VIETNAM NATIONAL UNIVERSITY, HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY FACULTY OF COMPUTER SCIENCE AND ENGINEERING

DATABASE SYSTEMS LAB (CO2014)

Assignment 1 Report

HOSPITAL MANAGEMENT SYSTEM

Advisor: Dr. Trần Minh Quang

Class: CC08

Students: Nguyễn Hoàng 1952255
Cao Bá Huy 1952713
Lưu Chấn Hưng 1952063

HO CHI MINH CITY, OCTOBER 2021

Contents

1 Requirement description

In this hospital management database, we will store information about patient medical records. A PATIENT RECORD should contain a unique record number, the patient's first name and last name, gender, home address, day of birth, diagnosis, treatments, medical background and patientID. In this database, we consider a PATIENT as a RECORD to reduce the complexity, which means a record contains all the individual information of a patient and can be considered a patient also.

Secondly, we store the information about the hospital employees. An EMPLOYEE should have some basic attributes like: a unique EmployeeID, name, gender, day of birth, job type and salary. We assume there are 5 types of employees in this hospital which are: Doctor, Nurse, Receptionist, Technician and Driver. Each of them will inherit all the basic attributes above from the superclass Employee. Furthermore, each of them will have their own attributes and functionalities like:

- A DOCTOR should have a unique medical practising certificate id, medical degree, experience and specialty. A doctor will treat and be responsible for the treatment of multiple patients. The treatment start and end dates are also recorded. A patient can only have one doctor treating at one department to reduce complexity.

  We also store the department where each doctor belongs. A department will have a unique name, unique id and location. Moreover, a department will consist of many rooms where the patients stay in and a room can contain many patients. We will store some information about each room like room ID (unique), the number of beds left and room type. We also record the bed that a patient use, the dates where a patient uses the bed and leaves.

- A NURSE will have a medical degree and experience recorded in the system. A nurse can take care of multiple patients.

- A RECEPTIONIST will arrange the meeting between the patient and the doctor by maintaining an appointment record. An appointment record should have a unique id, date and time. Furthermore, patients can have many appointment records because they may want to consult with other doctors in different departments.

- A TECHNICIAN will have his/her own specialty such as: computer, electrical, thermal engineering, etc. A technician will manage many equipment that are installed in each room of each department. Additionally, we also store the data about the equipment like the unique equipment id, the type, bought date and the maintenance date.

- A DRIVER will have a unique license id and can only use 1 ambulance to transport the patients. The ambulance's number and license plate are also recorded.

Finally, information about the treatment of patients are recorded:

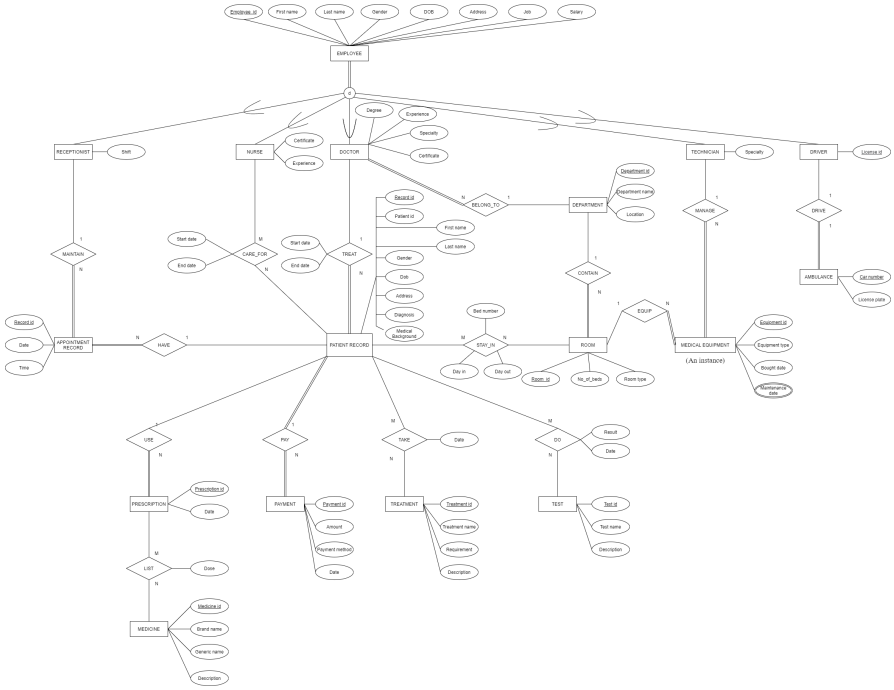
- A patient may have many medical PRESCRIPTIONS which include an id (unique) and the date. Each prescription can have many types of medicine and vice versa. A type of MEDICINE may have some information like ID (unique),

brand name, generic name and manual description. Dose of each prescription shall be recorded.

- Patients will have their own PAYMENT and this information should be stored. A PAYMENT will include a unique id, amount, method and date.
- We also save the TREATMENT that is provided for each patient record, a TREATMENT will have a treatment id (unique), treatment name, requirement and description. The date that the treatment is taken should be also saved.
- In order to indicate the problem a patient is having, the patient has to take one or many diagnostic tests. Data about the TEST such as the unique test id, test name and description should be collected. Additionally, the date and the result of the test are recorded too.

2 Conceptual design with ER diagram

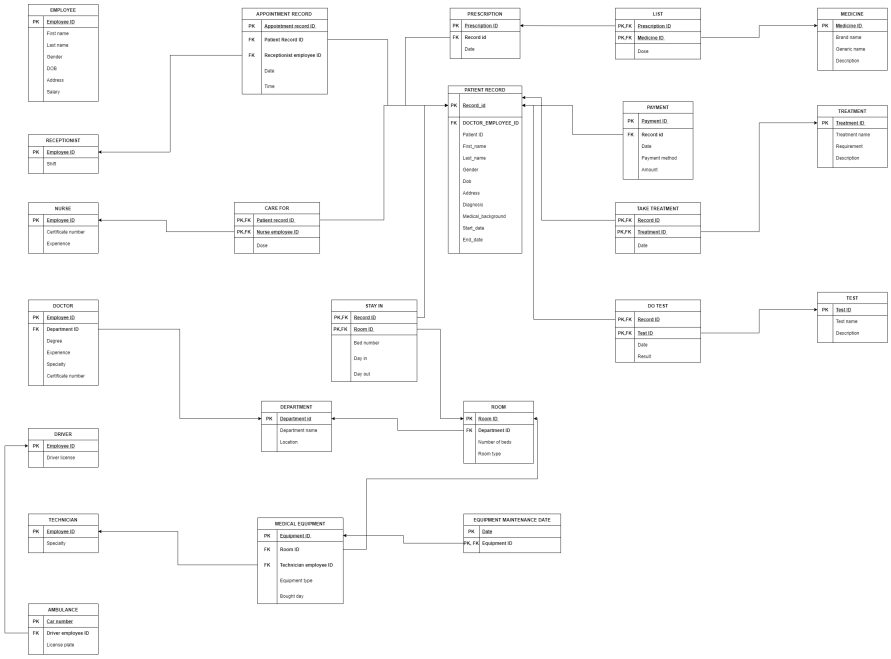
From the requirement description, we obtain the following ER diagram.



You can find a high quality version of this figure at https://i.imgur.com/2gl84iB.png.

3 Logical design

From the requirement description, we obtain the following ER diagram.



You can find a high quality version of this figure at https://i.imgur.com/iNemgZS.png.

4 Using MySQL Workbench for designing relational model.

4.1 Introduction to MySQL Workbench

- MySQL Workbench is a Visual database designing and modeling access tool for MySQL server relational database.
- The purpose of MySQL workbench is to provide the interface to work with databases more easily and in a more structured way.
- It facilitates creation of new physical data models and modification of existing MySQL databases with reverse/forward engineering and change management functions.

4.2 Pros

- MySQL workbench is GUI for MySQL, which is the most popula DBMS.
- MySQL workbench has a free (community) version
- Huge amount of resources and features . For example : Reverse engineering , forward engineering , data migration, ...
- Reverse and forward engineering make the database design process easy to perform.

4.3 Cons

- Only works for MySQL.
- Does not support collaboration.
- Some features are available only in paid versions.
- It is quite complicated and overkill to perform simple tasks.

5 Our choice of DBMS: MySQL

5.1 Some main features of MySQL

5.1.1 Data types

MySQL supports a variety of data types: signed and unsigned integers; 1, 2, 3, 4, and 8 bytes long FLOAT, DOUBLE; CHAR, VARCHAR,... MySQL also supports time data. For example: DATE, TIME, CHAR(n)...

5.1.2 MySQL is open-source

Any individual or enterprise may freely use, modify, publish, and expand on Oracle's open-source MySQL code base. The software is released under the GNU General Public License (GPL).

For MySQL code to be integrated or included in a commercial application (or if open-source software is not a priority), enterprises can purchase a commercially licensed version from Oracle.

5.1.3 Security

A privilege and password system that is very flexible and secure, and makes sure that only authorized users have access to the database. Password security by encryption of all password traffic when you connect to a server.

5.1.4 Compatible on many operating systems

MySQL is compatible to run on many operating systems, like Novell NetWare, Windows, Linux, many varieties of UNIX (such as Sun Solaris, AIX, and DEC UNIX), OS/2, FreeBSD, and others. MySQL also provides a facility that the clients can run on the same computer as the server or on another computer (communication via a local network or the Internet).

5.1.5 GUI Support

MySQL provides a unified visual database graphical user interface tool named "MySQL Workbench" to work with database architects, developers, and Database Administrators. MySQL Workbench provides SQL development, data modeling, data migration, and comprehensive administration tools for server configuration, user administration, backup, and many more. MySQL has a fully GUI supports from MySQL Server version 5.6 and higher.

5.2 Why we choose MySQL

- Our hospital management database is a relational database which describes the information and relationships between many tables (entities) so MySQL will be a good choice since this DBMS supports the management of relational database.
- MySQL contains records in multiple, separate, and highly codified tables which allows it to optimize actions like data retrieval, updating information, or more complex actions like aggregations better.
- The software is easy to install and also uses an event scheduler to schedule the tasks automatically.
- MySQL is designed to meet even the most demanding applications while ensuring optimal speed, full-text indexes and unique memory caches for enhanced performance.

6 Physical design and Implementation

6.1 Physical design

Previously, we have implemented a logical design for a database, and now we will implement the physical design by adding the datatype for each attribute.

Lets take the patient record as the illustration.

For the sake of simplicity, we decided that all IDs shall be integers, hence the following fields will be assigned INT:

- Record_id
- Patient_id
- DOCTOR_employee_id

A patient record contains some information about time, hence the following fields are assigned DATETIME:

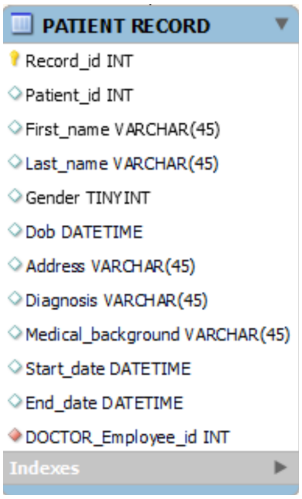
- Dob
- Start_date
- End_date

Our record also contains information like names, which can only be stored as strings. MySQL does not have an actual string, so we used VARCHAR instead. We decided that 45 characters is sufficient, hence we use VARCHAR45 for these fields:

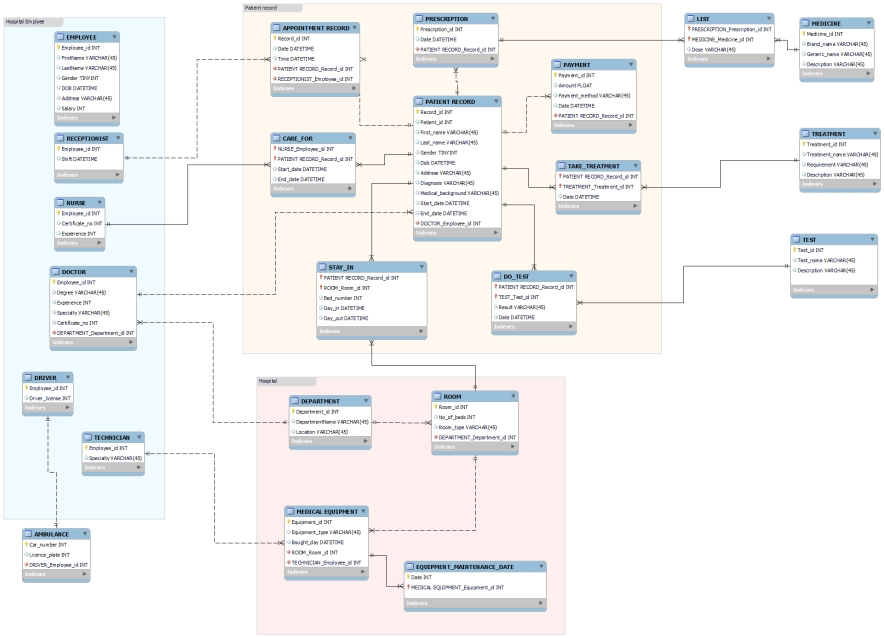
- First_name
- Last_name
- Address
- Diagnosis
- Medical_background

And the last field is Gender. Originally, we wanted this to be a bool, but MySQL does not define such datatype, so we use TINYINT instead.

The following picture will show the physical design of the MEDICAL RECORD.



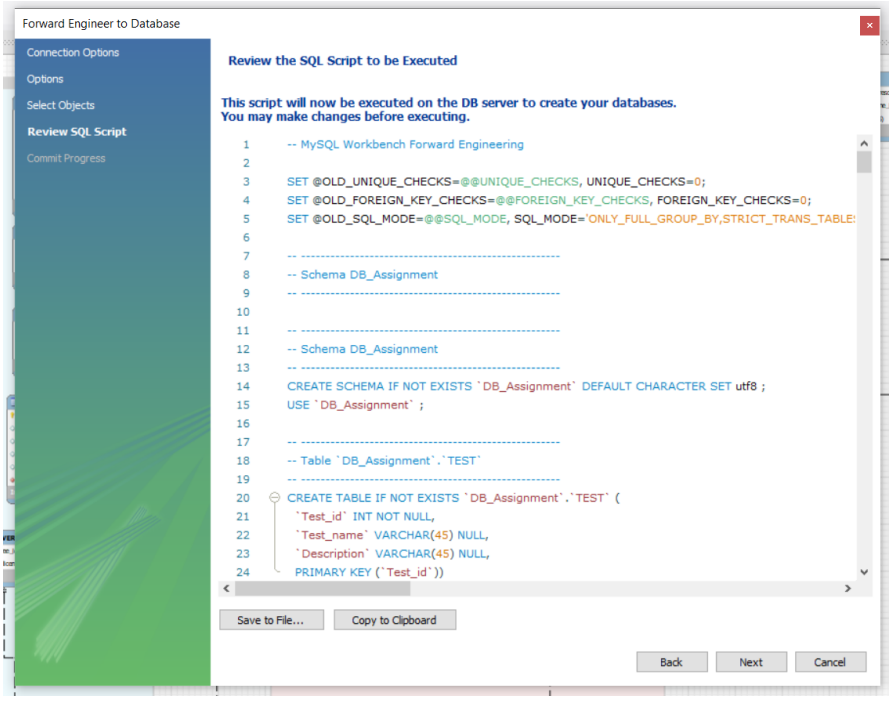
We repeat this process for all the tables in our logical design and eventually we obtain the following physical design.



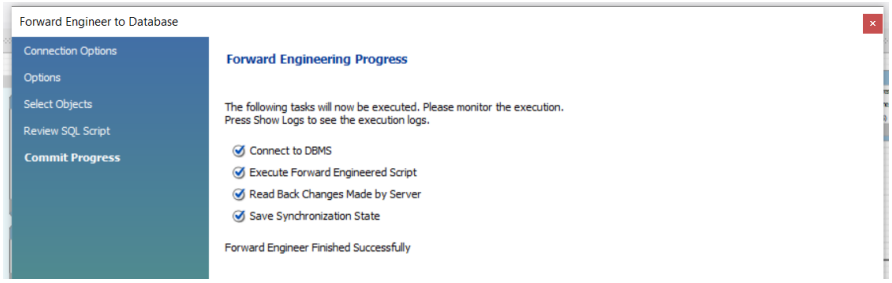
You can find a high quality version of this figure at https://i.imgur.com/fxAsCSQ.png.

6.2 Implementation

After we have define the design for our database, we will use a feature called forward engineering in MySQL Workbench to automatically convert our design to SQL code.



After reviewing the code, we click the "Next" button and receive a successfully compiled message which means that there are no errors in the code.



Our database is now ready to be used.

7 Conclusion

For this assignment, we have examined the hospital management system and tried to build a database for it. Regarding the requirements, the biggest difficulty we faced was the complexity of the hospital system, because a hospital have many employees types and each of them has specific role in their job. Moreover, the main purpose of a hospital management system is to record the patient medical record. Therefore, our system is built around the information stored for a patient. We also have gone through many database designing steps, including conceptual design, logical design, physical design and implementation. However, in the physical design part, we have only listed the data type constraint until now and left it there for the next assignment.