CMPE 321 – Project 1: Conceptual Database Design Report (Part 1)

1. Introduction:

This report presents the conceptual design of a Chess Tournament Database developed as part of Project 1 in CMPE 321. The design is based on an Entity-Relationship (ER) model which captures the major entities, attributes, and relationships necessary to represent chess players, tournaments, teams, and operational logistics such as arbiters and halls.

The final ER diagram is structured in accordance with the modeling rules taught in the course and is intended to support efficient database implementation, integrity constraints, and real-world chess tournament requirements.

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2. ER Diagram Overview:

The ER diagram consists of several entities grouped into three logical categories:

A. Core Entities

- USER: A generalized entity representing all system users. Users are divided into three specializations:
    - `PLAYER`: Has ELO rating, FIDE ID, title, and team memberships.
    - `COACH`: Manages one team and holds multiple specialties and certificates.
    - `ARBITER`: Officiates matches and possesses certification and experience level.

B. Tournament and Match Entities

- TEAM: Each team has a unique coach, may participate in tournaments, and must be linked to a sponsor.
- TOURNAMENT: Represents a formal competition with participating teams, matches, a chief arbiter, and halls.
- MATCH: A specific chess game between two players, assigned to a table, hall, and arbiter. It includes attributes like result, time slot, date, and rating.

C. Supporting Entities

- TITLE: Represents official FIDE titles like Grandmaster and International Master.
- CERTIFICATE: Certification records for both coaches and arbiters.
- SPECIALTY: Areas of coaching expertise.

- HALL and CHESS_TABLE: Represent the physical venues where matches are conducted.

3. Relationships and Cardinalities

The ER diagram includes the following relationships with explicit cardinality constraints:

Relationship	Entities Involved	Cardinality
ISA	USER → PLAYER / COACH / ARBITER	1:1
has_team	PLAYER – TEAM	M:N
has_coach	TEAM – COACH	1:1
has_sponsor	TEAM – SPONSOR	M:1
participates_in	TEAM – TOURNAMENT	M:N
held_in	TOURNAMENT – HALL	M:N
has_table	MATCH – CHESS_TABLE	1:1
held in	MATCH – HALL	M:1
assigned_arbiter	MATCH – ARBITER	1:1
white_player / black_player	MATCH – PLAYER	1:1
has_title	PLAYER – TITLE	M:1
has_specialty	COACH – SPECIALTY	M:N
has_certification	COACH – CERTIFICATE	M:N
has_certification	ARBITER – CERTIFICATE	M:N

4. Constraints Not Represented in ER Diagram:

Some real-world rules are not visually enforceable in the ER diagram and must be addressed in the relational schema or application logic:

- A player must belong to at least one team.
- A player cannot participate in two matches at the same time.
- A player must be in a team registered in a tournament to play in its matches.
- Two players from the same team cannot play against each other.
- Each coach must have at least one specialty and one certificate.
- Each arbiter must have at least one certificate.
- A team can have only one coach at a time.
- A coach cannot manage multiple teams at once.
- Each match must have exactly two players and one arbiter, and be scheduled uniquely in terms of time and location.

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5. Tools and Technologies Used

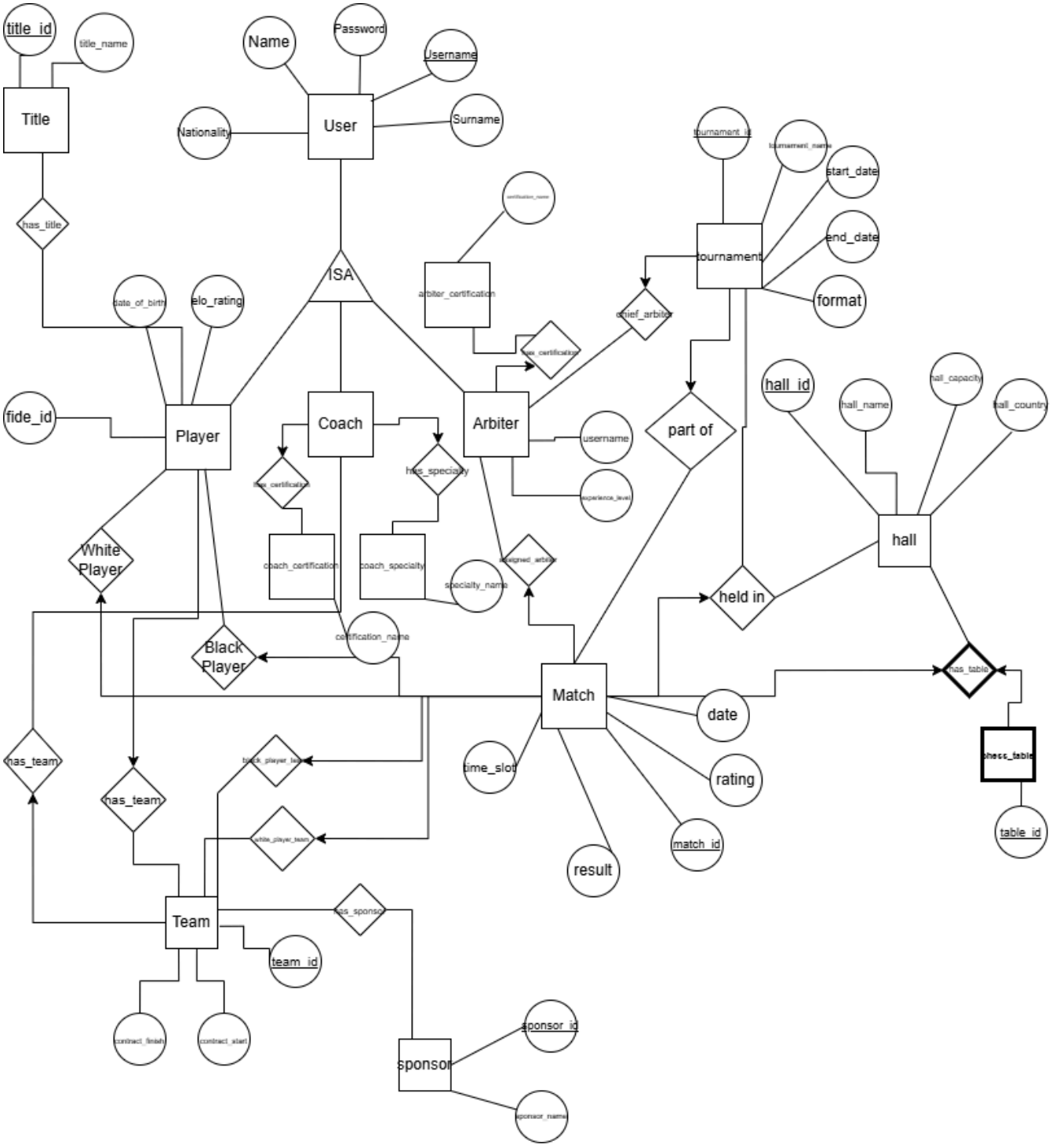
To develop the conceptual and logical design of the Chess Tournament Database, we utilized the following tools:

- **draw.io (https://app.diagrams.net/):** Used to create the ER diagram according to course guidelines. The finalized ER diagram was designed manually using standard notation, including entity rectangles, relationship diamonds, ISA hierarchies, and proper cardinalities. The workbook can be accessed at the following link:
  ER Diagram Workbook

- MySQL Workbench: Used to write, test, and refine the SQL schema. Additionally, we used the built-in ER Diagram Generation Tool to visualize the relational schema, validate table relationships, and ensure the structure was logically sound.

These tools allowed us to cross-check the ER model with the database implementation and ensure consistency between the conceptual and physical layers.

6. Entity Relationship Diagram:



7. Conclusion:

The final ER diagram effectively models the data structure needed for organizing and managing chess tournaments. It applies **specialization (ISA)**, **many-to-many relationships**, **participation**, and **key constraints** to support business rules.

This diagram serves as a clear foundation for transforming the conceptual design into a **relational schema and SQL implementation**, ensuring integrity, consistency, and flexibility in future development.