

# UNIT 1

## CONCEPTUAL MODELING (EER)

**BASES DE DATOS 2022/2023**  
CFGs DAW

### WORKSHOP C: HIGH LEVEL ER

#### PROPOSED SOLUTIONS

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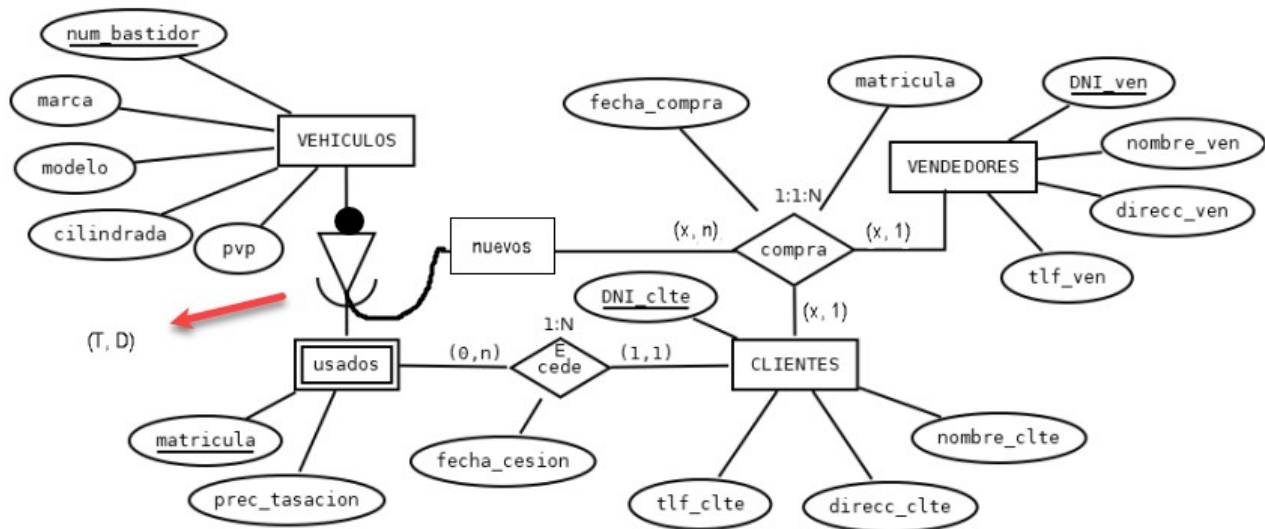
Fecha: 11/07/23

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## EXERCISE 1: CAR DEALERSHIP (solved)



The entity VEHICLES represents both new and used vehicles, to express this in our diagram we will make the specialization total, therefore there may be vehicles that are not used, and those will be the new ones.

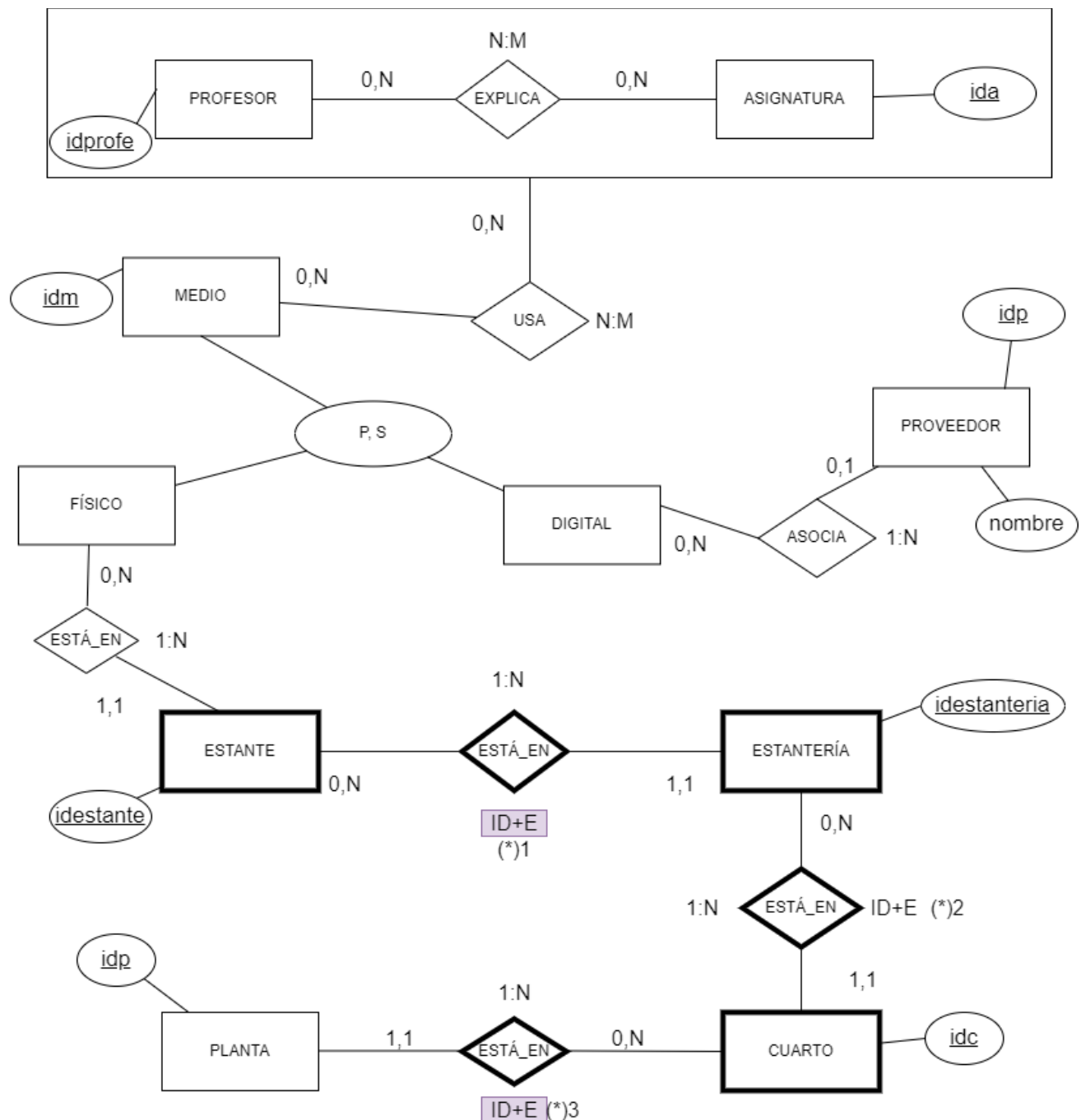
On the other hand, the statement "We want to know which salesperson has sold which model to which customer" is indicating a relationship between the three entities SELLERS - CUSTOMERS - VEHICLES. For this we will need to use a ternary relationship.

The maximum cardinalities are clear:

- Given a **new vehicle and a customer** how many sellers will that customer have bought this vehicle from? At most  $\rightarrow (x,1)$ . (minimum ignored)
- Given a **customer and a salesman** how many vehicles will that customer have bought from that salesman? At most  $\rightarrow (x,n)$ . (minimum ignored)
- And finally, given a **new vehicle and a salesman** how many customers will that salesman have sold that vehicle to? At most  $\rightarrow (x,1)$ . (minimum ignored)

We also have a weak USED with existence dependence on the strong CUSTOMERS, which is NOT of identity since it has an attribute that univocally identifies it (license plate).

## EXERCISE 2: MEANS

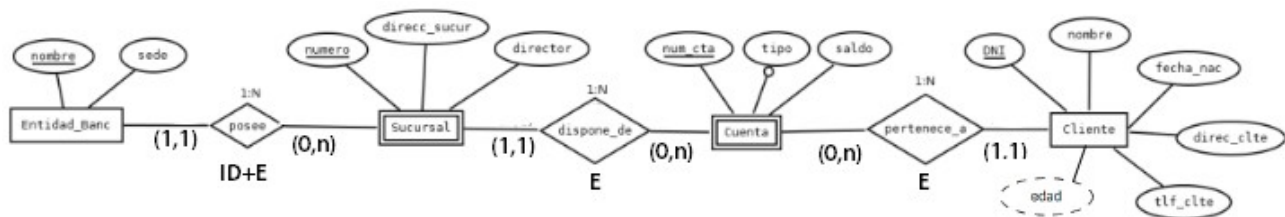


(\*)1 Relación débil binaria de cardinalidad 1:N con dependencia de identidad (que implica existencia) entre la entidad ESTANTERÍA (fuerte) y la débil (ESTANTE), dado que la segunda no puede identificarse sin la primera.

(\*)2 Relación débil binaria de cardinalidad 1:N, con dependencia de identidad (que implica existencia) entre la entidad CUARTO (fuerte) y la débil (ESTANTERÍA), dado que la segunda no puede identificarse sin la primera.

(\*)3 Relación débil binaria de cardinalidad 1:N, con dependencia de identidad (que implica existencia) entre la entidad PLANTA (fuerte) y la débil (CUARTO), dado que la segunda no puede identificarse sin la primera.

## EXERCISE 3: NETWORK OF BANKS



The most remarkable thing in this exercise is to realize between which entities there is an existence dependency and between which others the dependency is an identification dependency. Also, we don't need a specialization of account since there's nothing extra to do with them nor to add to them. Adding a non-zero attribute will be ok.

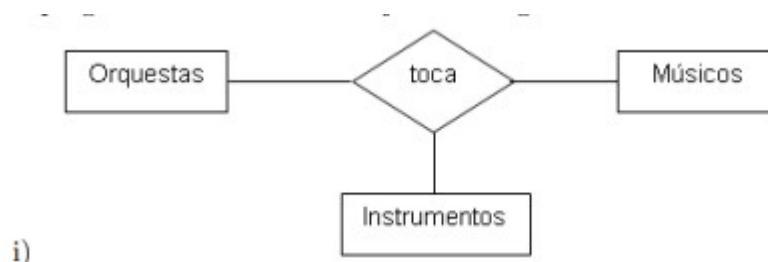
The identification dependency is between BANK and BRANCH because the statement indicates, "Each branch belongs to a single bank that assigns it a branch number." Therefore, different banks may assign the same number to their branches, and then the weak entity identifier attribute (BRANCH) will not uniquely identify each branch in the banking system, but rather the name the bank plus the branch number will be needed to be identified.

So we have:

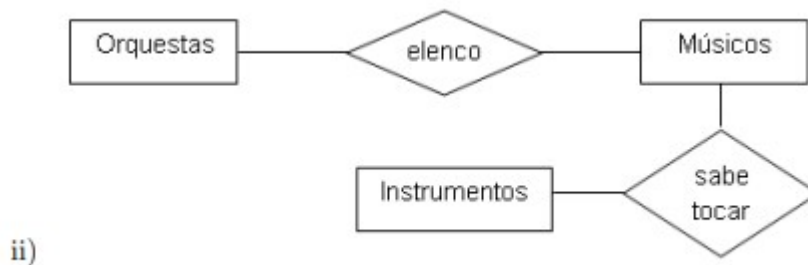
1. A weak entity called BRANCH with existence dependency on the strong BANK, which is also identity dependency since it does NOT have an attribute that uniquely identifies it.
2. A weak entity called ACCOUNT with existence dependency on the strong CUSTOMER, which is not of identity because it has an attribute that univocally identifies it as num\_cta (ACCOUNT).
3. A weak entity called ACCOUNT with existence dependency on the strong BRANCH (acting as strong), which is NOT of identity since it has an attribute that univocally identifies it.

Another aspect to consider is whether to consider account types as specializations of ACCOUNT or not. As you can see in the solution, we have not considered them as such, but as a type attribute that we consider that it cannot be null. The reason is because we specialize in sub-type entities, when the statement specifies that it is necessary to store different information for each of the sub-types than the information stored by the super-type.

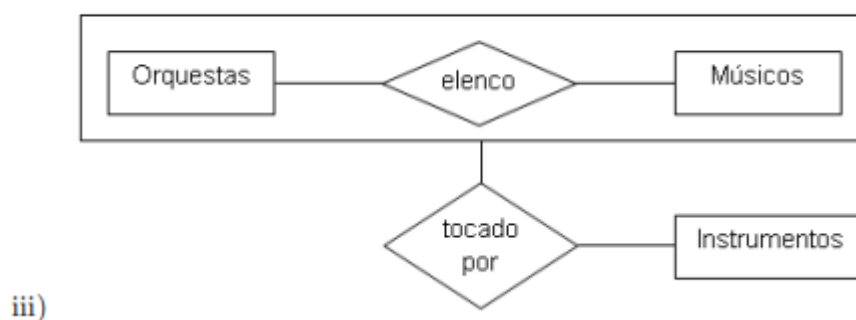
## EXERCISE 4: MUSICAL INSTRUMENTS



On one hand (drawback), a combination of two occurrences of only a pair of entities will not be able to be registered in the database. An occurrence of each of the three entities is needed. On the other hand (advantage) we can record if a musician can play different instruments depending on the orchestra.



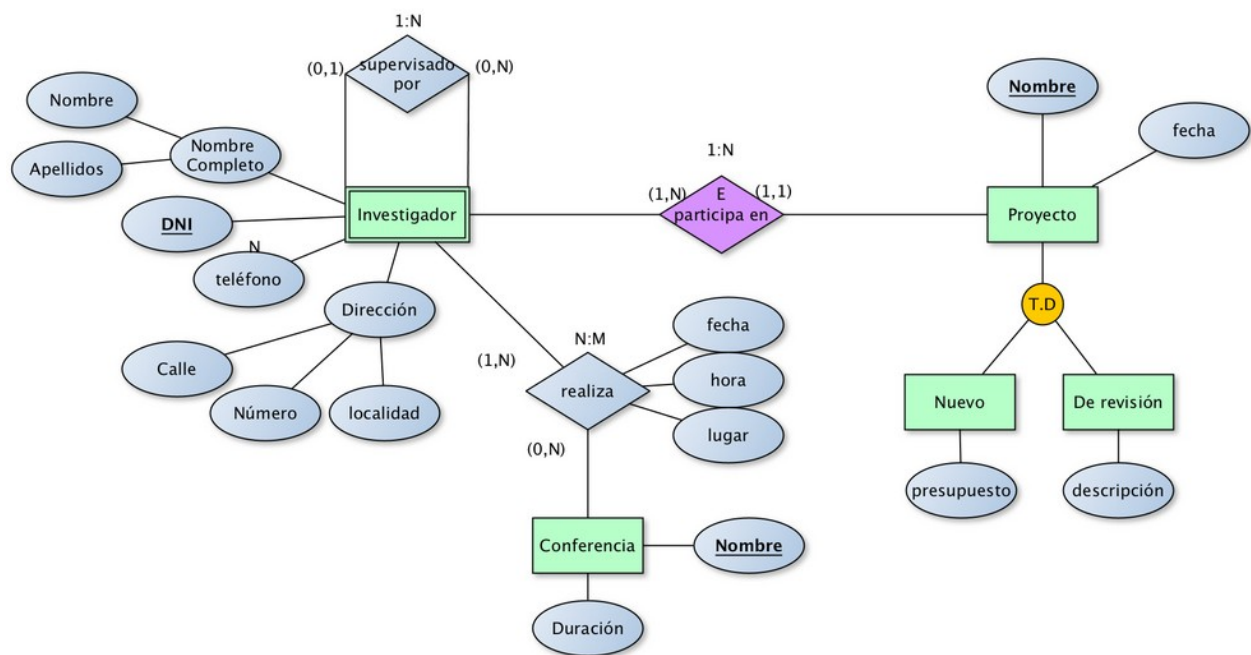
On one hand (advantage), an orchestra can be related to a musician and a musician can be related to an instrument. On the other hand (drawback), there's no way to register which instruments is a musician playing in a specific orchestra. Also, you could have orchestras and musicians with no information about instruments at all.



Combines the advantages of the two previous options: We can record if a musician can play different instruments depending on the orchestra and an orchestra can be related to a musician and a musician can be related to an instrument.

And only the drawback of the second one: you could have orchestras and musicians with no information about instruments at all.

## EXERCISE 5: RESEARCH CENTER



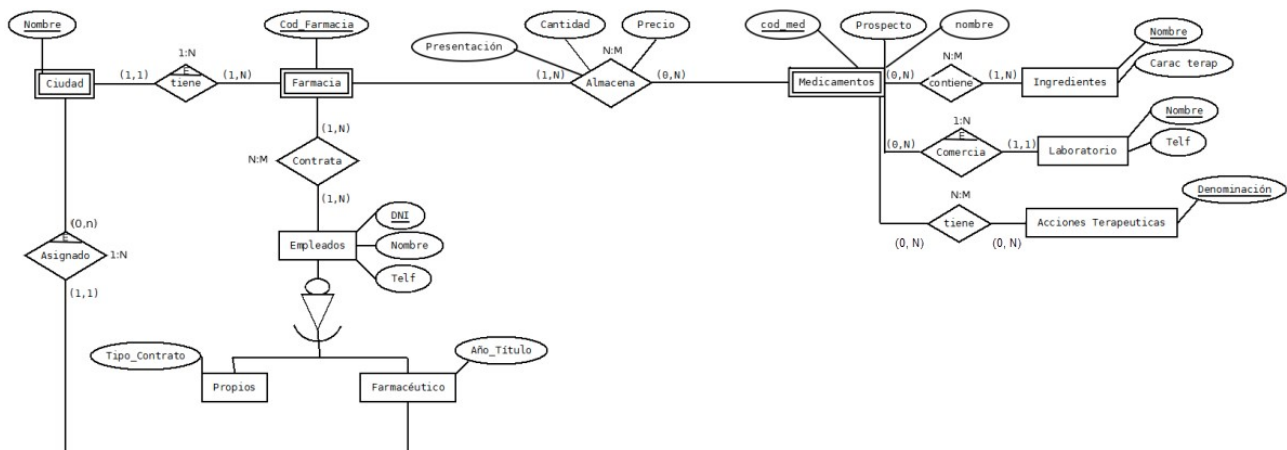
## Entities:

- PROJECT: which specializes in new and revision. Total specialization, since every project must belong to one of the subclasses and disjoint because a project cannot be both new and revision at the same time.
- RESEARCHER
- CONFERENCE

## Relationships

- PROJECT/RESEARCHER:
  - Given a PROJECT: it must be carried out by at least one investigator and at most N. (1,N)
  - Given a RESEARCHER: it will participate at least and at most in one project given the statement.(1,1)
  - We have a weak entity called RESEARCHER with existence dependence on the strong one PROJECT, which is not of identity since it has an attribute that univocally identifies it as DNI (in RESEARCHER).
  - The resulting cardinality is: 1:N

- RESEARCHER/CONFERENCE:
  - Given a RESEARCHER: it may give no lecture as a minimum and N as a maximum. (0,N)
  - Given a CONFERENCE: it will be given by at least one researcher and at most N. (1,N)
  - The resulting cardinality is N:M.
  - In this relation, the attributes date, time and place are considered as attributes of the relation. This allows us to manage the same conference with different researchers in different classrooms, on different dates and at different times. The only attributes that do not vary in the relationship would be the name of the conference and its duration, which is indifferent and does not vary with respect to the speakers.
- RESEARCHER/supervising RESEARCHER:
  - A RESEARCHER **is supervising** zero researchers when he/she is not a manager and N researchers when he/she is a supervisor.
  - A RESEARCHER **is supervised by** zero researchers when he/she is a supervisor and by one researcher when he/she is not a supervisor.

**EXERCISE 6: PHARMACIES (OPTIONAL; NOT ASSESSABLE)**

Regarding the weak entities, they are dependent on the entity that has a (1,1) next to it, exercising that entity as a strong entity.

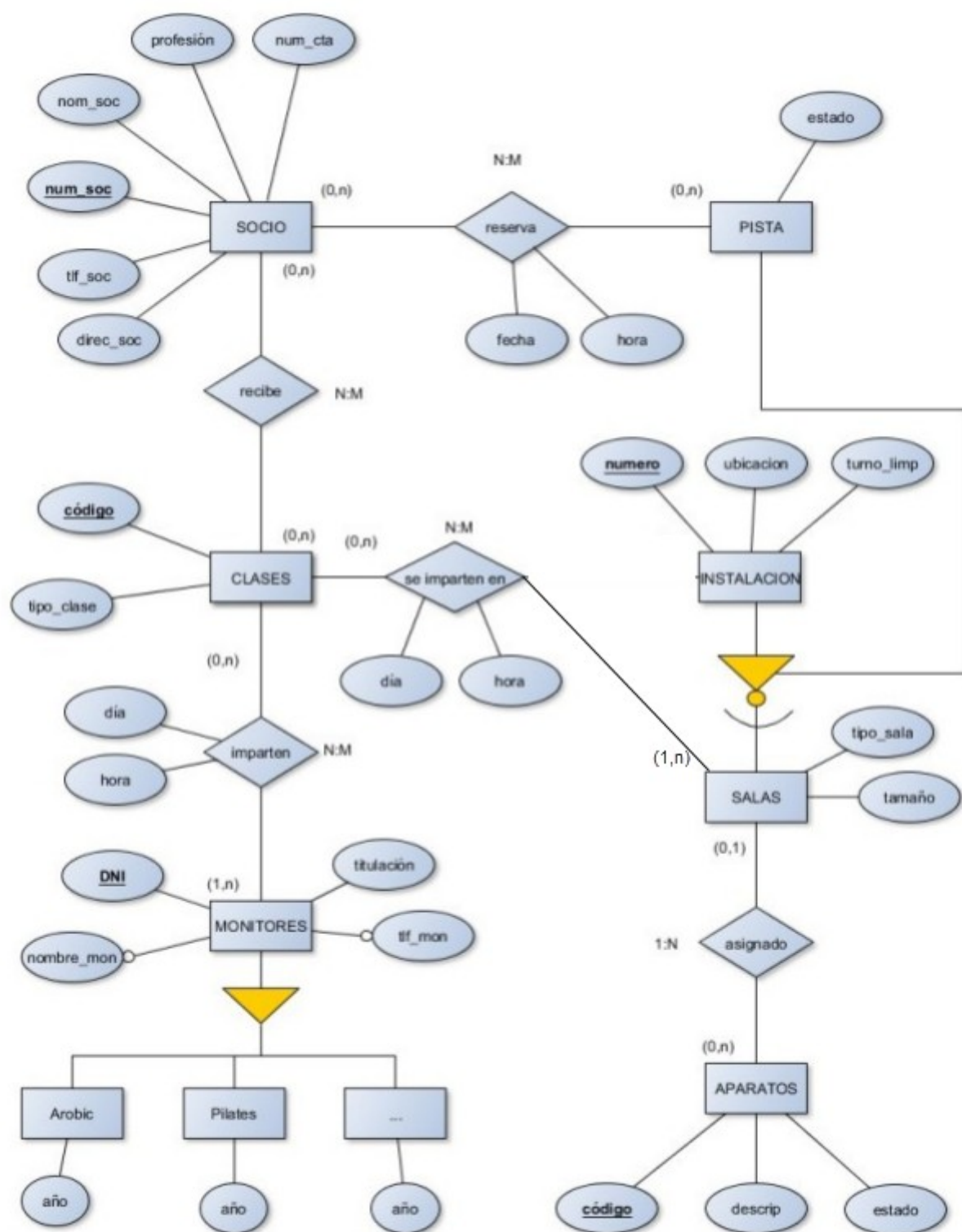
We have THREE WEAKNESSES/DEPENDENCIES:

- A weak entity called PHARMACY with existence dependence on the strong entity CITY, which is not of identity as it has an attribute that univocally identifies it as cod\_pharmacy (in PHARMACY).
- A weak entity called CITY with existence dependence on the strong PHARMACY, which is not of identity since it has an attribute that uniquely identifies it as Name (in CITY).
- A weak entity called MEDICINES with existence dependence on the strong LABORATORY, which is not of identity by having an attribute that univocally identifies it as is cod\_med (in MEDICINES).

AND THREE CONSEQUENCES:

1. If we DELETE a LABORATORY, the MEDICATIONS are deleted.
2. If we DELETE a CITY, the related PHARMACIES are deleted.
3. If we DELETE a PHARMACIST, the related CITIES will be deleted.



**EXERCISE 7: GYM (OPTIONAL; NOT ASSESSABLE)**

VALID alternatives:

- Classes and Instructors (*Monitores*):
  - OPTION A: As it is (specializing the instructors)
  - OPTION B: Remove the specialization and add another binary relationship between Classes and Instructors called “can teach”.
  - OPTION C: Remove the specialization and add a multi valued attribute to Instructors called “classes can teach”.
- Rooms and Equipment (*Aparatos*):
  - OPTION A: As it is (not specifying when an equipment is permanently assigned to a room)
  - OPTION B: Add a boolean attribute to the relationship called permanent.
  - OPTION C: Add another binary relationship between Rooms and Equipment called “assigned permanently”.
- Classes and Facilities (*Instalaciones*):
  - OPTION A: As it is (setting time and day for the relationship Classes-Facilities and setting time and day for the relationship Classes-Instructors)
  - OPTION B: Create an aggregation Classes-Instructors and relate it with Facilities, removing the attributes of that diamond.