Practice problems:

1. Draw an ERD for the following description:

Each department has a unique name, a unique number, and a particular employee who manages the department. We keep track of the start date when that employee began managing the department. A department may have several locations.

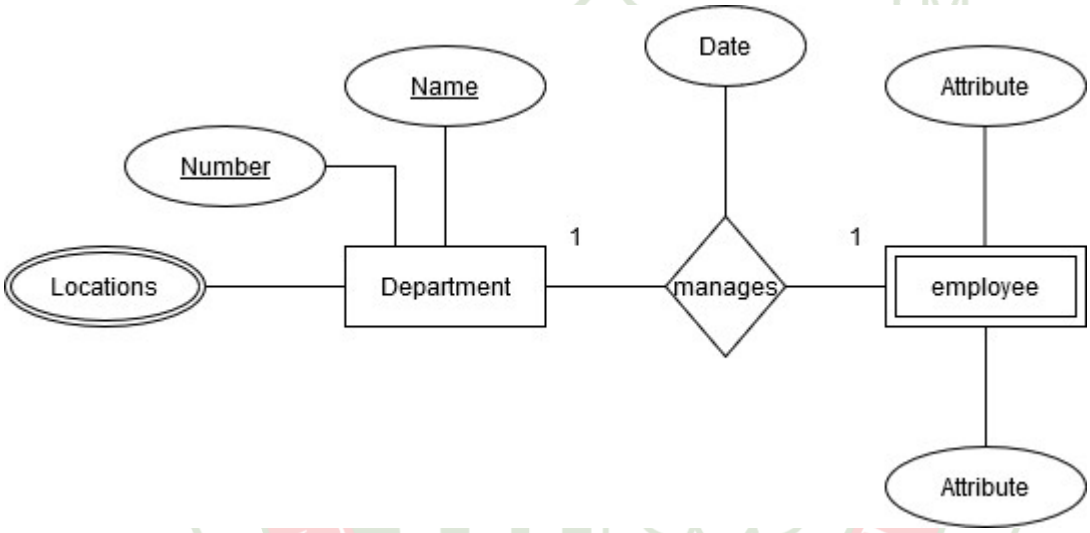

Fig 2: Employees manage departments, which operate in specific locations

This ER diagram illustrates the relationship between **Departments** and **Employees** within an organization.

- A **Department** entity has attributes like **Name** and **Number**, and it is associated with one or more **Locations**, indicating the physical presence of the department across various places.
- The **Employee** entity contains attributes (unspecified here but could represent details like employee ID, name, etc.) describing the employee's information.
- The **Manages** relationship shows that each department is managed by exactly one employee, and each employee manages exactly one department, reflecting a one-to-one relationship (1:1 cardinality).
- The **Date** attribute in the "Manages" relationship represents when an employee started managing the department, providing temporal information.

Overall, the diagram highlights a structured interaction between departments, employees, and their operational locations within an organization.

2. Draw an ERD for the following description:

A department controls several projects, each of which has a unique name, a unique number, and a single location.S

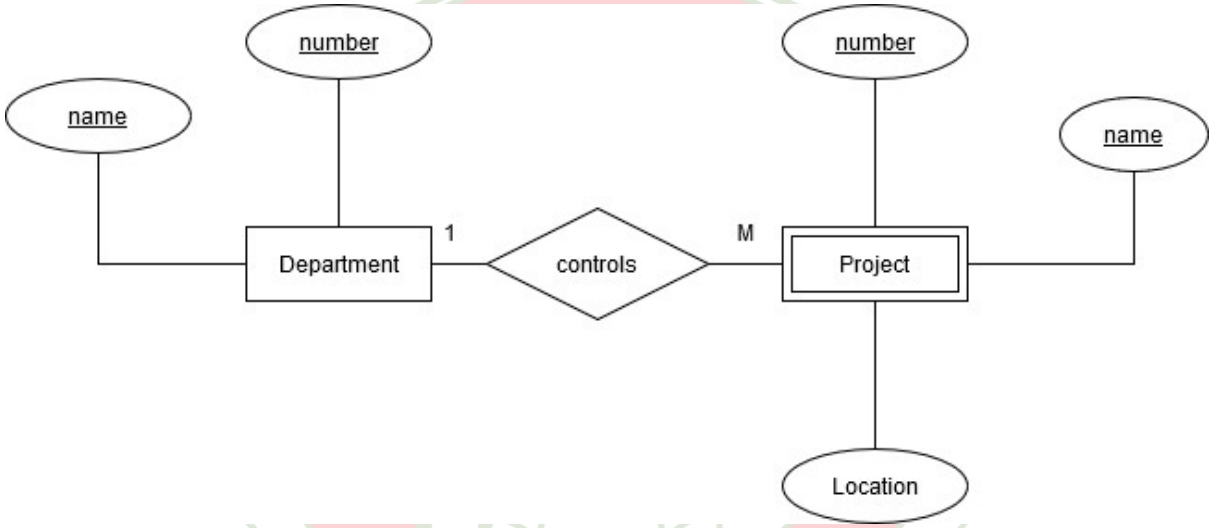

FIG3: Departments Control Projects, Which Operate in Specific Locations

This ER diagram illustrates the relationship between **Departments** and **Projects** within an organization.

- A **Department** entity has attributes like **name** and **number**, uniquely identifying each department.
- A **Project** entity also contains attributes such as **name**, **number**, and **Location**, providing specific details about each project and its operational site.
- The **Controls** relationship indicates that a department can control multiple projects (1:M cardinality), meaning one department can oversee several projects, but each project is controlled by only one department.

This diagram showcases the hierarchical structure of departments managing projects and highlights the connection between project operations and their corresponding departments.

3. Draw an ERD for the following description:

We store each employee's name (first, last, MI), Social Security number (SSN), street address, salary, sex (gender), and birth date. An employee is assigned to one department, but may work on several projects, which are not necessarily controlled by the same department. We keep track of the current number of hours per week that an employee works on each project. We also keep track of the direct supervisor of each employee (who is another employee).

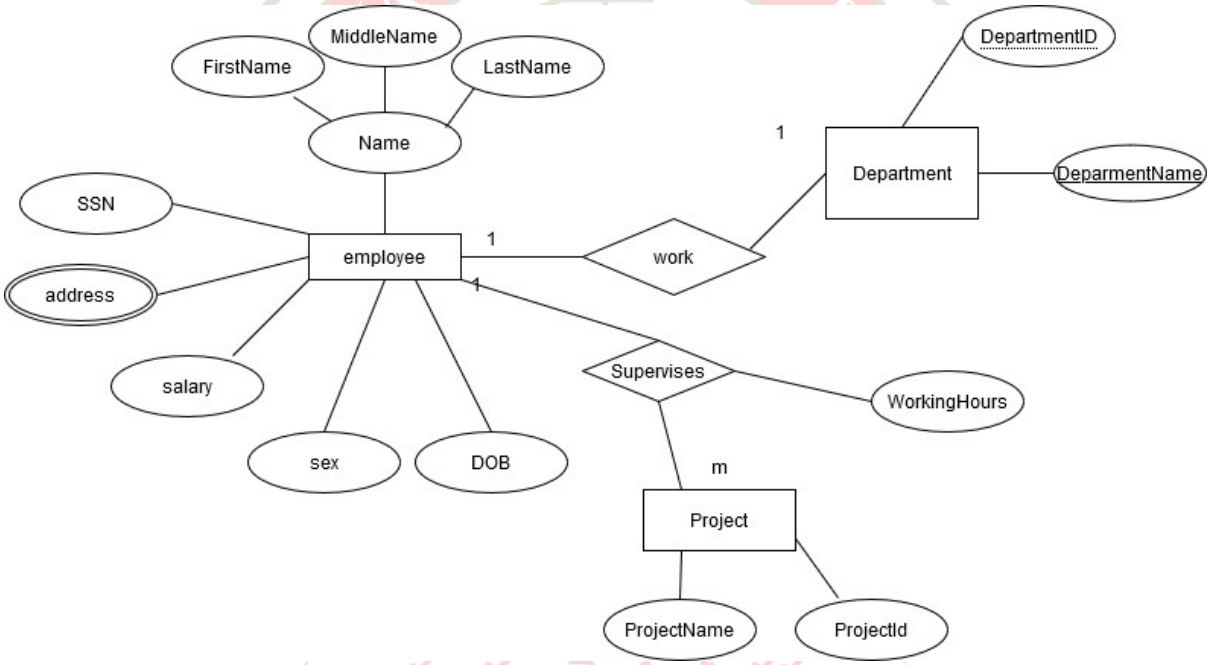

FIG4:Employees Work in Departments and Supervise Multiple Projects

This ER diagram illustrates the relationships between **Employees**, **Departments**, and **Projects** within an organization.

- The **Employee** entity includes attributes such as **SSN**, **address**, **salary**, **sex**, **DOB**, and a composite attribute **Name** (further divided into **FirstName**, **MiddleName**, and **LastName**), capturing comprehensive employee information.
- The **Department** entity contains attributes like **DepartmentID** and **DepartmentName**, uniquely identifying each department within the organization.
- The **Project** entity is characterized by attributes such as **ProjectName** and **ProjectID**, specifying details of the projects being handled.

- The **Work** relationship (1:1 cardinality) signifies that each employee works in exactly one department, and each department has exactly one employee assigned to it.
- The **Supervises** relationship (1:M cardinality) indicates that an employee can supervise multiple projects, while each project is supervised by one employee. Additionally, **WorkingHours** is an attribute of this relationship, representing the number of hours an employee dedicates to supervising a specific project.

This diagram effectively showcases the organizational structure, detailing how employees are linked to departments and projects, and the specific roles they play within the company's hierarchy.

4. Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):

• the NHL has many teams,

• each team has a name, a city, a coach, a captain, and a set of players,

• each player belongs to only one team,

• each player has a name, a position (such as left wing or goalie), a skill level,

and a set of injury records,

• a team captain is also a player,

• a game is played between two teams (referred to as host_team and

guest_team) and has a date (such as May 11th, 1999) and a score (such as 4 to2).

Construct a clean and concise ER diagram for the NHL database. List your assumptions and clearly indicate the cardinality mappings as well.

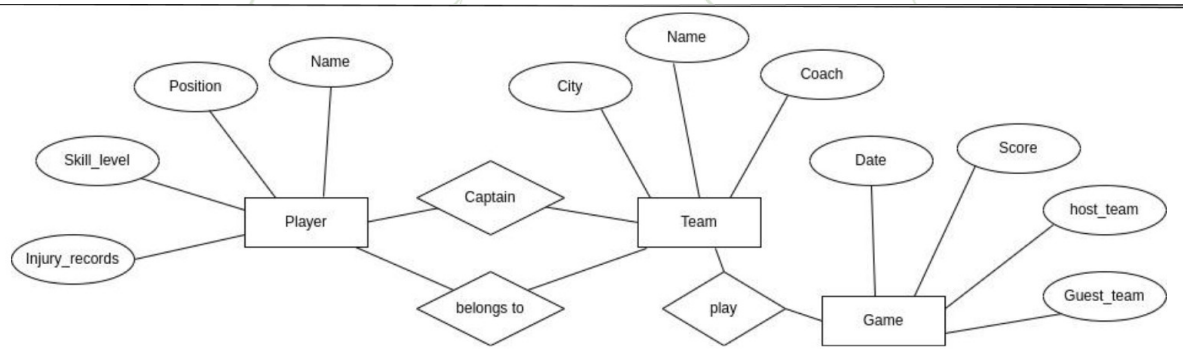

Fig 5: Teams and players participate in games, with players potentially having

The diagram showcases the NHL as an organization consisting of multiple Teams, which participate in Games with attributes like date and score. Players belong to teams, have roles (e.g., team_captain), and might encounter injuries with details like injury_type and recovery. The diagram emphasizes the interactions between teams, players, and games within the NHL ecosystem.