SEMESTRAL WORK: HOME SALE,

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In my semestral work I am implementing a database about home sale. The topic manages relationships between properties, real estates, salespeople, and potential buyers. The system models key interactions in the real estate domain. It is made up of five entities: homes, real estates and persons, which can be buyers or salesmen. There are several relations between the different entities.

-The homes are represented by real estate agencies from a certain date.

- Homes are marked as favorites by people, with a score.

- Salespeople work in real estate.

- Buyers visit homes represented by real estate agencies

Cardinalities:

* Real estates represent several homes, and a home can be represented by several real estate.
* A person can mark as a favorite several homes, and a home can be marked as favorite by several persons.
* A buyer can visit several homes, and a home can be visited by several buyers.
* A salesman can only work in one real estate, but in a real estate can work many salesmen.

In my work I have three many-to-many relationships: Represents, Visits and Favorites. To transform many-to-many cardinality into one-to-many relationships we have to create a bridge table that joins both original tables in the many-to-many cardinality. For example, in my project I had to create a table for Represents, Visits and Favorites. In this bridge tables we have to include the primary keys of both side tables as foreign keys and create a primary key for the bridge table which manages both primary keys, avoiding duplication.

Transformation of the ER diagram to the physical level:

```
CREATE TABLE Person (
    NIF VARCHAR2(9) PRIMARY KEY,
    name VARCHAR2(50) NOT NULL
);

ALTER TABLE Person ADD surname VARCHAR2(50) NOT NULL;

CREATE TABLE Buyer (
    person_NIF VARCHAR2(9) PRIMARY KEY,
    locality VARCHAR2(20) NOT NULL,
    FOREIGN KEY (person_NIF) REFERENCES Person(NIF)
);

CREATE TABLE RealEstate(
    id INT PRIMARY KEY,
    type VARCHAR2(15),
    name VARCHAR2(20),
    capital NUMBER(15,2)
);

CREATE TABLE Salesman (
    person_NIF VARCHAR2(9) PRIMARY KEY,
    job VARCHAR2(15) NOT NULL,
    realEstate_id INT,
    FOREIGN KEY (person_NIF) REFERENCES Person(NIF),
    FOREIGN KEY (realEstate_id) REFERENCES RealEstate(id)
);
```

```
CREATE TABLE Home(
    cadastre_num VARCHAR2(50) PRIMARY KEY,
    floor_num INT,
    meters INT,
    deleting_obj INT,
    CHECK (floor_num > 0 AND meters>0)
);

ALTER TABLE Home DROP COLUMN deleting_obj;

-- Relationship table for Favorites
CREATE TABLE Favorites(
    person_NIF VARCHAR2(9),
    home_cadastre VARCHAR2(50),
    score INT CHECK (score BETWEEN 0 AND 5),
    PRIMARY KEY (person_NIF, home_cadastre),
    FOREIGN KEY (person_NIF) REFERENCES Person(NIF),
    FOREIGN KEY (home_cadastre) REFERENCES Home(cadastre_num)
);

-- Relationship table for Represents
CREATE TABLE Represents(
    home_cadastre VARCHAR2(50),
    realEstate_id INT,
    certain_date DATE,
    PRIMARY KEY (home_cadastre, realEstate_id),
    FOREIGN KEY (realEstate_id) REFERENCES RealEstate(id),
    FOREIGN KEY (home_cadastre) REFERENCES Home(cadastre_num)
);
```

```
-- Relationship table for Visits
CREATE TABLE Visits(
   buyer_NIF VARCHAR2(9),
   realEstate_id INT,
   home_cadastre VARCHAR2(50),
   PRIMARY KEY (buyer_NIF, realEstate_id, home_cadastre),
   FOREIGN KEY (buyer_NIF) REFERENCES Buyer(person_NIF),
   FOREIGN KEY (realEstate_id) REFERENCES RealEstate(id),
   FOREIGN KEY (home_cadastre) REFERENCES Home(cadastre_num)
);
```

Checking that all tables are in 3NF:

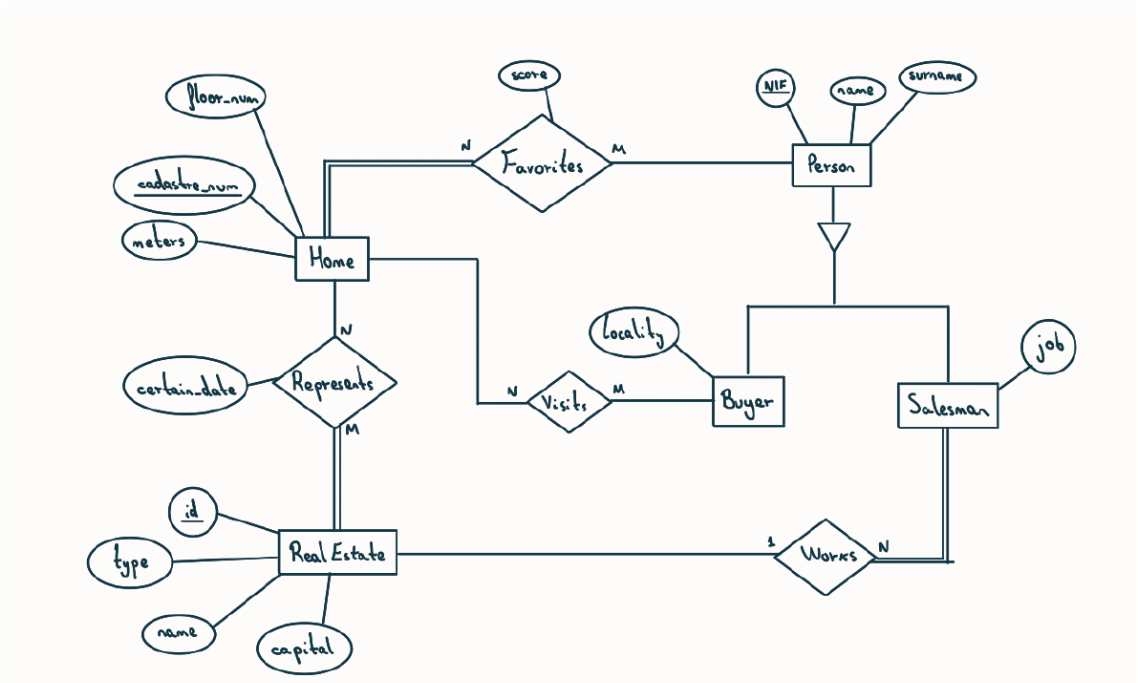
* Person table:
  The primary key, NIF, is unique and identifies each person, all attributes (name, surname) depend directly on the primary key and there are no transitive dependencies.
* Buyer table:
  The primary key (person_NIF) uniquely identifies each buyer. The attribute locality depends directly on the primary key, and there are no transitive dependencies, since person_NIF is already a primary key.
* RealEstate table:
  The primary key (id) identifies in a unique way each real estate agency. All attributes depend directly on id, and there are no transitive dependencies.
* Salesman table:
  The primary key (person_NIF) uniquely identifies each salesman. Job depends on person_NIF and realState_id depends directly on person_NIF, so there are no indirect or transitive dependencies.
* Home table:
  The castre_num attribute uniquely identifies each home, and the attributes floor_num and meters depend directly on cadastre_num. There are also no transitive dependencies.
* Favorites table:
  The composite key (person_NIF, home_cadastre) identifies in a unique way each favorite relationship. Score depends directly on the composite

key, as it is specific to each person-home pair. There are no transitive dependencies.

* Represents table:
  The composite key (home_cadastre, realState_id) uniquely identifies each representation. The attribute certain_date depends on the composite primary key and there are no transitive dependencies.
* Visits table:
  The composite key of this bridge table uniquely identifies each visit. There are no additional attributes in this table, so there is no possibility of transitive dependencies.

  In conclusion, every single table is in 3NF, as any of them have transitive dependencies, but all the attributes functionally depend on their respective primary keys.

ERA diagram:



Inserts:

--RealEstate

INSERT INTO RealEstate (id, type, name, capital) VALUES (1, 'Apartment', 'Downtown Residence', 200000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (2, 'House', 'Beachside Villa', 350000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (3, 'Apartment', 'Suburban Living', 150000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (4, 'House', 'Mountain Retreat', 500000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (5, 'Apartment', 'City View Towers', 250000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (6, 'House', 'Countryside Estate', 600000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (7, 'Apartment', 'Green Park Residence', 220000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (8, 'House', 'Lakeside Mansion', 700000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (9, 'Apartment', 'Central Plaza', 180000.00);

INSERT INTO RealEstate (id, type, name, capital) VALUES (10, 'House', 'Country Manor', 450000.00);

--Person

INSERT INTO Person (NIF, name, surname) VALUES ('12345678A', 'Miguel', 'Torres');

INSERT INTO Person (NIF, name, surname) VALUES ('23456789B', 'Ruben', 'Cotagge');

INSERT INTO Person (NIF, name, surname) VALUES ('34567890C', 'Silvia', 'Matamoros');

INSERT INTO Person (NIF, name, surname) VALUES ('45678901D', 'Teresa', 'Steadman');

INSERT INTO Person (NIF, name, surname) VALUES ('56789012E', 'Irene', 'Valrojo');

INSERT INTO Person (NIF, name, surname) VALUES ('67890123F', 'David', 'Gordillo');

INSERT INTO Person (NIF, name, surname) VALUES ('78901234G', 'Elena', 'Nito');

INSERT INTO Person (NIF, name, surname) VALUES ('89012345H', 'Nacho', 'Pistacho');

INSERT INTO Person (NIF, name, surname) VALUES ('90123456I', 'Cristina', 'Pelusa');

INSERT INTO Person (NIF, name, surname) VALUES ('01234567J', 'Javi', 'Paletas');

INSERT INTO Person (NIF, name, surname) VALUES ('12345679K', 'Ivan', 'Yvienen');

INSERT INTO Person (NIF, name, surname) VALUES ('23456780L', 'Marco', 'Elgrande');

INSERT INTO Person (NIF, name, surname) VALUES ('34567891M', 'Esther', 'Molina');

```
INSERT INTO Person (NIF, name, surname) VALUES ('45678902N', 'Laura', 'Buesa');

INSERT INTO Person (NIF, name, surname) VALUES ('56789013O', 'Josemari', 'Laurel');

INSERT INTO Person (NIF, name, surname) VALUES ('67890124P', 'Claudia', 'Cobaya');

--Buyer

INSERT INTO Buyer (person_NIF, locality) VALUES ('12345678A', 'Valladolid');

INSERT INTO Buyer (person_NIF, locality) VALUES ('23456789B', 'Burgos');

INSERT INTO Buyer (person_NIF, locality) VALUES ('34567890C', 'Sevilla');

INSERT INTO Buyer (person_NIF, locality) VALUES ('45678901D', 'Granada');

INSERT INTO Buyer (person_NIF, locality) VALUES ('56789012E', 'Lisboa');

INSERT INTO Buyer (person_NIF, locality) VALUES ('67890123F', 'Granada');

INSERT INTO Buyer (person_NIF, locality) VALUES ('78901234G', 'Zaragoza');

INSERT INTO Buyer (person_NIF, locality) VALUES ('89012345H', 'Zaragoza');


--Salesman

INSERT INTO Salesman (person_NIF, job, RealEstate _id) VALUES ('90123456I', 'Agent',
1);

INSERT INTO Salesman (person_NIF, job, RealEstate _id) VALUES ('01234567J',
'Manager', 2);

INSERT INTO Salesman (person_NIF, job, RealEstate _id) VALUES ('12345679K', 'Agent',
3);

INSERT INTO Salesman (person_NIF, job, RealEstate _id) VALUES ('23456780L',
'Assistant', 4);

INSERT INTO Salesman (person_NIF, job, RealEstate _id) VALUES ('34567891M',
'Manager', 5);

INSERT INTO Salesman (person_NIF, job, RealEstate _id) VALUES ('45678902N', 'Agent',
6);

INSERT INTO Salesman (person_NIF, job, RealEstate _id) VALUES ('56789013O', 'Agent',
7);

INSERT INTO Salesman (person_NIF, job, RealEstate _id) VALUES ('67890124P',
'Assistant', 8);



--Home
```

```
INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H001', 2, 85);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H002', 3, 120);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H003', 1, 60);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H004', 4, 150);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H005', 2, 95);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H006', 5, 200);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H007', 6, 250);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H008', 2, 75);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H009', 3, 110);

INSERT INTO Home (cadastre_num, floor_num, meters) VALUES ('H010', 1, 45);


--Favorites

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('12345678A',
'H001', 4);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('23456789B',
'H002', 5);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('34567890C',
'H003', 3);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('45678901D',
'H004', 2);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('56789012E',
'H005', 4);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('67890123F',
'H006', 5);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('78901234G',
'H007', 1);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('89012345H',
'H008', 3);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('90123456I',
'H009', 2);

INSERT INTO Favorites (person_NIF, home_cadastre, score) VALUES ('01234567J',
'H010', 4);
```

--Represents

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H001', 1, TO_DATE('2024-01-10', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H002', 2, TO_DATE('2024-01-12', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H003', 3, TO_DATE('2024-01-14', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H004', 4, TO_DATE('2024-01-15', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H005', 5, TO_DATE('2024-01-16', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H006', 6, TO_DATE('2024-01-18', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H007', 7, TO_DATE('2024-01-20', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H008', 8, TO_DATE('2024-01-21', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H009', 9, TO_DATE('2024-01-22', 'YYYY-MM-DD'));

INSERT INTO Represents (home_cadastre, RealEstate _id, certain_date) VALUES ('H010', 10, TO_DATE('2024-01-22', 'YYYY-MM-DD'));

--Visits

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('12345678A', 1, 'H001');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('23456789B', 2, 'H002');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('34567890C', 3, 'H003');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('45678901D', 4, 'H004');

```
INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('56789012E', 5, 'H005');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('67890123F', 6, 'H006');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('78901234G', 7, 'H007');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('89012345H', 8, 'H008');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('12345678A', 9, 'H009');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('23456789B', 10, 'H010');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('34567890C', 1, 'H001');

INSERT INTO Visits (buyer_NIF, realEstate_id, home_cadastre) VALUES ('45678901D', 2, 'H002');
```

Queries:

```
--We select the whole Persona table for seeing what we have

SELECT * FROM Person;
```

NIF	NAME	SURNAME
12345678A	Miguel	Torres
23456789B	Ruben	Cotagge
34567890C	Silvia	Matamoros
45678901D	Teresa	Steadman
56789012E	Irene	Valrojo
67890123F	David	Gordillo
78901234G	Elena	Nito
89012345H	Nacho	Pistacho
90123456I	Cristina	Pelusa
01234567J	Javi	Paletas
12345679K	Ivan	Yvienen
23456780L	Marco	Elgrande
34567891M	Esther	Molina
45678902N	Laura	Buesa
567890130	Josemari	Laurel
67890124P	Claudia	Cobaya

--We select the NIF from buyers which are from a certain locality, in this case Zaragoza

```
SELECT person_NIF AS buyers_from_Zaragoza from Buyer WHERE locality = 'Zaragoza';
```

BUYERS_FROM_ZARAGOZA
78901234G
89012345H

--Updating the real state´s capital with id 5 to 550000.00

```
UPDATE RealState
SET capital = 550000.00
WHERE id = 5;
```

--Deleting a favorite

```
DELETE FROM Favorites
WHERE person_NIF = '12345678A' AND home_cadastre = 'H001';
```

--Complex query

--Find the average score that each RealState has received for its homes marked as favorites by different people.

--Include only real estate entries that have an average score above a specified one

--List the result ordered by the average score in descending order.

```
SELECT
    RealState.id AS real_state_id,
    RealState.name AS real_state_name,
    AVG(Favorites.score) AS avg_score,
    COUNT(Favorites.person_NIF) AS num_of_favorites
FROM
    RealState
JOIN
    Represents ON RealState.id = Represents.realState_id
JOIN
    Home ON Represents.home_cadastre = Home.cadastre_num
JOIN
    Favorites ON Home.cadastre_num = Favorites.home_cadastre
WHERE
    RealState.capital > 100000 --only considering RealState with capital over 100,000
GROUP BY
    RealState.id, RealState.name
HAVING
    AVG(Favorites.score) >= 3 --only include those with an average score of 3 or higher
ORDER BY
    avg_score DESC, num_of_favorites DESC;
```

REAL_STATE_ID	REAL_STATE_NAME	AVG_SCORE	NUM_OF_FAVORITES
6	Countryside Estate	5	1
2	Beachside Villa	5	1
10	Country Manor	4	1
5	City View Towers	4	1
3	Suburban Living	3	1
8	Lakeside Mansion	3	1

--Find the number of houses that have 3 or more floors

SELECT COUNT(cadastre_num) as homes_with_3_or_more_floors FROM Home WHERE floor_num >= 3;

HOMES_WITH_3_OR_MORE_FLOORS
5