Lab 1. Using MySQL Workbench to create an ER model and a new database schema

The labs require MySQL Community version. You can download MySQL Community from https://dev.mysql.com/downloads/. For Windows system the easiest way is to download MySQL Installer from https://dev.mysql.com/downloads/installer/.

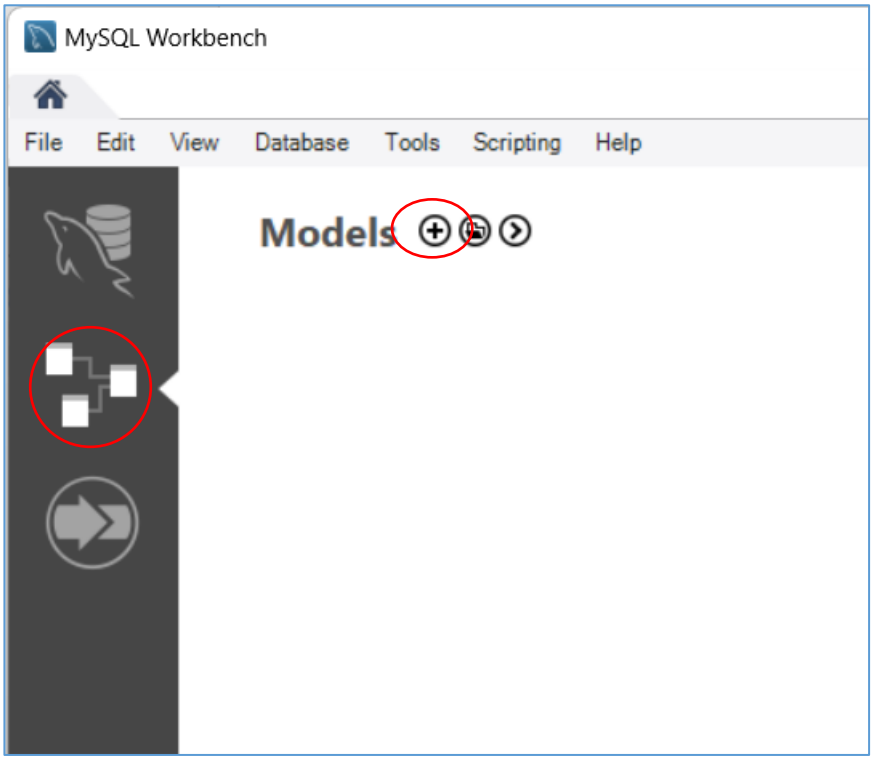
A few tips for installation:

- Install the "full" package, when you are asked to select installation options.
- During configuration, there is no need to change anything.
- You need to set the MySQL Root Password and you must remember this password.

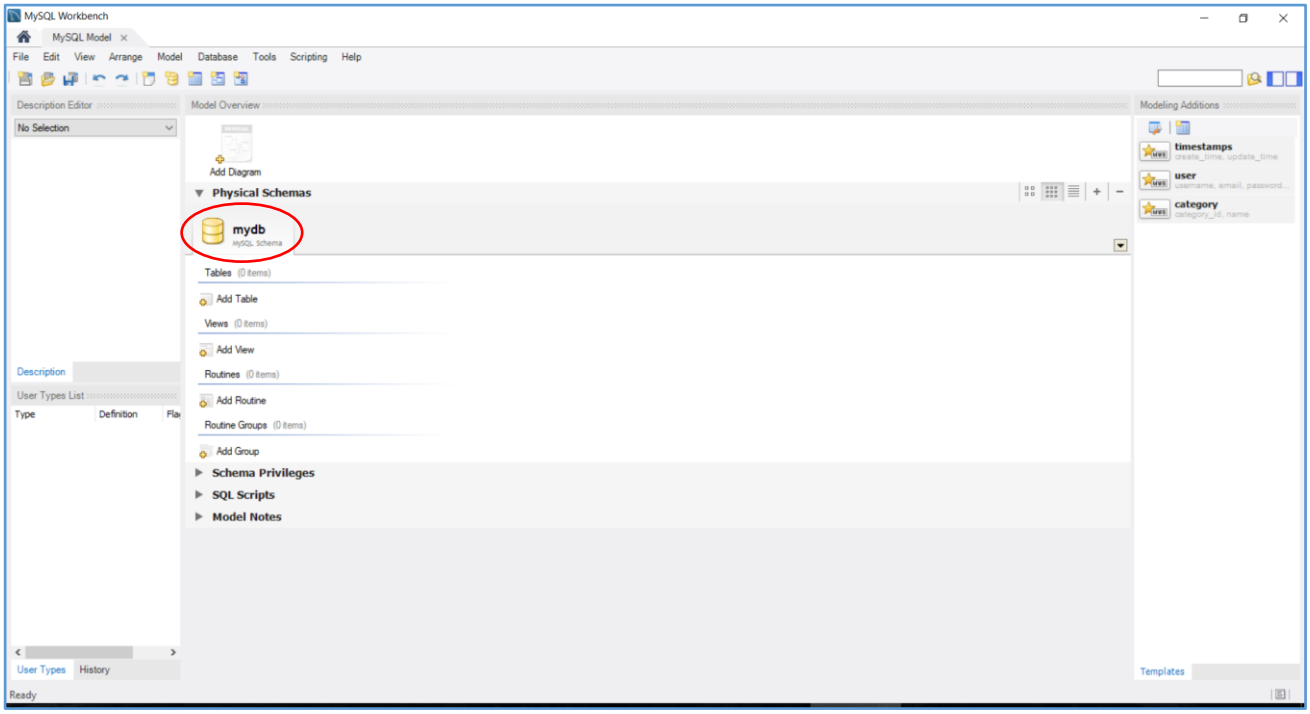
For Lab 1 you will need to use MySQL Workbench to design and implement the DreamHome Database (which will be used for later labs). After you have installed MySQL Community, follow the step-by-step guide below.

Part I. Using MySQL to create an ER model

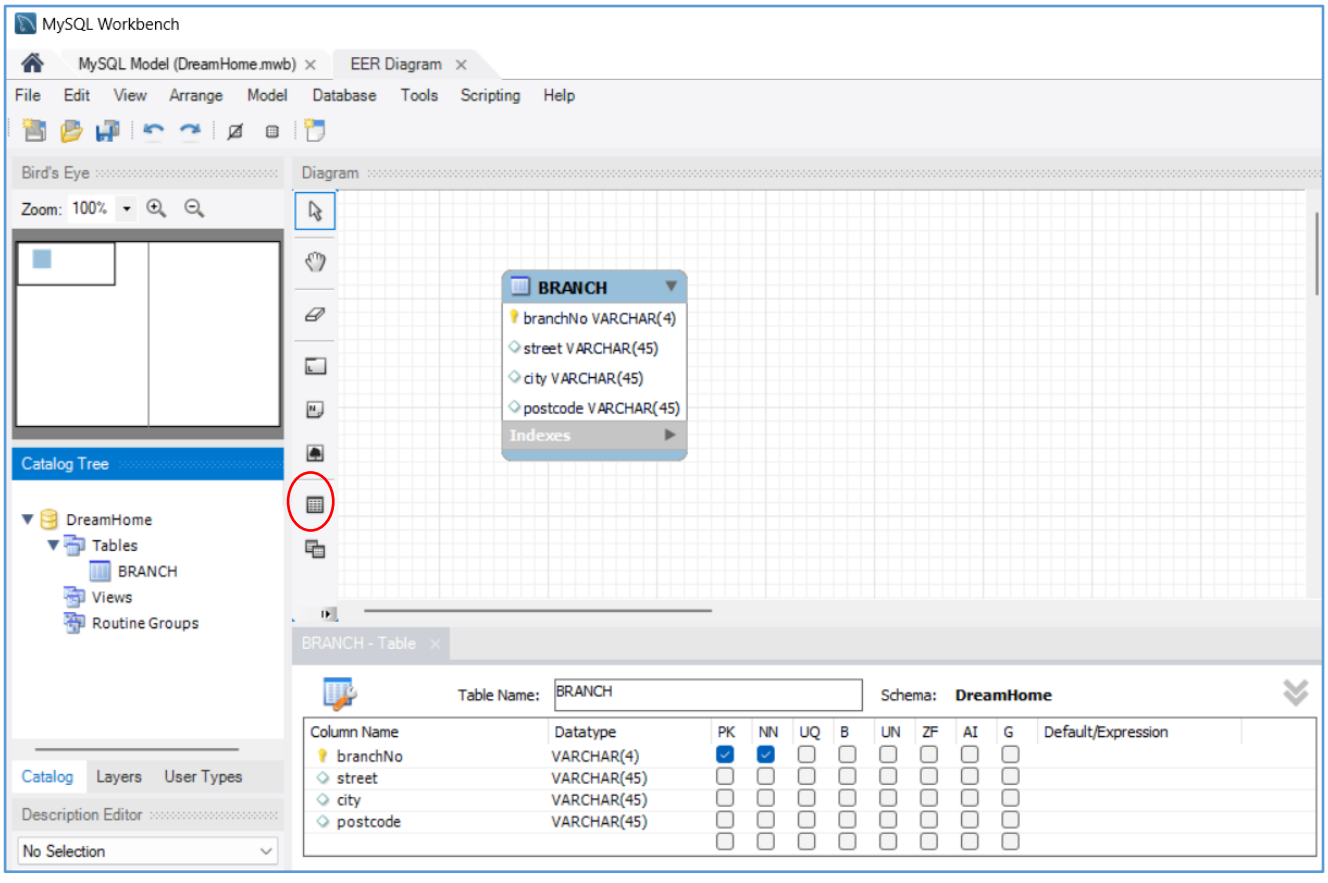
Open MySQL Workbench. Click the "Models" tab from Workbench homepage, then click the "+" icon (Add new diagram icon) to create a new EER model.



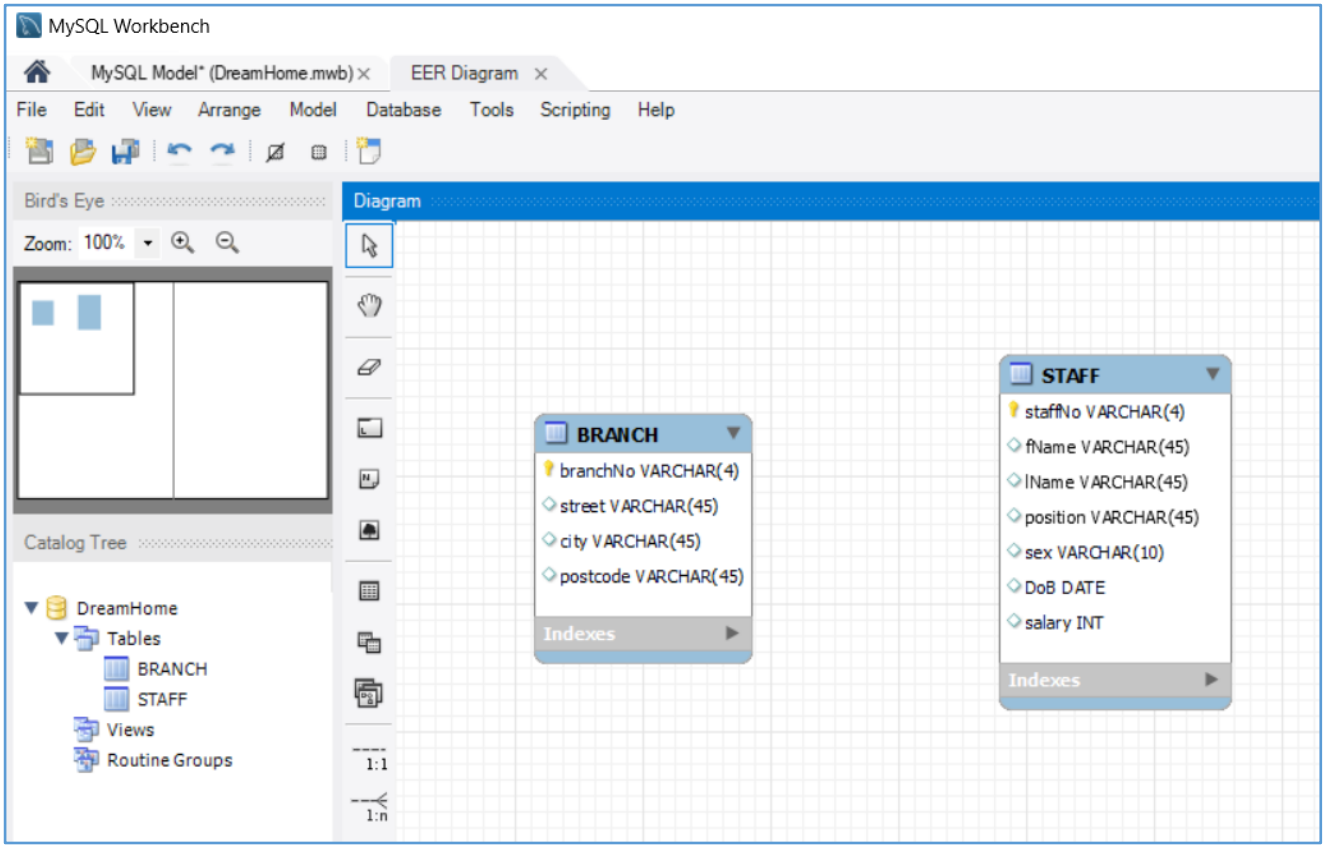
Then you will see the new model page as below. Right click on "mydb", then choose "Edit Schema", rename the schema to "DreamHome".



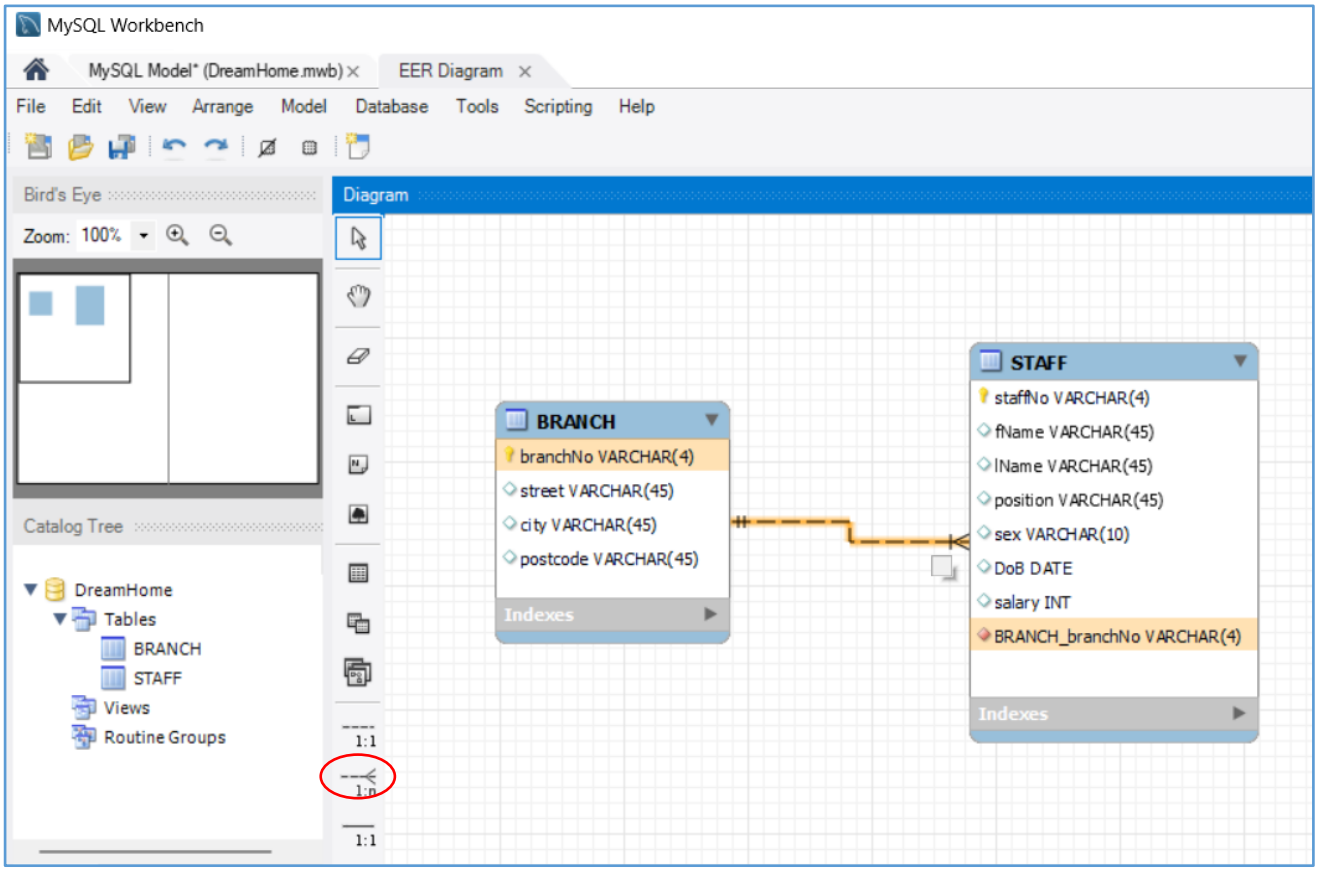
Once the schema is renamed to “DreamHome”, double-click on “Add Diagram”. In the EER Diagram view, click on the “Place a New Table” icon, and create a new table called “BRANCH” and add the attributes as below. For primary key attributes, you need to tick “PK” and “NN”, which is used to indicate this attribute is primary key and cannot be NULL.



Following the last step, create another table called “STAFF” as below.



Now create the relationship of "A branch may have many staff" by adding a 1:m relationship: click on the "Place a New 1:n Non-identifying relationship" icon. Click on the "STAFF" table first, then click on the "BRANCH" table. You should see a new relationship with foreign key attribute added in "STAFF" table as below. (The foreign key in STAFF table is created automatically and is called "BRANCN_branchNo", for simplicity you may change the name of the foreign key attribute to "branchNo". You will find in this guide the foreign key names are changed in later pictures.)



Note on ***identifying relationship*** and ***non-identifying relationship*** (see also https://dev.mysql.com/doc/workbench/en/wb-relationship-tools.html):

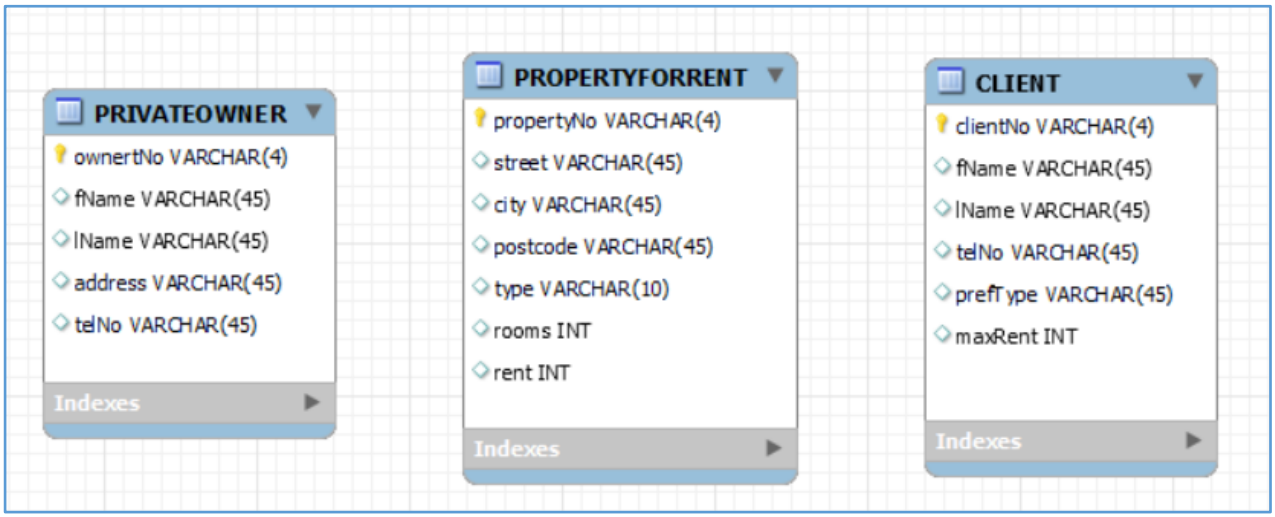
- An identifying relationship: identified by a solid line between tables

  An **identifying relationship** is **one where the child table cannot be uniquely identified without its parent**. Typically this occurs where an intermediary table is created to resolve a **many-to-many** relationship. In such cases, the primary key is usually a composite key made up of the primary keys from the two original tables.

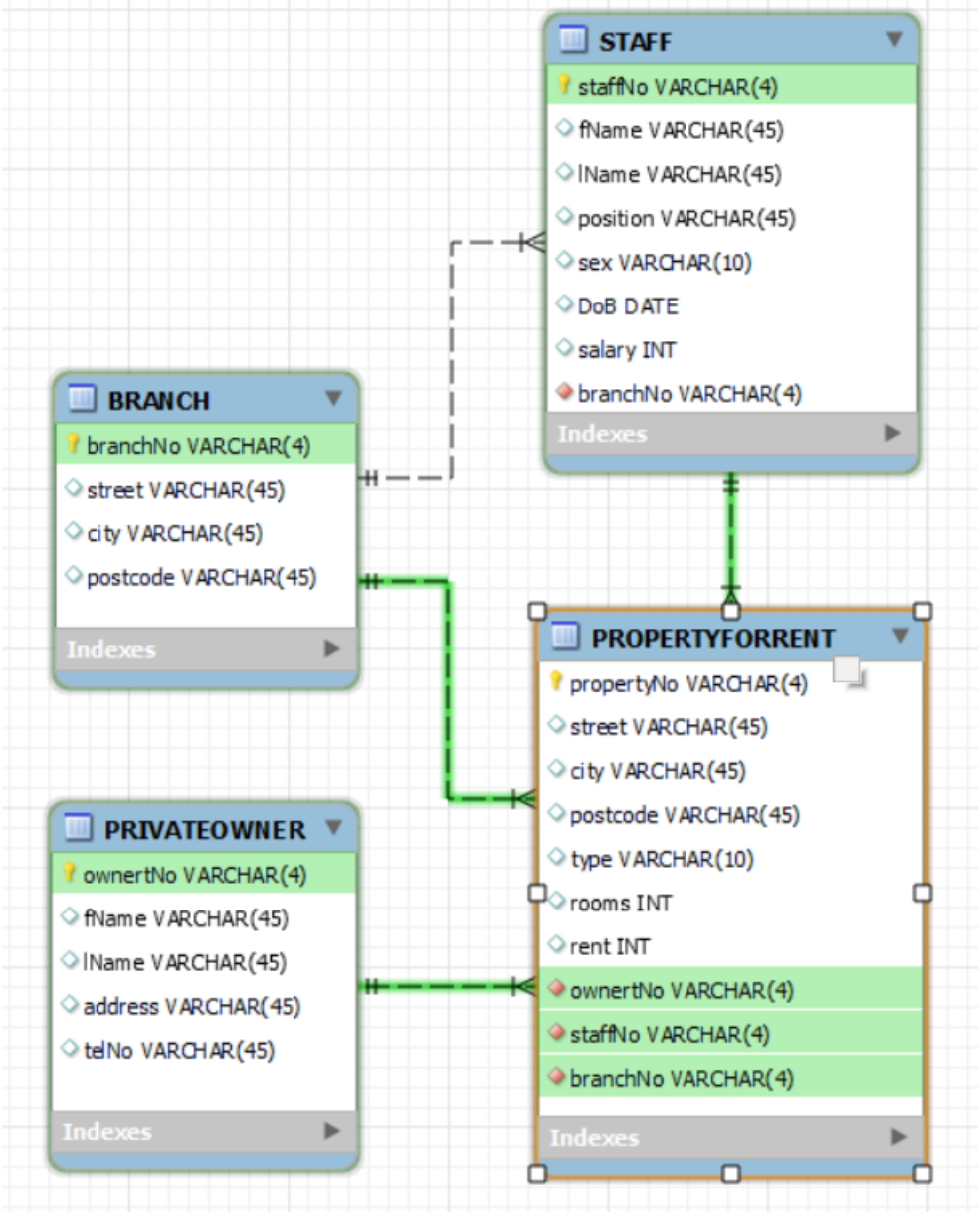
- A **non-identifying relationship**: identified by a broken (dashed) line between tables

  Create or drag and drop the tables that you wish to connect. Ensure that there is a primary key in the table that will be on the "one" side of the relationship. Click on the appropriate tool for the type of relationship you wish to create. If you are creating a **one-to-many** relationship, first click the table that is on the "**many**" side of the relationship, then on the table containing the referenced key. This creates a column in the table on the many side of the relationship. The default name of this column is `table_name_key_name` where the table name and the key name both refer to the table containing the referenced key.

Following the steps above, create the other tables: "PROPERTYFORRENT", "CLIENT", "PRIVATEOWNER", as below:

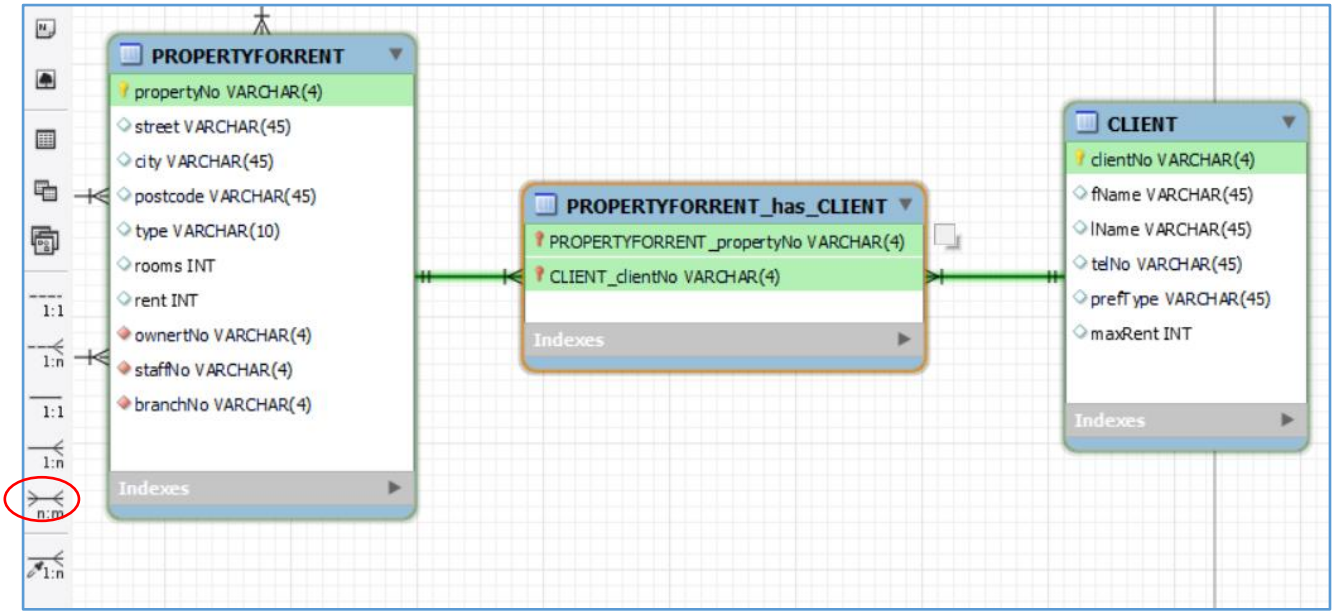


Then create their relationships: Private owners own properties for rent (1:m), staff are responsible for properties (1:m), properties are registered at one branch only (1:m), following the example of creating the 1:m relationship between BRANCH and STAFF earlier. You should now have the following relationships:

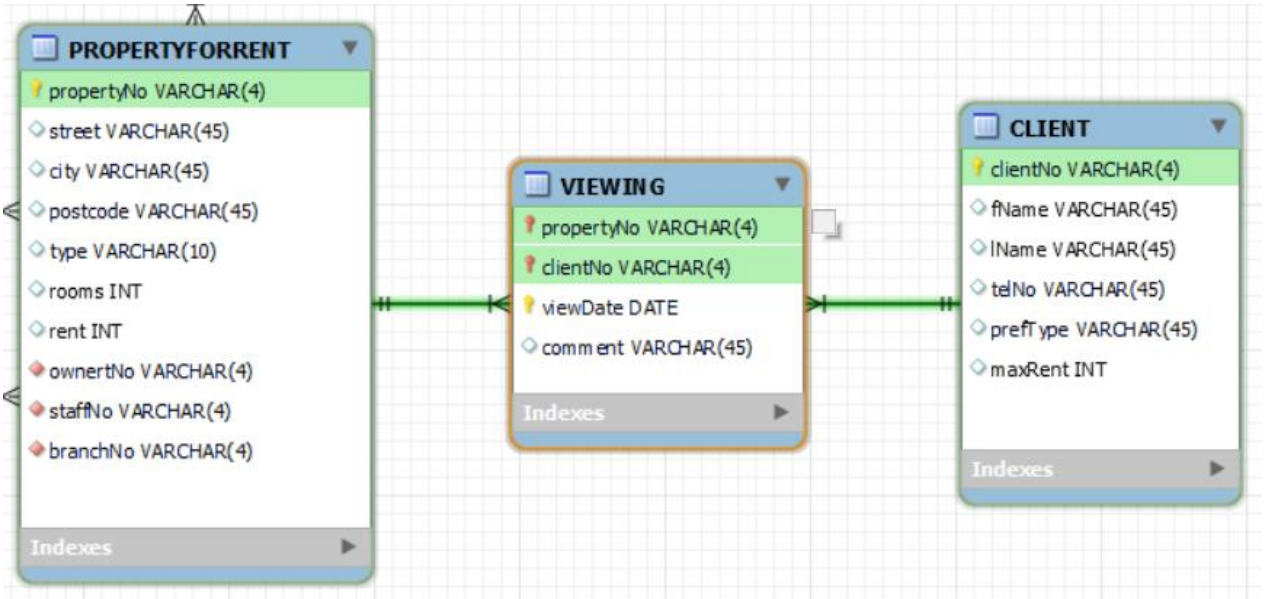


Next step is creating the m:m relationship of “Clients view properties for rent”. Click on the “Place a New n:m Identifying Relationship” button, then click on “PROPERTYFORRENT” table, then click on “CLIENT” table, you will have the m:m relationship as below.

Note when you add “m:m” relationship in MySQL Workbench, an associative relationship will be **automatically created** when you click on the two tables (entities) with many-to-many relationship.

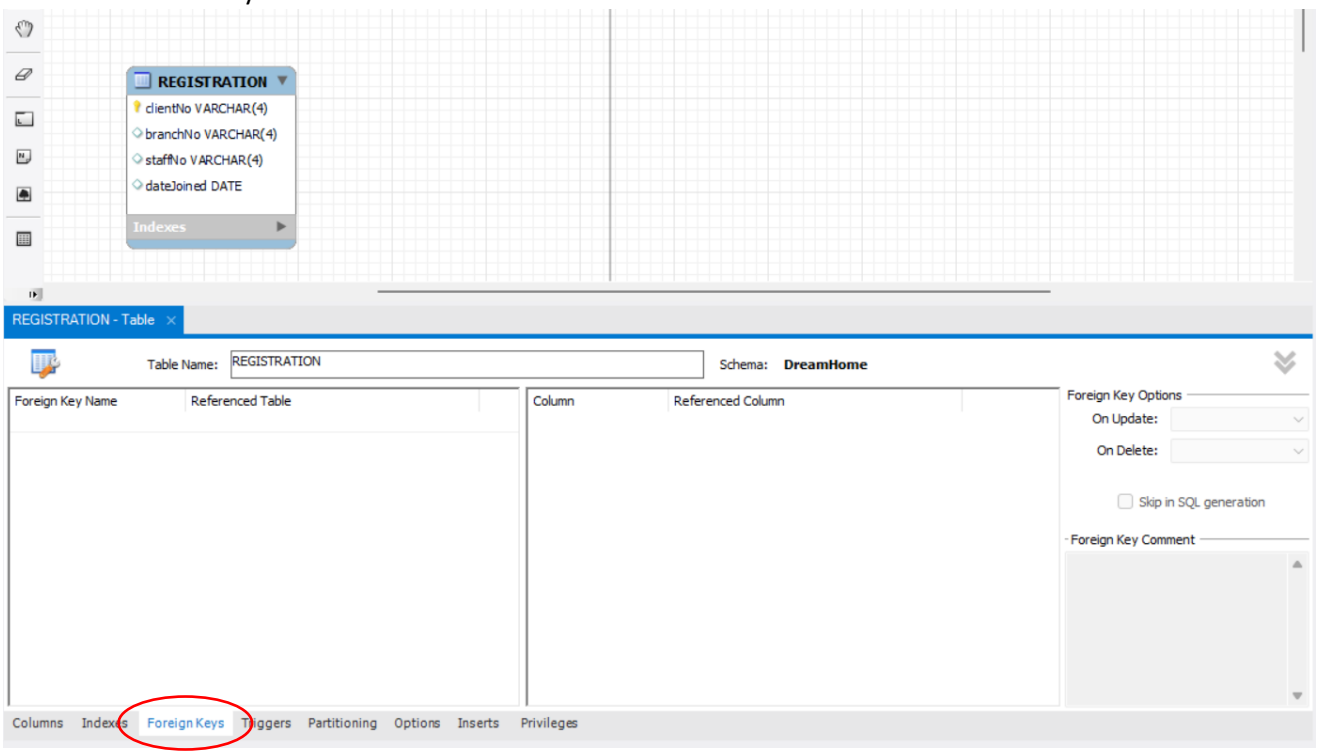


You can then change the name of the associative entity to "VIEWING". You need to add extra attributes related to the m:m relationship, e.g. the "viewDate" and "comment" attributes are attributes we would like to record for the associative entity "VIEWING". Also bear in mind if extra attributes should be made part of primary key (viewDate). The m:m relationship of clients view properties for rent looks like this:

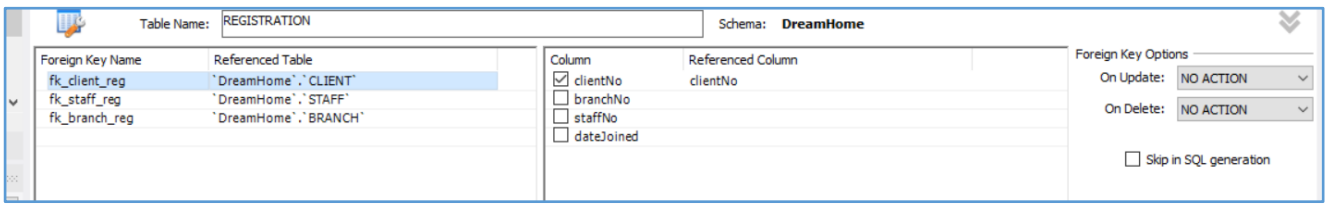


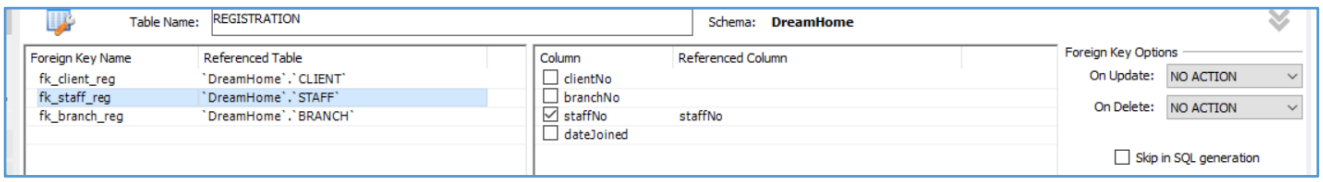
Note: **You will need to modify the foreign key attributes names** after using MySQL Workbench to add relationships/foreign keys. E.g., the foreign key attribute "BRANCH_BranchNo" should be changed to "BranchNo", to match the DreamHome database attribute names. Do this for all foreign key attributes once you have created the relationship.

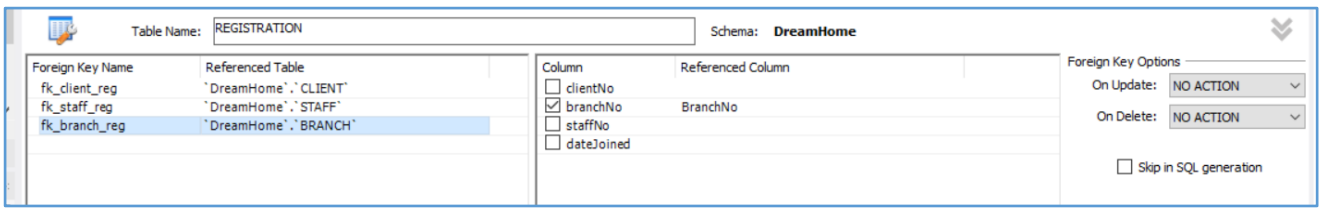
When creating the **ternary relationship** of "A client is registered at a branch by a staff member", first create a table in the diagram called "REGISTRATION", then add attributes for the table: clientNo, branchNo, staffNo and dateJoined. In order to create the relationship, in the editing tab click on "Foreign keys" to add the foreign key constraints by hand. See figure below:



Then fill in the foreign key name, choose referenced table, and referenced column for each of the foreign keys as below:



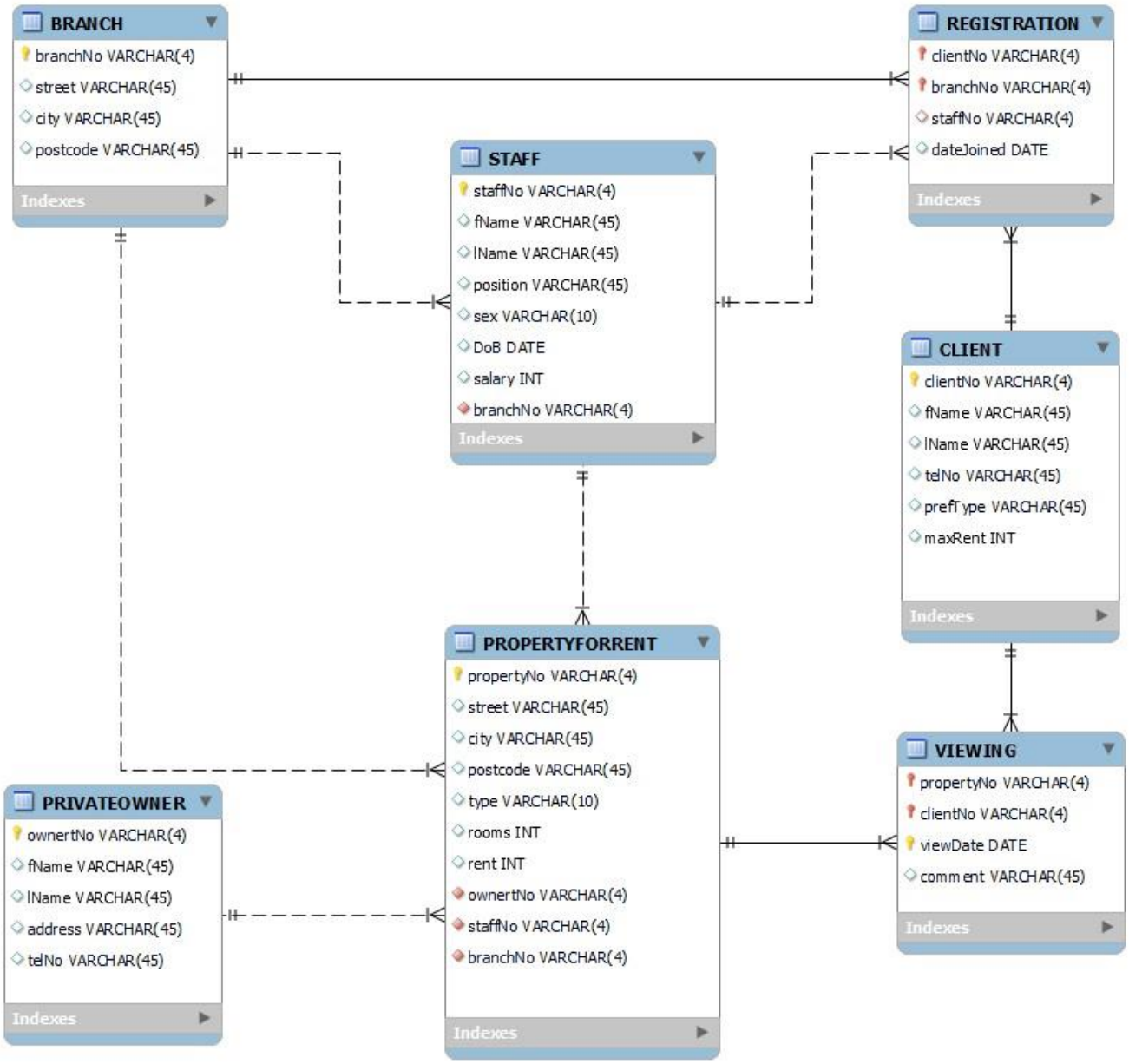




We *assume* that one client can be registered in different branches, but one client can only be registered by one staff for each branch. Primary key for table REGISTRATION would be clientNo and branchNo.

Now we have the ER diagram for DreamHome database.

The finished ER diagram looks like this:

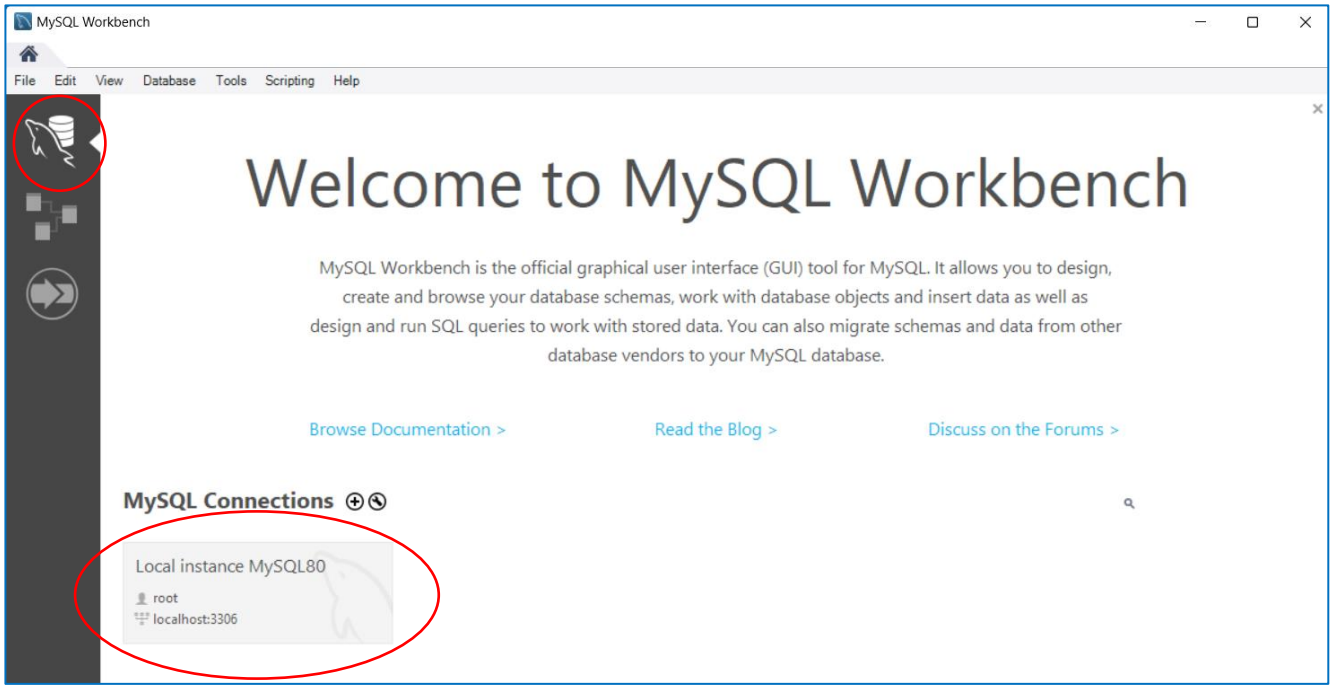


Part II. Using MySQL Workbench to create a database (or "*schema*" as in MySQL Workbench)

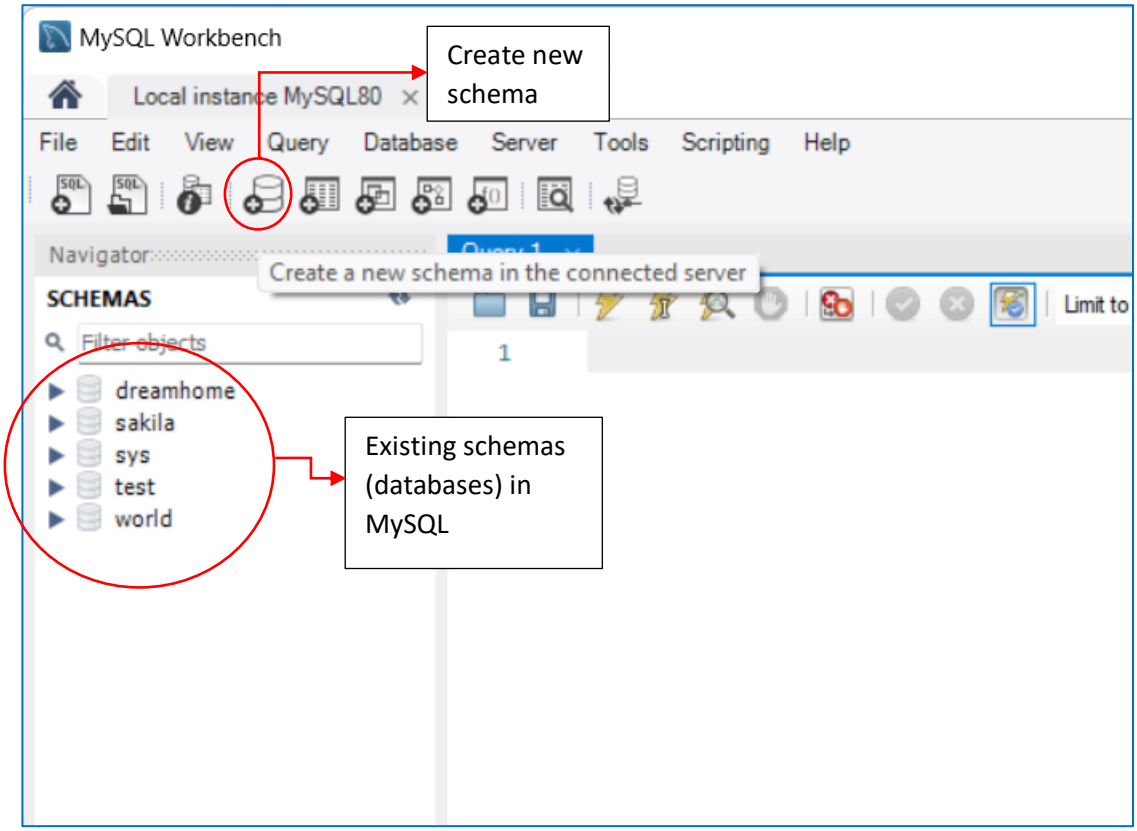
There are two different ways of creating database/schema in MySQL Workbench: 1, creating schema manually or 2, creating schema using forward engineering tool from the created ER model.

1. Creating a schema manually.

Go to "MySQL connections" in Home Screen:



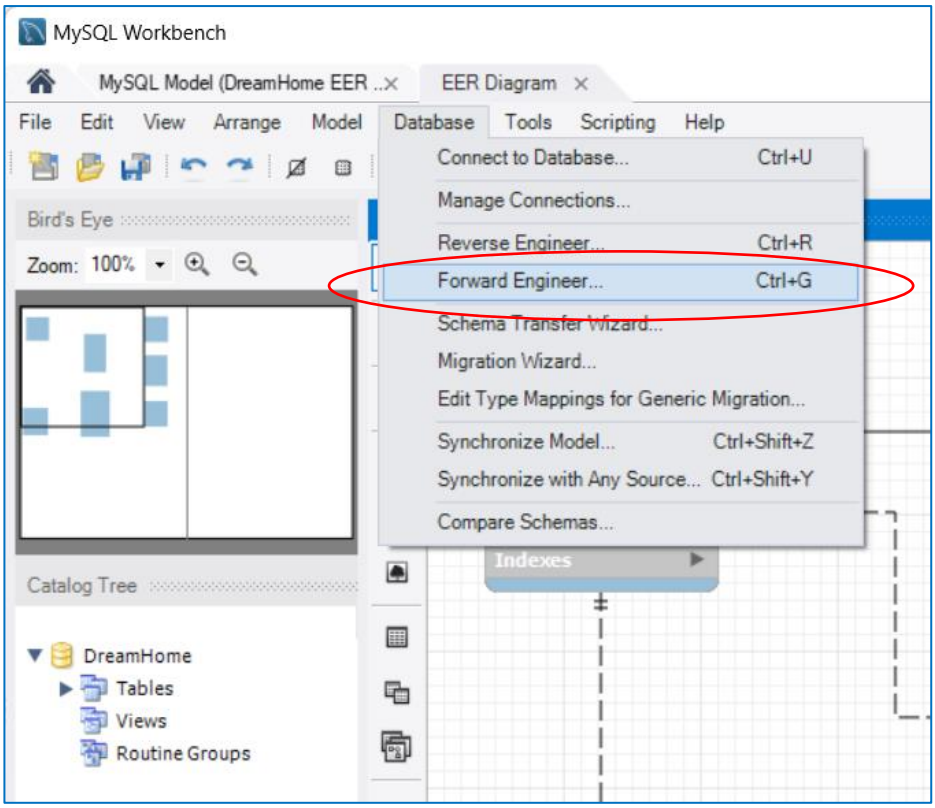
Click on a connection to establish a connection and you will see a separate tab in MySQL Workbench like the figure below. Click on the icon for "create a new schema", then you can follow the on-screen instructions to create a schema. Once the new schema is created, click on the "Create a new table" to create all tables designed for the database schema. Note the new table will be created in the active schema in the connected server. (See also https://dev.mysql.com/doc/workbench/en/wb-tables-physical-schemata.html)



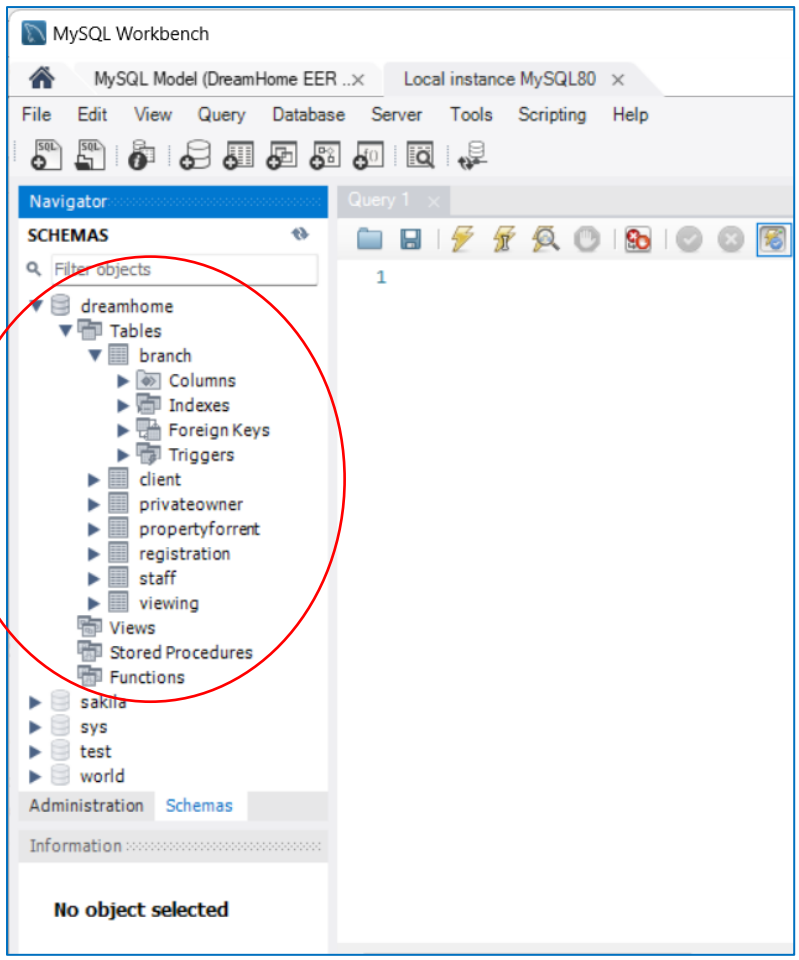
2. Creating a schema using "Forward engineering tool".

Go to "DreamHome" model panel and click on the "Forward Engineer" menu choice under "Database" as figure below. Following on-screen steps and create a new database schema from existing DreamHome ER model. For details see https://dev.mysql.com/doc/workbench/en/wb-

forward-engineering-live-server.html. If you come across error messages during forward engineering process, read the error messages carefully and change your EER diagram accordingly.



Now in your connection panel, you should see the DreamHome schema as below:



You now have an implemented DreamHome Database.