



Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

Experiment No.2
Mapping ER/EER to Relational schema model.
Date of Performance:
Date of Submission:



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Aim :- Prepare the schema for Relational Model with the ER/ERR diagram, drawn for the identified case study in experiment no.1.

Objective :- To map the Entity Relationship (ER) / Extended Entity-Relationship (EER) Diagram to Relational Model schema and learn to incorporate various schema-based constraints.

Theory:

Mapping an Entity-Relationship (ER) model to a relational database schema involves translating the conceptual model represented in the ER diagram into tables and relationships in a relational database management system (DBMS). Here are the general rules for mapping ER to a schema in a DBMS:

1. Entities to Tables:
 - a. Each entity in the ER diagram corresponds to a table in the relational schema.
 - b. The attributes of the entity become the columns of the table.
 - c. The primary key of the entity becomes the primary key of the table.
2. Relationships to Tables:
 - a. Many-to-Many Relationships:
 - i. Convert each many-to-many relationship into a new table.
 - ii. Include foreign key columns in this table to reference the participating entities.
 - iii. The primary key of this table may consist of a combination of the foreign keys from the participating entities.
 - b. One-to-Many and One-to-One Relationships:
 - i. Represented by foreign key columns in one of the participating tables.
 - ii. The table on the "many" side of the relationship includes the foreign key column referencing the table on the "one" side.
 - iii. The foreign key column typically references the primary key of the related table.
3. Attributes to Columns:
 - a. Each attribute of an entity becomes a column in the corresponding table.
 - b. Choose appropriate data types for each attribute based on its domain and constraints.
 - c. Ensure that attributes participating in relationships are represented as foreign keys when needed.
4. Primary and Foreign Keys:
 - a. Identify the primary key(s) of each table based on the primary key(s) of the corresponding entity.
 - b. Ensure referential integrity by defining foreign keys in tables to establish relationships between them.
 - c. Foreign keys should reference the primary key(s) of related tables.



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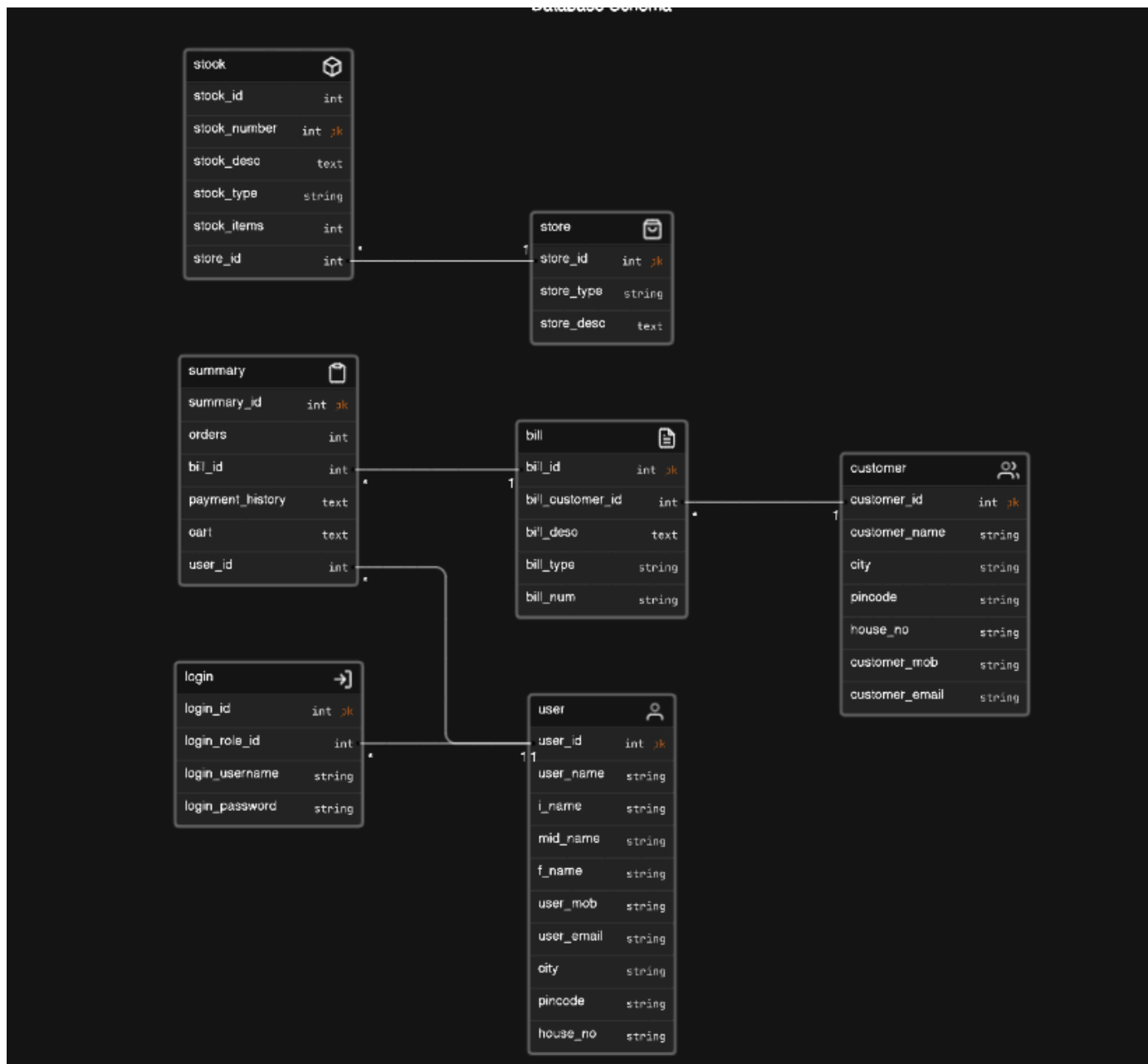
- d. Ensure that foreign keys have appropriate constraints, such as ON DELETE CASCADE or ON UPDATE CASCADE, to maintain data integrity.
5. Cardinality Constraints:
 - a. Use the cardinality constraints from the ER diagram to determine the multiplicity of relationships in the relational schema.
 - b. Ensure that the constraints are enforced through the appropriate use of primary and foreign keys.
6. Normalization:
 - a. Normalize the schema to minimize redundancy and dependency.
 - b. Follow normalization rules such as First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), etc., to ensure data integrity and minimize anomalies.
7. Indexing and Optimization:
 - a. Consider indexing frequently queried columns to improve query performance.
 - b. Evaluate the schema design for optimization opportunities based on query patterns and performance requirements.

Implementation:



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Conclusion:

1. write definition of relational schema and notations
2. write various schema-based constraints

In conclusion, relational schema and schema-based constraints play crucial roles in database design and management:

1. Relational Schema:

- Definition: A relational schema defines the structure of a relational database, including tables, columns, and relationships between tables.
- Notations:
 - Table: Represented as a rectangle with the table name at the top.
 - Attributes: Represented as ovals inside the table rectangle, specifying the attribute name and data type.



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- Primary Key: Underlined attribute(s) indicate the primary key(s) of the table.
- Foreign Key: Attributes representing foreign keys establish relationships between tables.
- Example:

```

Student

-----

student\_id (PK): int

name: varchar

age: int

```

2. Schema-Based Constraints:

- Primary Key Constraint:
 - Ensures uniqueness and non-nullity of a column or combination of columns.
 - Example: `PRIMARY KEY (student_id)`
- Foreign Key Constraint:
 - Enforces referential integrity by ensuring that values in a column match values in a related table's primary key.
 - Example: `FOREIGN KEY (dept_id) REFERENCES Department(dept_id)`
- Unique Constraint:
 - Ensures that values in a column or combination of columns are unique.
 - Example: `UNIQUE (email)`
- Check Constraint:
 - Validates data integrity by specifying a condition that must be satisfied for each row.
 - Example: `CHECK (age >= 18)`
- Not Null Constraint:
 - Ensures that a column does not accept NULL values.
 - Example: `age INT NOT NULL`

These schema-based constraints ensure data integrity, consistency, and accuracy within the database, enforcing rules and restrictions on the data stored in the tables. By defining a clear relational schema and applying appropriate constraints, database administrators can maintain the quality and reliability of the database system, facilitating efficient data management and retrieval operations.



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