

UNIT 1

CONCEPTUAL MODELING (EER)

BASES DE DATOS 2023/2024
CFGs DAW

WORKSHOP B: MEDIUM LEVEL ER

PROPOSED SOLUTIONS

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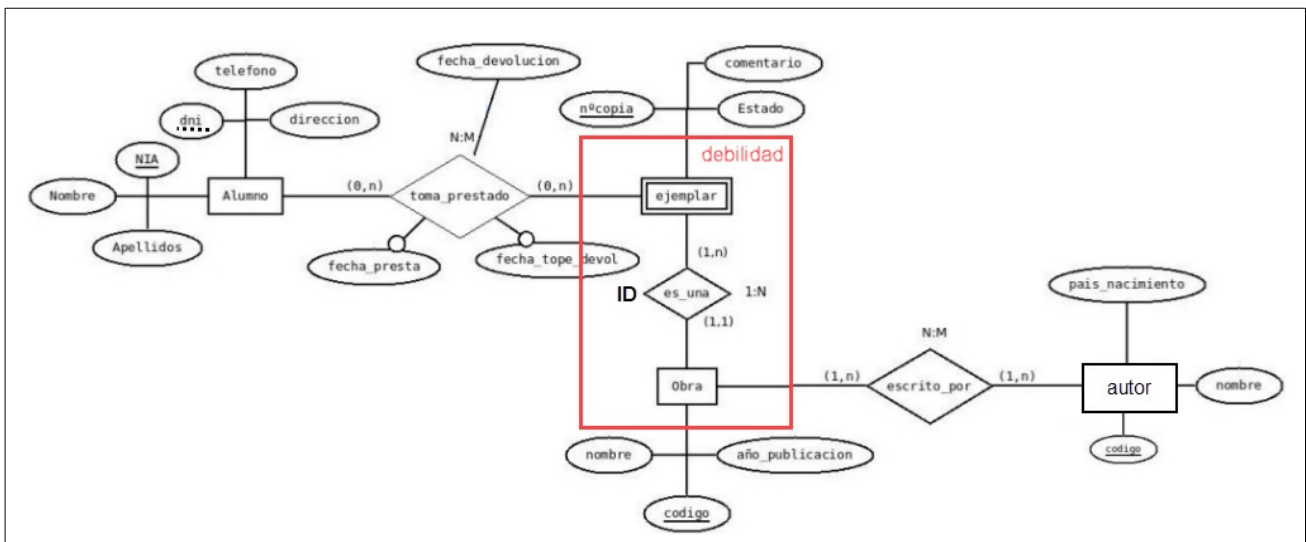
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EXERCISE 1: LIBRARY (solved)**KEYS OF THIS EXERCISE:****1. Identify the relationship attributes****2. Detect, classify and justify the weakness!**

This is our proposed solution:

**RELATIONSHIPS**

Regarding cardinality

Since we need a student can take the same copy several times, we could use attributes in the relationship. Minimums are always subjective.

Regarding weaknesses ...

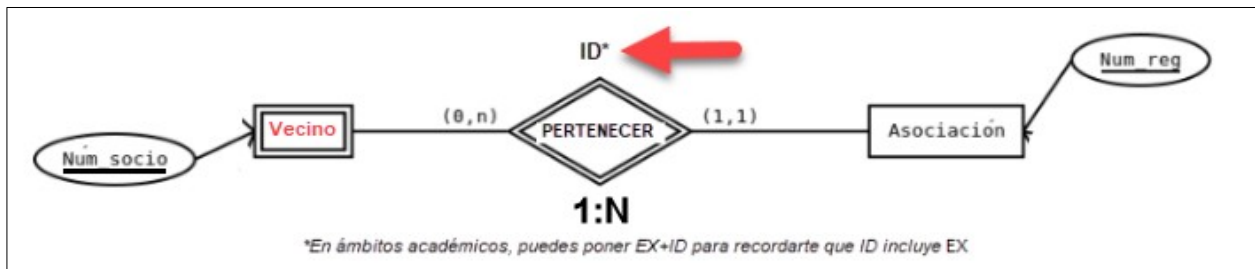
A weak entity called COPY (ejemplar) that has an identity dependency (which includes existence dependency) against the strong entity PUBLICATION (obra).

All this is due to the following:

- If we eliminate an instance of PUBLICATION we should remove all related instances of entity COPY (existence).
- Every instance of COPY needs an instance of PUBLICATION since the "exemplar number" (n° copia) could be repeated from one PUBLICATION to another (identity).

EXERCISE 2: NEIGHBORS

KEY OF THIS EXERCISE: Detect, classify and justify the weakness!



- We will use the term member (miembro) and neighbor (vecino) indistinctly, since they refer to the same entity.
- The entity NEIGHBOR (Vecino) has an **identity dependence/weakness in this relationship** since each neighbor is identified by its member number which can be repeated in several associations. By definition, this **dependence of identification** includes existence since if we remove an instance of the entity ASSOCIATION we should remove its partners (NEIGHBOR)
 - ASSOCIATION PUERTO; NUMREG 1 > NUMSOCIO 1; CARMEN GARCÍA
 - ASSOCIATION PORT; NUMREG 1 > NUMSOCIO 2; PEDRO PÉREZ
 - ASSOCIATION CENTRO; NUMREG 2 > NUMSOCIO 1; LUCÍA BOSCH
 - ASSOCIATION CENTRO; NUMREG 2 > NUMSOCIO 2; MARCO MARTOS
- Regarding the DNI, it could act as a primary key and they would not have the weakness, but the statement clearly says that we have to use the membership number (maybe the DNI is not compulsory).
- The entity ASSOCIATION is **strong in this relationship** since the num_reg is unique. A member (vecino) with a particular membership number, can only be in one association and must be in at least one to be in the database.

If a member could be in several associations the weakness would disappear.

IMPORTANT: When you read: "Your city council..." you have to understand that it talks about ONE city council that acts as a client requesting the database (for example City Council of Valencia) therefore "City Council" is the name of the database and it is NOT an entity.

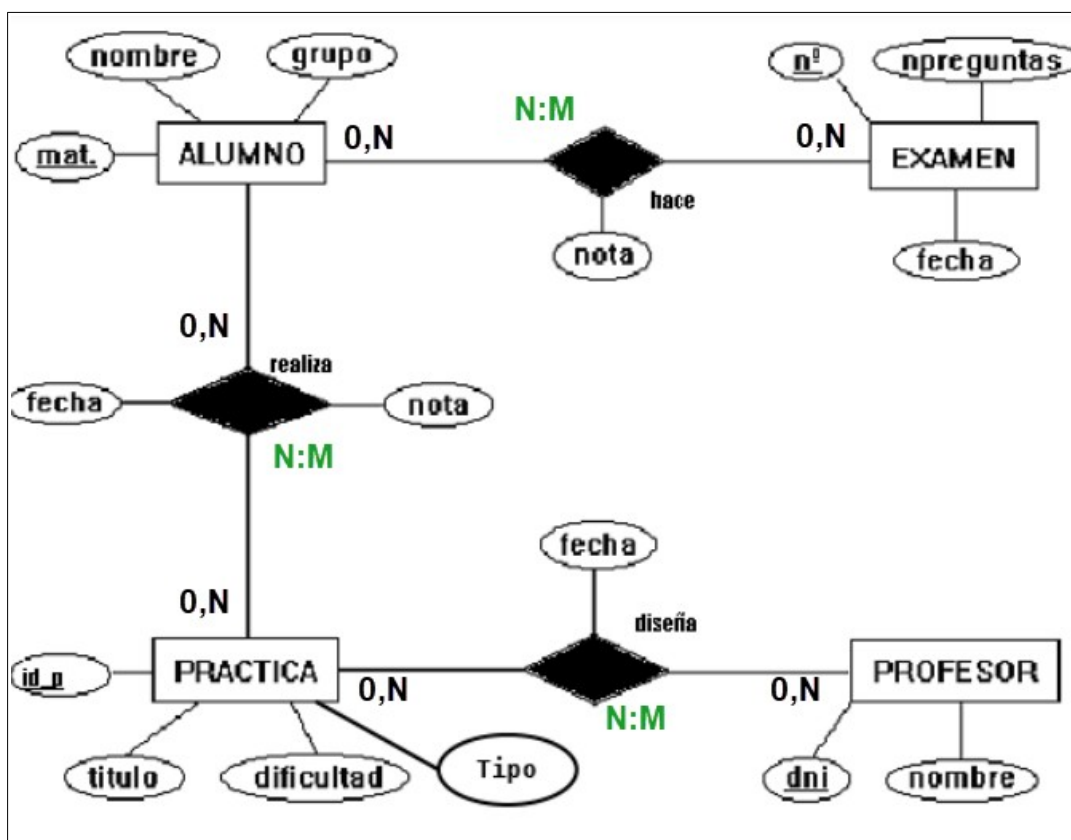
EXERCISE 3: ASSESSMENTS

KEYS OF THIS EXERCISE:

1. Justify the absence of any ternary relationship and any weakness

2. Identify the relationship attributes

This is our proposed solution:



ENTITIES AND ATTRIBUTES

The attribute qualification (*nota*) can vary depending on the pair we analyze in the relationship between STUDENT (*alumno*) and EXAM, so we have to give that attribute to the relationship.

Same happens with the attributes of the other two relationships. They belong to the relationships, since they can vary with every pair of instances.

An entity called GROUP would be redundant since “we don’t need more extra information about the groups”.

RELATIONSHIPS

It's VITAL you understand there's no space for a ternary relationships here:

- ALTERNATIVE 1 (not feasible). One ternary.
 - If you set STUDENT + TASK (practica) + TEACHER you are not allowing a relationship between the TEACHER and the TASK (a binary one). In other words, you are forcing every TASK to be assessed by a STUDENT.
- ALTERNATIVE 2 (not feasible). One ternary and a binary.
 - If you set STUDENT + TASK (practica) + TEACHER and STUDENT+TASK you are duplicating the information (making the database redundant). Guess why.

WEAKNESSES

There is no express mention in the statement of existence weakness (delete one if we delete another) and none of the entities needs another to identify itself (all are strong in all relationships) so we do not include any dependency.

EXERCISE 4: YACHTING

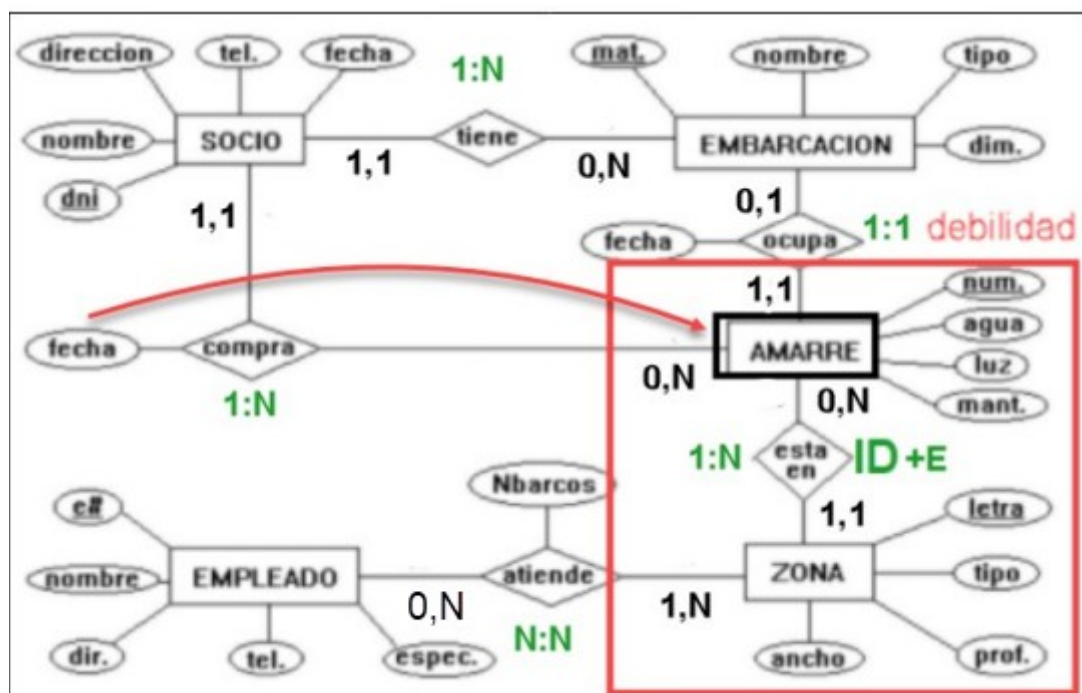
KEYS OF THIS EXERCISE:

1. Detect, classify and justify the weakness!

2. Identify the relationship attributes

3. Identify and accept the “unusual” loop that shows up

The minimum participations and cardinalities do not appear in this alternative notation. It is not a fault of the diagram, since these are data that are too often omitted in ER diagrams (unfortunately). **The diagram is not as rich, but is a valid one!**



ENTITIES AND ATTRIBUTES: It's important to remark the attribute number of boats (nbarcos), belonging to the relationship ATTENDS (atiende).

RELATIONSHIPS: No ternary relationship is valid here.

WEAKNESSES: A weak entity called MOORING (amarre) that has an **identity dependency** on the strong entity ZONE (which includes an existence dependency). Given that:

- If a zone is removed, its moorings are removed (existence) .

- A mooring is identified by a mooring number and a zone number (identity).
- As the identity includes the existence, we indicate only ID.

EXERCISE 5: FLIGHTS

KEYS OF THIS EXERCISE:

1. Identify the **SYSTEM** (the context)

2. Justify the absence of any ternary relationship and any weakness

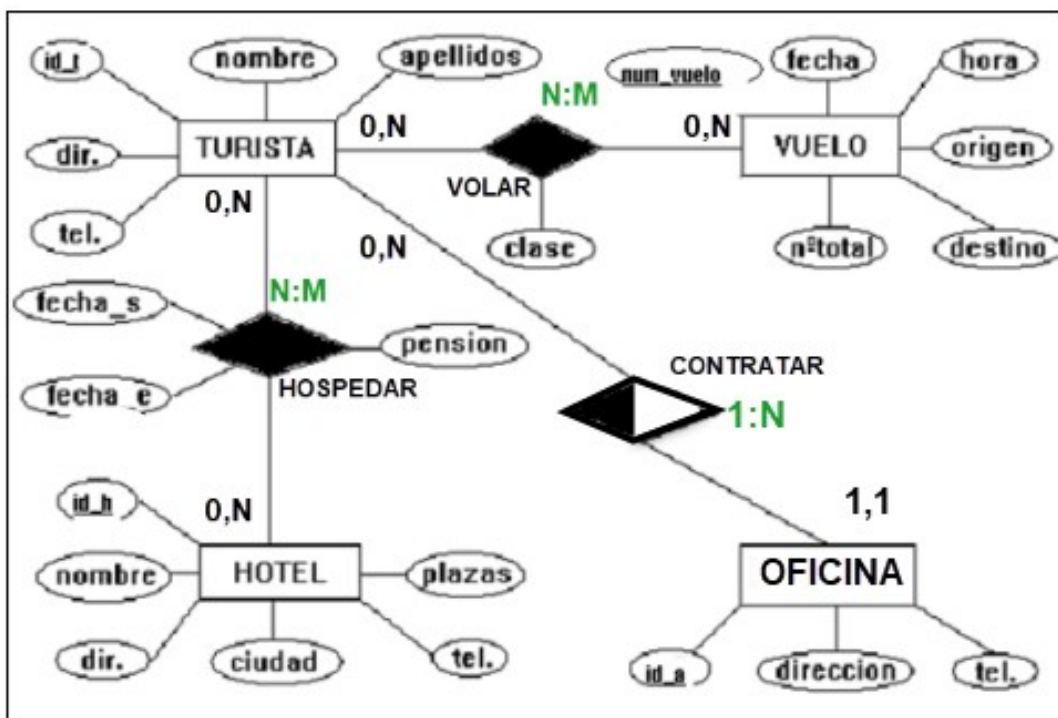
3. Identify the relationship attributes

When we face longer statements where there is a lot of information to analyze, the first thing we have to look at is what we want to store information about, so that we can deduce which entities we are going to have.

IMPORTANT: When you read: "The agency chain is composed of a set of branches" you can understand that there are many agencies and each one of them has many branches. In reality, when it says "a travel agency" you must understand that it speaks of ONE agency that acts as the client requesting the database (for example Nautalia) so "Agency" is the name of the database and is NOT an entity.

If we were asked to design a database that could be used by SEVERAL TRAVEL AGENCIES (El Corte Inglés, Nautalia, Expedia, Rumbo...) we would need the (strong) AGENCY entity and the (weak) BRANCH entity.

This is our proposed solution:



RELATIONSHIPS

Next, we must identify how the entities are related to each other. To do so, we must continue reading the statement and look for the verbs that relate pairs of entities.

- "...which branch (OFFICE) the tourist has contracted". => It tells us that there is a CONTRACT (CONTRATAR) relationship between the OFFICE (OFICINA) and the TOURIST (TURISTA).

- "...the tourist can choose any of the flights offered **by the agency**, ..." => Indicates that there is a FLIGHT (VOLAR) relationship between TOURIST (TURISTA) and FLIGHTS (VUELO). Remember **THE AGENCY IS NOT AN ENTITY HERE!**

- "...the tourist can stay in any of the hotels offered **by the agency**,..." => It indicates that there is a relationship HOST (HOSPEDAR) between TOURIST (TURISTA) and HOTEL. Again, **THE AGENCY IS NOT AN ENTITY HERE!**

It's VITAL you understand there's no space for a ternary relationships here:

- ALTERNATIVE 1 (not feasible). Two ternaries.
 - If you set TOURIST+HOTEL+OFFICE and TOURIST+FLIGHT+OFFICE you are not allowing a relationship between the TOURIST and the OFFICE (a binary one). Also, you are allowing the TOURIST to get a FLIGHT with one OFFICE and a HOTEL with another one.
- ALTERNATIVE 2 (not feasible). Two ternaries and a binary.
 - If you set TOURIST+HOTEL+OFFICE, TOURIST+FLIGHT+OFFICE and TOURIST+OFFICE you are fixing just one of the two problems mentioned above.

PARTICIPATIONS

Once the entities and the relationships between them have been found, it is time to look for the participations, for which we ask ourselves the questions again:

- Given a tourist, how many flights will he be able to take? At least 0, if he always chooses another type of transport, and at most n (0,n).
- On the other hand, given a flight, how many tourists could take it? We could force a flight not to depart if it does not have a minimum number of passengers, but the statement does not say anything about it, so 0 and at most n (0,n).

ATTRIBUTES

Now, we have to analyze if all the attributes are really attributes of the entities, or they could be of the relations. For this we have to ask ourselves if the attributes are fixed of one or another entity or, on the contrary, if they vary with the relationship.

Regarding the attribute "class" (in FLIGHT), when the statement indicates "when travelling, the tourist can choose any of the flights offered **by the agency**, and in which class (tourist or first class) he/she wishes to travel."

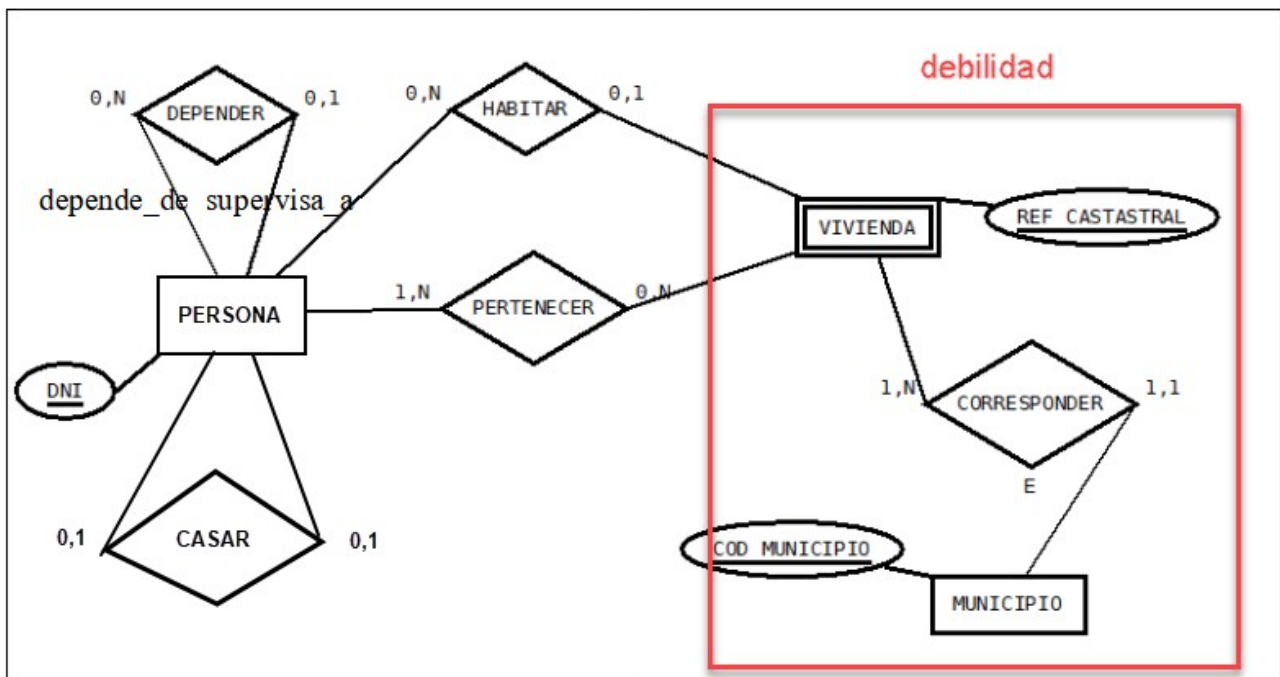
- If we include "class" as an attribute of the entity FLIGHT (VUELO) it would indicate that a flight could only be in one class, that's why it would be better as an attribute of the relationship FLIGHT (VOLAR).
- Similarly, if we include "class" as an attribute of TOURIST, that tourist would be obliged to always travel in that class, on any of the flights he/she took.
- Thus, we see that "class" is an attribute that can vary over time with the different occurrences of tourists and flights. On one occasion a tourist may choose to fly economy class and on another, the same tourist may choose another flight, or the same flight, but in first class.
- In order to model this behaviour, the attribute is included in the FLIGHT relationship (VOLAR).

WEAKNESSES

There is no brief mention in the statement of existence weakness (delete one if we delete another) and none of the entities needs another to identify itself (all are strong in all relationships) so we do not include any dependency.

EXERCISE 6: FLATS (OPTIONAL; NOT ASSESSABLE)**KEYS OF THIS EXERCISE:****1. Justify the absence of any ternary relationship and any weakness****2. Identify the relationship attributes**

This is our proposed solution:

**WEAKNESSES**

A weak entity called APARTMENT (vivienda) with an **existence dependence/weakness** against the strong entity called CITY (municipio).

Given that if we remove a city there is no sense of storing apartments of this city.

RELATIONSHIPS

No ternaries allowed here for the same reasons mentioned before.

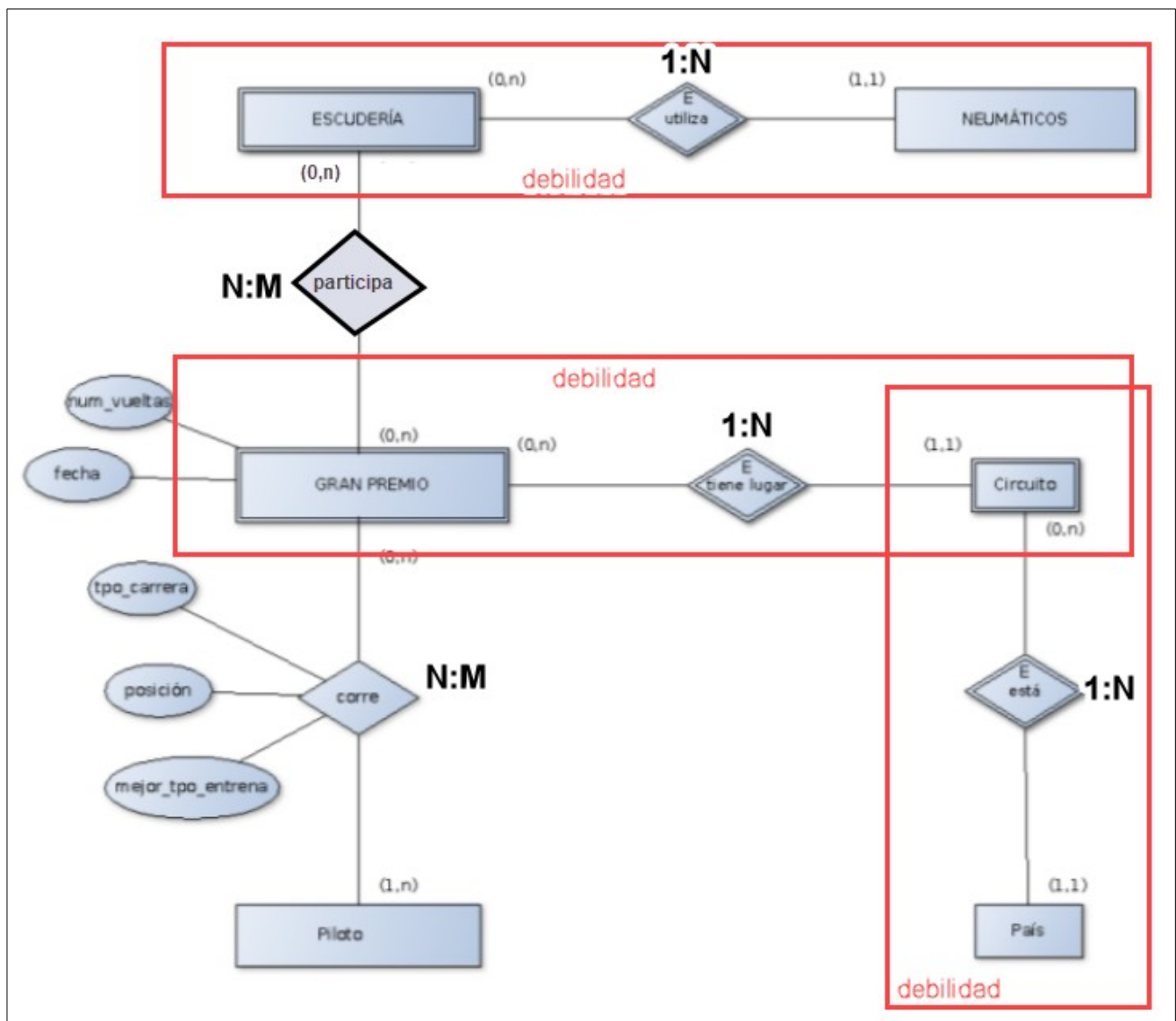
Challenge to get the two reflexive relationships:

- A PERSON takes_care 0 or n PERSONS and depends_on 0 or 1 PERSONS.
- A PERSON marries 0 or n PERSONS and is_married_to 0 or 1 PERSONS.

EXERCISE 7: FORMULA 1 (OPTIONAL; NOT ASSESSABLE)**KEYS OF THIS EXERCISE:****1. Detect, classify and justify the weakness!****2. Identify the relationship attributes****3. Identify and accept the “unusual” loop that shows up**

The attributes do not appear in this alternative notation. It is not a fault of the diagram, since these are data that are too often omitted in ER diagrams (unfortunately). **The diagram is not as rich, but is a valid one!**

This is our proposed solution.



- A weak entity called TEAM (escuderia) which has an **existence dependency** against the strong entity TIRES (neumáticos).
- A weak entity called GRAND PRIX which has an **existence dependency** against the entity CIRCUIT (which acts here as a strong entity).
- A CIRCUIT entity has an **existence dependence** on the strong entity COUNTRY (pais).

All this is due to the following:

- If we eliminate the tire brand, the team is eliminated (existence).
- Each Grand Prix and each circuit depends on the country. If the country is eliminated, all occurrences of these two entities are eliminated (existence), but this does NOT affect the rest of the entities.