DNA Assignment 1

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1. Introduction to the mini-world

The movie that we were given was Monsters Inc. and within that our mini world comprises of the world of Monstropolis. Within this, there is Monsters Inc., a company which produces electrical power from the screams or laughter of children.

2. Purpose of the database

The purpose of the database is to describe the world of Montropolis and calculate the electrical energy that the monster obtains from the child due to screams or laughter. In the world, there is a "scream shortage" and hence this database can be very helpful in harvesting the optimum energy from each child based on the combination of monster and child.

3. Users of the database

The database can be used by many monsters. The boss and the managers of the Monsters Inc. can access the powers of the monsters working under them. They can also know about the status of all the doors, to which child's house they are leading to. Knowing about the children' s scream and their shrillness will make it easy for the managers to handle and assign the children and their doors to the monsters accordingly. They will get to know how each of the monsters is performing.

4. Applications of the database

The database can be used by these users to find out the optimal combination of monsters and children such that the most energy is produced. Hierarchical views of the database allow different people to view it at different scales. For example, while the boss is able to see all of the data, the statistics department is able to see the energy requirements and the energy produced for each month and other relevant data points. More information is included in the functional analysis and summary.

Database Schema

Monsters (related to monster inc.)

Monster ID (INT, >= 0)	Name (STRING)	Age (INT, >= 0)	Experience (INT, >= 0)	Size (INT, >= 0)	Department Name (STRING)	Bonus Salary (INT, >= 0)	Salary (INT, >= 0)

Departments

Department Name (STRING)	Department Head ID (INT, >= 0)	Base Salary (INT, >= 0)

Energy Obtainers

Monster ID (INT, >= 0)	Manager Monster ID (INT, >= 0)	Scare/Laugh Factor (INT, >= 0)	Scare/Laugh Talent (INT, >= 0)	Highest energy in 1 month (INT, >= 0)	Last Month's energy (INT, >= 0)	Current month energy (INT, >= 0)

Children

Child ID (INT, >= 0)	Door ID (INT, >= 0)	Child Name (STRING)	Age (INT, >= 0)	Height (INT, >= 0)	Scare/Laugh Factor (INT, >= 0)	Scared of or finds funny (STRING)	Country (STRING)	Shrillness of scream factor (INT, >= 0)

Doors

Door ID (INT, >= 0)	Child ID (INT, >= 0)	Color (STRING)	Height (INT, >= 0)	Door Status (BOOL)

Monster to child assignment

Monster ID (INT, >= 0)	Child ID (INT, >= 0)	Total Energy acquired (INT, >= 0)

Colleagues

Partner 1 ID (INT, >= 0)	Partner 2 ID (INT, >= 0)	Collaboration Factor (INT, >= 0)	Manager's ID (INT, >= 0)

5. Database Requirements

a) Assumptions:

- The hierarchy is as follows: We have the monster that scares and its partner at the lowest level. The "manager" is the head of the partner and monitors the pair. The CEO is the boss of the "manager" (the colleague entity type includes the "manager" and the "pair").
- All departments in the monster entity type are a part of monsters inc., except for the police department.
- The database can only include either monsters that scare or monsters that make the children laugh.
- When a new entity is added with the department as energy obtainer, we assign its pair to be NULL if it cannot have one yet (odd energy acquirers after he joins), and the bit is set when the partner assigns a door to him.

b) Strong Entity Types:

Monster, Energy Obtainers, Child, Doors, Monster to Child Assignment, Colleague

c) Weak Entity Type:

Department

d) Relationship types:

1) Works for
   Degree: 2
   Participating entity types: Monster → Department
   Cardinality Ratio: N : 1 (Min-max: (0, N) → (1, 1))
2) Acquisition of Energy
   Degree: 2

Participating entity types: Energy Obtainers → Child
Cardinality Ratio: 1 : 1 (Min-max: (1, 1) → (1, 1))

3) Assign Child with Door
   Degree: 2
   Participating entity types: Child ←→ Door
   Cardinality Ratio: 1 : 1 (Min-max: (1, 1) → (1, 1))
4) Assign Monster with child
   Degree: 3
   Entity types involved: Monster → Monster to Child Assignment ← Child
   Cardinality Ratio: 1 : 1 : 1 (Min-max: (1, 1) → (1, 1) ← (1, 1))
5) Part of
   Degree: 2
   Participating entity types: Energy Obtainers → Colleague
   Cardinality Ratio: 1 : 1 (Min-max: (1, 1) → (1, 1))

e) Relationship type with degree > 2

Relationship Type: Assign Monster with child
Degree: 3
Entity types involved: Monster → Monster to Child Assignment ← Child
Cardinality Ratio: 1 : 1 : 1 (Min-max: (1, 1) → (1, 1) ← (1, 1))

6. Functional Requirements:

Modifications:
The insertion of entities for Monster, department, energy obtainer, colleague entity types will include all the attributes described in the database schema. There are exceptions not inserted including base salary and salary attributes in monster entity type, highest energy in 1 month, last month's energy, and current month energy attributes in energy obtainer entity type, and door status attribute in Door entity type (Default 0, signifying dead).

For updation, monster to child assignment entity type is done whenever the user prompts it for either a given monster or given child, in which it retrieves the respective child or monster to assign in order to obtain the most energy. The partner of the scarer then makes the door alive, updating its status in the table to 1, so that the scarer can enter the door. It then updates the current month energy by incrementing it by the energy obtained by the monster from the child multiplied by the scare factor multipliers of monster and child, collaboration factor of partner, shrillness of scream factor, and bonus multiplier of 2x If the scare/laugh talent value matches with the child scared of/finds funny value.

In the Energy Obtain entity type, after every month, if the current month energy is greater than the highest energy in 1 month attribute, then the highest energy value is updated to the current month energy. The last month energy gets updated to the current month energy value and the current month energy value gets updated to 0. The age of all children is incremented by 1 month and if the child is 13 year old or older. In this case, the door is destroyed, and the door entity is removed from the table. If an energy obtaining monster earns more energy than the average amount of energy produced after 1 month, then they are awarded this difference as their bonus salary. Salary is accordingly updated.

Retrieval:
There are many views depending on the position of the Monster (permissions are set by database administrators).

For the monster, there is only the view of the Monster to child assignment and their own and only their own Energy Obtainer entity in which they can see their own statistics on Last month's energy, their highest energy in 1 month, and their current month energy. They have no permissions to insert or update entries.

For the manager, there is a larger view where they are able to see the colleague, energy obtainer, child, door, and to child assignment entity types. In this way, they are able to track the progress and statistics of their subordinates, who are mainly the partners in the colleague table.

And for the boss, it is the greatest superset view where they are able to see all the data including the colleague, energy obtainer, child, door, and to child assignment entity types. They are able to view all operations and make sure that everything is going well. Their view is to be able to insert and update the entries wherever required in which they might make their assistant/secretary to do.

The manager and boss can both retrieve the data and analyse it using the database manipulation language to access the data by selection and projection. They might regularly make queries looking for specific data like the descending order of energy obtainer Monsters to find their best monsters (which is projection). They can also look at the maximum energy produced by a monster in the current month and award them the "scarer of the month" (as in the movie) and give them an extra bonus salary up to their discretion. Likewise, more guidance or assistance can be given the minimum energy produced by an energy obtainer. The boss can also gain information on the total amount of energy produced which can be helpful as there might be an energy quota they must fill to power the city.

The manager and boss can search throughout the database to suit their needs as well. For example, they can search for a country in which they would like to scare the children of. They can also look at specific sizes of monsters by querying to see the information and data produced. They can accordingly make projection queries for whatever needs they like.

7. Summary:

In this assignment, we were able to understand the world of Monsters Inc. with context to the data presented within it, and design the mini world to model this environment in the movie. We had approached the mini world by identifying the entity types that we would require. We decided on encapsulating as much of the mini world as possible by including a monster entity type which contains all the monsters relating to Monsters Inc. and describing the department of the monsters, which if it is energy obtainer, an entry is inserted to the energy obtainer entity type with the relevant details of the monsters that either scared children or made them laugh depending on the point of the movie it was at (they got energy from the children laughing after the climax). We kept a lot of focus describing the statistics of the monsters in order to be realistic as a usable database model for the monsters including the energy obtainers, managers, and boss.

In this way, the retrieval operations that one would do in their respective view are quite realistic and have relevant functions within the context of the database, which was our main focus. In conclusion, we were able to accurately model and design the mini world of Monsters Inc. and provide realistic views that are usable by Monsters Inc. managers and boss.