Database Design Guide

This guide will help the student to create a database on the Certificate Authentication System Using Qr Code. It will help to manage the below functionalities.

- Student details
- Admin details
- Verify details
- Certificate Request details
- Qr code verification details
- Download Certificate

We will use MySQL as the DBMS to create the database and its related operations.

1. Introduction to MySQL

MySQL is an open-source relational database management system (RDBMS) that uses structured query language (SQL) to manage and manipulate data in a database. It is widely used for various applications, from small web applications to large enterprise systems.

MySQL's key features include:

- Scalability: Capable of handling large amounts of data and concurrent connections.
- Flexibility: Supports various data types and storage engines.
- Performance: Optimized for speed and efficiency.
- Reliability: Known for its stability and robustness.

2. Installation of MySQL

MySQL can be installed on various operating systems, including Windows, macOS, and Linux. Here are the general steps to install MySQL:

Windows:

- Download the MySQL installer from the official website. https://dev.mysql.com/downloads/installer/
- Run the installer and follow the on-screen instructions.
- Choose the installation type (Typical, Complete, or Custom). Recommended Custom.
- Set a root password for the MySQL server.

3. E-R Diagram (ERD)

An Entity-Relationship Diagram (ERD) is a visual representation of the data model that shows the entities, attributes, relationships between entities, and cardinality. ERDs are commonly used in database design to help developers and stakeholders understand the structure and relationships within a database.

Identify Entities

- Start by identifying the main entities in your system. These are the objects or concepts about which you want to store data.
- Each entity should correspond to a table in your database.
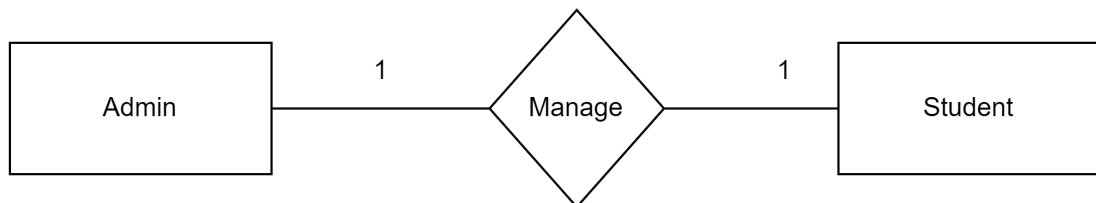
Define Attributes
- For each entity, list the attributes (properties or fields) that describe it.
- These attributes will become columns in the corresponding database table.
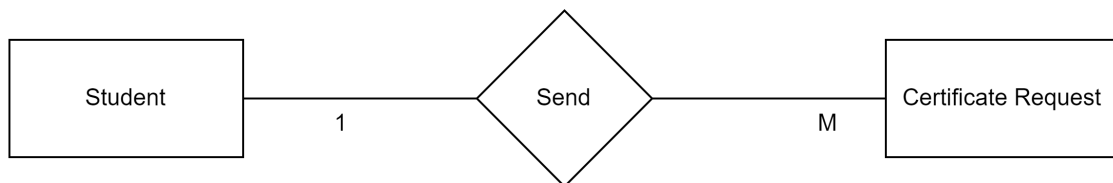
Identify Relationships
- Determine how entities are related to each other. There are three types of relationships: one-to-one (1:1), one-to-many (1:N), and many-to-many (N:M).
- Represent these relationships using lines connecting the entities.

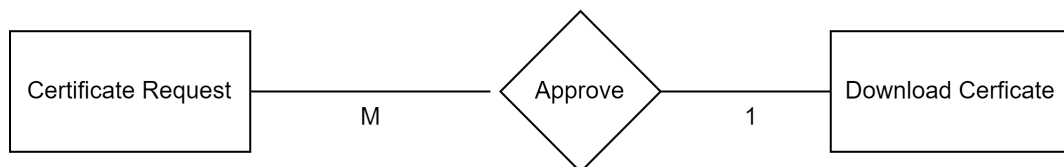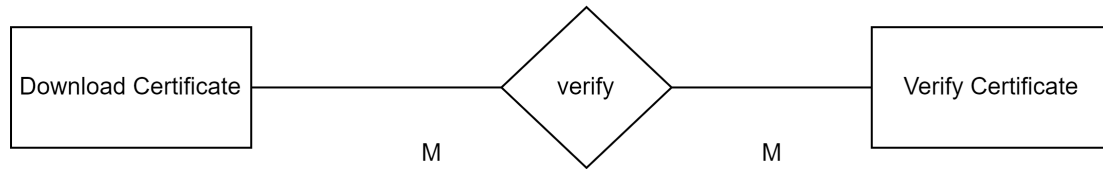Let's see a few examples of relationships:

One to One

```
┌─────────┐        ◇          ┌─────────┐
│  Admin  │──1──◇ Manage ◇──1──│ Student │
└─────────┘        ◇          └─────────┘
```

One to Many

```
┌─────────┐        ◇          ┌──────────────────────┐
│ Student │────◇ Send ◇────│ Certificate Request  │
└─────────┘   1    ◇    M   └──────────────────────┘
```

Many to one

```
┌─────────────────────┐     ◇       ┌──────────────────────┐
│ Certificate Request │──◇ Approve ◇──│ Download Cerficate  │
└─────────────────────┘  M   ◇   1   └──────────────────────┘
```

Many to Many

Cardinality Notation
Cardinality represents the number of times an entity of an entity set participates in a relationship set. Or we can say that the cardinality of a relationship is the number of tuples (rows) in a relationship.
- Use notation (such as Crow's Foot Notation or Chen Notation) to indicate the cardinality of each relationship.
- Cardinality describes how many instances of one entity are related to how many instances of another entity.
- Common notations include:
  - One (1)
  - Zero or one (0..1)
  - Many (N)
  - Zero or many (0..N)

Optional:
Add Attributes and Constraints
- Include additional information in your ERD, such as primary keys, foreign keys, and constraints (e.g., unique constraints).

Create the Diagram
- Use specialized diagramming software or tools (e.g., Lucidchart, draw.io, or even pen and paper) to create your ERD.

Refine and Review:
- Review your ERD with stakeholders and team members to ensure it accurately represents the data model and relationships. Make any necessary refinements.

Let's identify the entities of the Certificate Authentication System Using Qr Code
- Student details
- Admin details
- Verify details
- Certificate Request details
- Qr code verification details
- Download Certificate

*** Now let's identify the attributes and relationships of each entity for the Student Management System.

1) **Student :-**
●   **Attributes:-**
1. id` int(10) unsigned NOT NULL AUTO_INCREMENT,
2. `name` varchar(45) NOT NULL,
3. `email` varchar(45) NOT NULL,
4. `phone` varchar(45) NOT NULL,
5. `address` varchar(45) NOT NULL,
6. `pass` varchar(45) NOT NULL,
7. `ustatus` varchar(45) NOT NULL,
8. `regtime` varchar(45) NOT NULL,
9. `lastlog` varchar(45) DEFAULT '0',
10. `ppic` longblob NOT NULL,
11. `rollno` varchar(45) NOT NULL,
12. `syear` varchar(45) NOT NULL,
13. `dept` varchar(45) NOT NULL,
14. PRIMARY KEY (`id`)

Ralationship:- one student can do certificate request (one to one)

2) **Admin:-**
● **Attributes:-**
1. id` int(11) NOT NULL AUTO_INCREMENT,
2. `name` varchar(255) NOT NULL,
3. `logo` longblob,
4. `cid` varchar(45) NOT NULL,
5. PRIMARY KEY (`id`)

Ralationship:- Admin can manage the student

3) Verifier:-

● **Attributes:-**
1. `id` int(11) NOT NULL,
2. `password` varchar(255) NOT NULL,
3. PRIMARY KEY (`id`)

Ralationship:- Verify can only verify certificate

4) Certificate Request
- **Attributes:-**
1. id` int(11) NOT NULL AUTO_INCREMENT,
2. `syear` varchar(20) NOT NULL,
3. `student_id` int(11) NOT NULL,
4. `cert_id` varchar(50) DEFAULT NULL,
5. `dept` varchar(50) NOT NULL,
6. `certype` varchar(100) DEFAULT NULL,
7. `sname` varchar(45) NOT NULL,
8. `smail` varchar(45) NOT NULL,
9. `certstatus` varchar(45) NOT NULL DEFAULT 'No',
10. `rollno` varchar(45) NOT NULL,
11. `image_data` longblob,
12. PRIMARY KEY (`id`)

Ralationship:- Student can send the request for certificate

5) Qr Code Verifier :-

- **Attributes:-**

1. qr_code_id` int(11) NOT NULL,
2. `qrcodeimg` longblob NOT NULL,
3. `genrateimg` longblob NOT NULL,
4. `creation_date` timestamp NOT NULL DEFAULT CURRENT_TIMESTAMP,
5. PRIMARY KEY (`qr_code_id`)

Ralationship:- Verifier mange the qr code

6) Download Certificate
1. `ID` int(11) NOT NULL,
2. `Password` varchar(50) NOT NULL,
3. `Email` varchar(100) NOT NULL,
4. `InTime` datetime DEFAULT NULL,
5. `OutTime` datetime DEFAULT NULL,
6. PRIMARY KEY (`ID`)

Ralationship:- Student can download a certificate

Table Structure
1 Student:-

2 Admin:-

3 Verifier:-


```
Enter password: ****
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 68
Server version: 5.7.44-log MySQL Community Server (GPL)

Copyright (c) 2000, 2023, Oracle and/or its affiliates.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use certauth;
Database changed
mysql> desc verifier;
+----------+--------------+------+-----+---------+-------+
| Field    | Type         | Null | Key | Default | Extra |
+----------+--------------+------+-----+---------+-------+
| id       | int(11)      | NO   | PRI | NULL    |       |
| password | varchar(255) | NO   |     | NULL    |       |
+----------+--------------+------+-----+---------+-------+
2 rows in set (0.00 sec)

mysql>
```

4 Certificate Req:


```
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use certauth
Database changed
mysql> desc student
    -> desc student;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'desc student'
 at line 2
mysql> use certauth
Database changed
mysql> desc certrequests;
+------------+---------------+------+-----+---------+----------------+
| Field      | Type          | Null | Key | Default | Extra          |
+------------+---------------+------+-----+---------+----------------+
| id         | int(11)       | NO   | PRI | NULL    | auto_increment |
| syear      | varchar(20)   | NO   |     | NULL    |                |
| student_id | int(11)       | NO   |     | NULL    |                |
| cert_id    | varchar(50)   | YES  |     | NULL    |                |
| dept       | varchar(50)   | NO   |     | NULL    |                |
| certype    | varchar(100)  | YES  |     | NULL    |                |
| sname      | varchar(45)   | NO   |     | NULL    |                |
| smail      | varchar(45)   | NO   |     | NULL    |                |
| certstatus | varchar(45)   | NO   |     | No      |                |
| rollno     | varchar(45)   | NO   |     | NULL    |                |
| image_data | longblob      | YES  |     | NULL    |                |
+------------+---------------+------+-----+---------+----------------+
11 rows in set (0.04 sec)

mysql>
```

5 Qr Code:


```
MySQL 5.7 Command Line Client                                                                    —  □  ×
Enter password: ****
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 66
Server version: 5.7.44-log MySQL Community Server (GPL)

Copyright (c) 2000, 2023, Oracle and/or its affiliates.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use certauth;
Database changed
mysql> desc qrcode;
+---------------+-----------+------+-----+-------------------+-------+
| Field         | Type      | Null | Key | Default           | Extra |
+---------------+-----------+------+-----+-------------------+-------+
| qr_code_id    | int(11)   | NO   | PRI | NULL              |       |
| qrcodeimg     | longblob  | NO   |     | NULL              |       |
| genrateimg    | longblob  | NO   |     | NULL              |       |
| creation_date | timestamp | NO   |     | CURRENT_TIMESTAMP |       |
+---------------+-----------+------+-----+-------------------+-------+
4 rows in set (0.02 sec)

mysql>
```

5 Download Certificate


```
MySQL 5.7 Command Line Client                                                                    —  □  ×
Enter password: ****
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 67
Server version: 5.7.44-log MySQL Community Server (GPL)

Copyright (c) 2000, 2023, Oracle and/or its affiliates.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use certauth;
Database changed
mysql> desc downloadcertificate;
+----------+--------------+------+-----+---------+-------+
| Field    | Type         | Null | Key | Default | Extra |
+----------+--------------+------+-----+---------+-------+
| ID       | int(11)      | NO   | PRI | NULL    |       |
| Password | varchar(50)  | NO   |     | NULL    |       |
| Email    | varchar(100) | NO   |     | NULL    |       |
| InTime   | datetime     | YES  |     | NULL    |       |
| OutTime  | datetime     | YES  |     | NULL    |       |
+----------+--------------+------+-----+---------+-------+
5 rows in set (0.06 sec)

mysql>
```
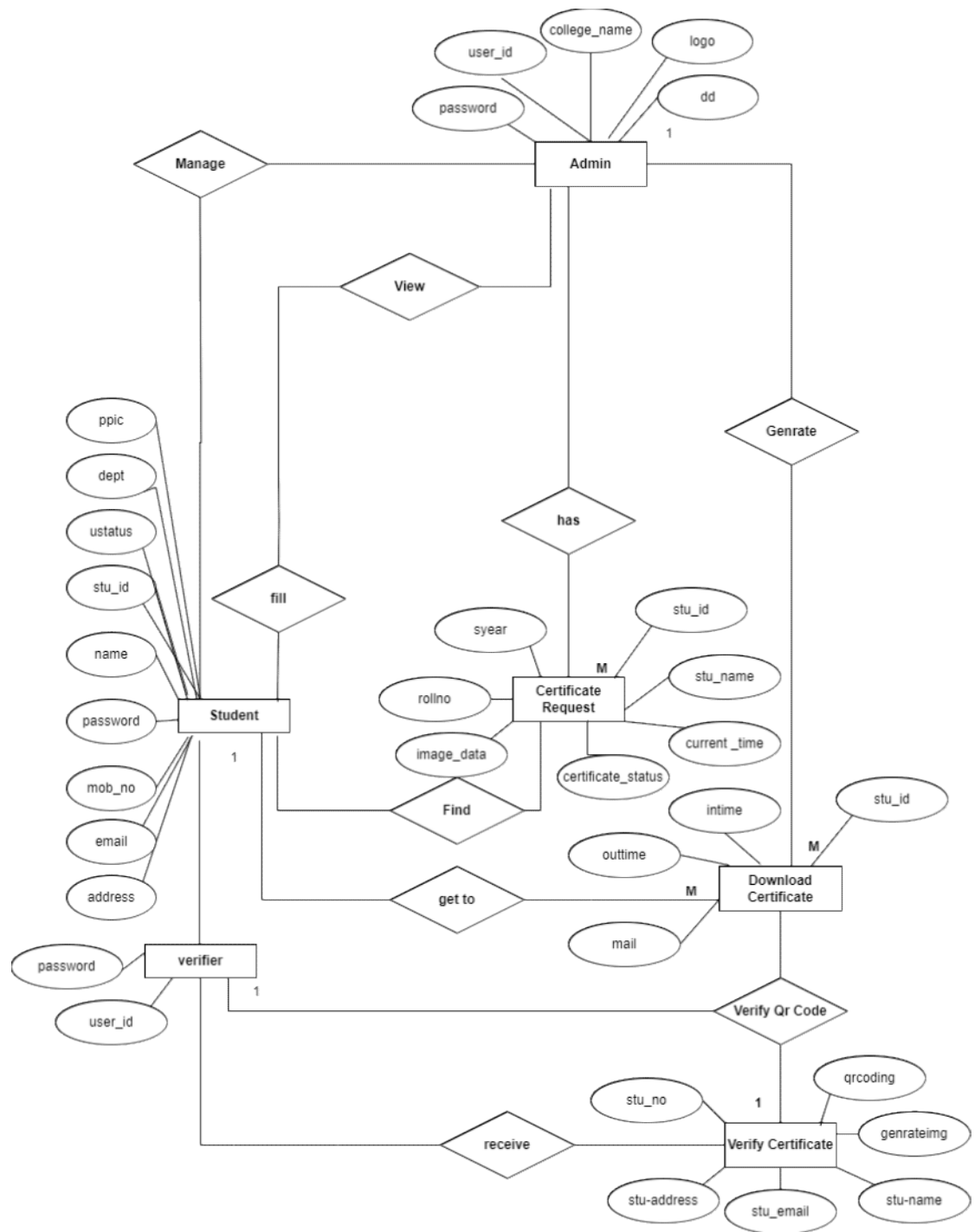
ER diagram

In this ERD:
- Students can enroll, and each course can have multiple students, creating a many-to-many relationship.
- The Enrollment entity serves as a bridge table between Student and Course entities to represent this relationship.
- Multiple courses can be taught by one Instructor (many-to-one relationship).
- Each Instructor can teach multiple courses (one-to-many relationship).
- A student can give multiple feedbacks
- Student may have scores of multiple courses

4. Creating a Database
Using MySQL server, create a new database for your student management system. You can do this with SQL commands or through the graphical interface.

1)Student:-
```
CREATE TABLE `students` (
 `id` int(10) unsigned NOT NULL AUTO_INCREMENT,
 `name` varchar(45) NOT NULL,
 `email` varchar(45) NOT NULL,
 `phone` varchar(45) NOT NULL,
 `address` varchar(45) NOT NULL,
 `pass` varchar(45) NOT NULL,
 `ustatus` varchar(45) NOT NULL,
 `regtime` varchar(45) NOT NULL,
 `lastlog` varchar(45) DEFAULT '0',
 `ppic` longblob NOT NULL,
 `rollno` varchar(45) NOT NULL,
 `syear` varchar(45) NOT NULL,
 `dept` varchar(45) NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1
```

2)Admin:
```
CREATE TABLE `admin` (
 `id` int(11) NOT NULL AUTO_INCREMENT,
 `name` varchar(255) NOT NULL,
 `logo` longblob,
 `cid` varchar(45) NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB AUTO_INCREMENT=2 DEFAULT CHARSET=latin1
```

5) Verifer:-
CREATE TABLE `verifier` (
  `id` int(11) NOT NULL,
  `password` varchar(255) NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1

6) Certificate Request:-
CREATE TABLE `certrequests` (
  `id` int(11) NOT NULL AUTO_INCREMENT,
  `syear` varchar(20) NOT NULL,
  `student_id` int(11) NOT NULL,
  `cert_id` varchar(50) DEFAULT NULL,
  `dept` varchar(50) NOT NULL,
  `certype` varchar(100) DEFAULT NULL,
  `sname` varchar(45) NOT NULL,
  `smail` varchar(45) NOT NULL,
  `certstatus` varchar(45) NOT NULL DEFAULT 'No',
  `rollno` varchar(45) NOT NULL,
  `image_data` longblob,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1

7) QR Code:-
CREATE TABLE `qrcode` (
  `qr_code_id` int(11) NOT NULL,
  `qrcodeimg` longblob NOT NULL,
  `genrateimg` longblob NOT NULL,
  `creation_date` timestamp NOT NULL DEFAULT CURRENT_TIMESTAMP,
  PRIMARY KEY (`qr_code_id`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1

8) Download Certicate:-
CREATE TABLE `downloadcertificate` (
  `ID` int(11) NOT NULL,
  `Password` varchar(50) NOT NULL,
  `Email` varchar(100) NOT NULL,
  `InTime` datetime DEFAULT NULL,
  `OutTime` datetime DEFAULT NULL,
  PRIMARY KEY (`ID`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1