column1*, *column2*, *column3*, ...)
    VALUES (*value1*, *value2*, *value3*, ...);
- If you are adding values for all the columns of the table, you do not need to specify the column names in the SQL query.
  - INSERT INTO *table_name*
    VALUES (*value1*, *value2*, *value3*, ...);
- Insert data in specific columns.
  - INSERT INTO *table_name* (*column2*, *column5*, *column6*)
    VALUES (*value1*, *value2*, *value3*);

SQL: DML: SELECT and SELECT DISTINCT

- The field names of the table you want to select data from:
  - SELECT *column1*, *column2, ...*
    FROM *table_name*;
- If you want to select all the fields available in the table, use the following syntax:
  - SELECT * FROM *table_name*;
- We can also populate one table using another table with the help of select statement. The only condition is that the table must have the same sets of attributes.
  - Insert into table_no_first [(column1, column 2…column n)]
    select column1, column 2…column n from table_no_two;
- Used to return only distinct (different) values.
  - SELECT DISTINCT *column1, column2, ...*
    FROM *table_name*;

SQL: DML: SELECT with where

- used to extract only those records that fulfill a specified condition.
  - SELECT *column1*, *column2, …*
    FROM *table_name*
    WHERE *condition*;
- SQL requires single quotes around text values (most database systems will also allow double quotes).
- However, numeric fields should not be enclosed in quotes.
- Operators → =, >, <, <>, >=, <=, BETWEEN, LIKE, IN

SQL: DML: SELECT with AND, OR, NOT

- The AND operator displays a record if all the conditions separated by AND are TRUE.
  - SELECT *column1*, *column2, ...*
    FROM *table_name*
    WHERE *condition1* AND *condition2* AND *condition3 ...*;
- The OR operator displays a record if any of the conditions separated by OR is TRUE.
  - SELECT *column1*, *column2, ...*
    FROM *table_name*
    WHERE *condition1* OR *condition2* OR *condition3 ...*;
- The NOT operator displays a record if the condition(s) is NOT TRUE.
  - SELECT *column1*, *column2, ...*
    FROM *table_name*
    WHERE NOT *condition*;
- Combine:
  - SELECT * FROM students WHERE student_name LIKE 'r%' AND (course='C' OR roll_no between 2 and 4);

SQL: DML: SELECT with ORDER BY

- Used to sort the result-set in ascending or descending order.
- Sorts the records in ascending order by default. To sort the records in descending order, use the DESC keyword.
  - SELECT *column1*, *column2, ...*
    FROM *table_name*
    ORDER BY *column1, column2, ...* ASC|DESC;
- ORDER BY Several Columns: Means that it orders by column1, but if some rows have the same column1 value, it orders them by column2:
  - SELECT * FROM *table_name*
    ORDER BY *column1, column2*;
  - SELECT * FROM *table_name*
    ORDER BY *column1* ASC, *column2* DESC;

SQL: DML: SELECT with GROUP BY

- groups rows that have the same values into summary rows
  - ```
    SELECT column_name(s)
    FROM table_name
    WHERE condition
    GROUP BY column_name(s)
    ORDER BY column_name(s);
    ```
  - ```
    SELECT COUNT(roll_no), course
    FROM students
    GROUP BY course; #lists the number of students in each course
    ```
  - ```
    SELECT COUNT(roll_no), course
    FROM students
    GROUP BY course
    ORDER BY COUNT(roll_no) DESC; #number of students in each course, sorted high to low
    ```
    ```

SQL: DML: SELECT with NULL and NOT NULL

- SELECT *column_names*
  FROM *table_name*
  WHERE *column_name* IS NULL;

- SELECT *column_names*
  FROM *table_name*
  WHERE *column_name* IS NOT NULL;

SQL: DML: SELECT with HAVING

- The HAVING clause was added to SQL because the WHERE keyword cannot be used with aggregate functions.
  - ```
    SELECT column_name(s)
    FROM table_name
    WHERE condition
    GROUP BY column_name(s)
    HAVING condition
    ORDER BY column_name(s);
    ```
  - ```
    SELECT COUNT(roll_no), course
    FROM students
    GROUP BY course
    HAVING COUNT(roll_no) > 1; #lists the number of students in each course with more than 1 student
    ```

SQL: DML: SELECT with Aggregate Functions

- MIN() Syntax: returns the smallest value of the selected column
  - SELECT MIN(*column_name*) FROM *table_name* WHERE *condition*;
- MAX() Syntax: returns the largest value of the selected column
  - SELECT MAX(*column_name*) FROM *table_name* WHERE *condition*;
- COUNT() Syntax: returns the number of rows that matches a specified criterion
  - SELECT COUNT(*column_name*) FROM *table_name* WHERE *condition*;
- AVG() Syntax: returns the average value of a numeric column
  - SELECT AVG(*column_name*) FROM *table_name* WHERE *condition*;
- SUM() Syntax: returns the total sum of a numeric column
  - SELECT SUM(*column_name*) FROM *table_name* WHERE *condition*;

SQL: DML: UPDATE

- UPDATE *table_name*
  SET *column1 = value1, column2 = value2, ...*
  WHERE *condition*;
- UPDATE Multiple Records: update the column1 to value1 for all records where the condition is true
  - UPDATE *table_name*
    SET *column1 = value1*
    WHERE *condition*;
- Warning
  - Be careful when updating records. If you omit the WHERE clause, ALL records will be updated!
  - UPDATE *table_name*
    SET *column1 = value1*;

SQL: DML: DELETE

- `DELETE FROM table_name WHERE condition;`
- `DELETE FROM table_name;` [to delete all records]