EV2. Logical and Physical Model

Assessable Task 2

Database Management (DBM)
NSM/ASIR

Pau Miñana
2023-2024

To Consider

This activity is optional but **evaluative**: it may affect your evaluation grade.

> 🚫 **If you look for solutions on the internet or ask the ChatGPT oracle, you will only be fooling yourself**. Remember that ChatGPT is not infallible or omnipotent. It is a great tool for speeding up your work once you have mastered a subject, but using it as a shortcut when you are acquiring basic skills and knowledge is seriously detrimental to your learning.
>
> Try to solve the activities using the resources we have seen and the extended documentation you will find in the Virtual Classroom.

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1. Instructions and rules

1.1. Description

You are required to produce valid logical (relational) and physical (MySQL) models that match the given specifications.

1.2. Plazo de entrega y porcentajes

- **EVALUATION ratio**: 30% of the total grade is for the evaluable tasks.
- **ACTIVITY ratio**: 50% of the evaluable tasks grade (there are two per evaluation).
- **DEADLINE**: *23:59 on Thursday 28th December 2023* (4 WEEKS).

1.3. Grading

Submission is not compulsory and there is no minimum mark. **It will be graded from 0 to 10 according to the rubric** provided in this document.

1.4. Resources

You should study and consult all the resources given on the virtual classroom, paying particular attention to the non-assessable tasks and all the extra material.

E-R is HIGHLY subjective but next steps are quite deterministic in nature.

To facilitate the correction of the activity, follow the steps indicated in the template provided.

1.5. Plagiarism

You should avoid other students copying your work and take care to prevent this situation.

This is an **individual assignment**. If authorship is suspected, an oral interview will be required.

1.6. Submission instructions

Lhe assignment must be submitted as **a single PDF** containing the exercises solved according to the template.

ANY OTHER FORMAT WILL NOT BE ACCEPTED

1.7. Solutions and grading results

You will receive the grade broken down by each criterion, and the overall score, along with any comments that provide suggestions on how you could improve.

2. Procedure to follow

1. Download the template and the E-R diagram from the Virtual Classroom. Remember that you have to start from this ENTITY-RELATIONSHIP DIAGRAM, regardless of the diagram you presented in the previous assessable activity.

2. Study the diagram carefully. The solution suggested in the first assessable task has been modified to simplify it.

3. Imagine that you are working in a company and you are asked to complete this task only for this part of the diagram, leaving the other part to be completed later by another colleague in the company or by yourself.

4. Once you have done the relational logic modelling (the tables/relations), you must include the correct set of DDL statements to run on MySQL server.

5. Finally, we will ask you to make a series of changes to the tables and to introduce and manipulate some information by "attacking" the database with DDL statements.

6. Very important:
   - Indicate the necessary constraints and changes to comply with the third normal form (3NF), note any semantic losses and correctly implement weaknesses when passing to tables.
   - Be very careful about the order of the statements in the following steps.
   - Read the full document before you start. It is crucial, for example, to choose the data types.

3. Rubric

ASSESSABLE ITEMS	DETAILS	SCORE
Relational logic modelling.	Correct E-R diagram mapping Correct identification of semantic losses (if applicable). Correct implementation of weaknesses (if applicable). No unjustified decision. No unexplained semantic loss. Apply normalization correctly to move to third normal form (3NF).	5
DDL Physical Modelling. Metadata creation.	Sets all the necessary instructions to create the tables of the logical relational model in MySQL. Uses metadata constraints. Specifies the instructions in the proper order so that they can be correctly executed sequentially in the DBMS.	2
DDL Physical Modelling. Metadata modification.	Provides the correct instructions for carrying out modifications to the structures. Specifies the instructions in the proper order so that they can be correctly executed sequentially in the DBMS.	2
DML Physical Modelling. Data handling.	Sets out the correct instructions for making changes to the data. Specifies the instructions in the proper order so that they can be correctly executed sequentially in the DBMS.	1

4. Statement. Cyber Security Division (ASSESSABLE)

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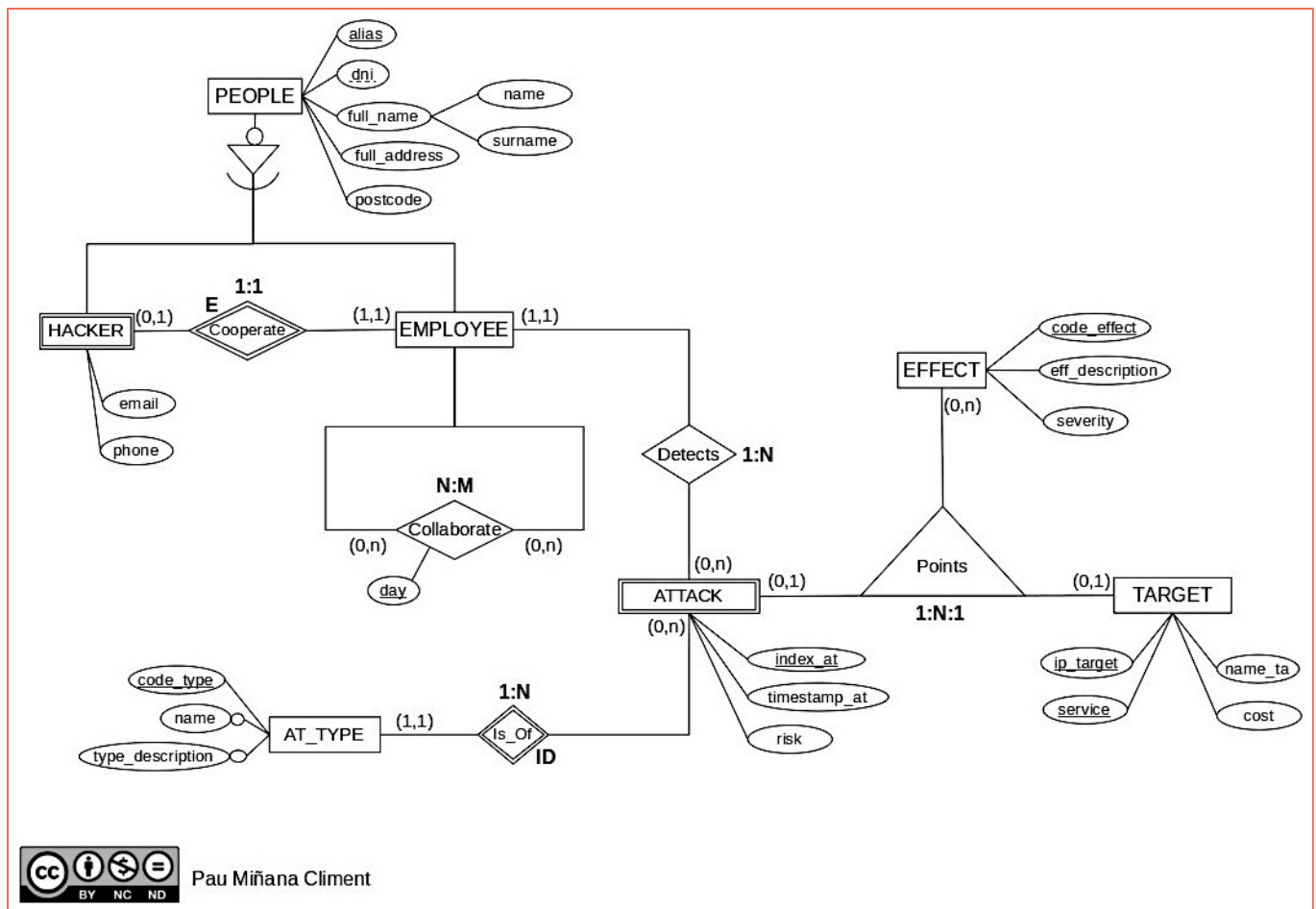
COMMENTS

Fields

- *cost*: Records how much money all ATTACKs on the TARGET have cost
- *risk*: Range of danger for the ATTACKs of each type.

Points ternary relationship

- The EFFECTs registered are exclusive of an ATTACK and a TARGET, that enforces the 1:N:1 cardinality.
- Binary relationships are not recommendable as we would need to restrict every EFFECT to be related only to one of the TARGETs that have received the ATTACK that caused it. Harder to control than this ternary relationship.

Weaknesses

- ATTACK needs the AT_Type to be registered and identified, so it has an identification weakness.
- As HACKERS will be deleted from system when their Cooperation days are over, it states for an existence weakness.

Additional constraints

- *Severity* represents a percentage.
- *Risk* can only take values: "High", "Medium" or "Low".
- EFFECTs are exclusive for each ATTACK on each TARGET, so the same EFFECT cannot be related to many TARGETs nor to MANY ATTACKs (this is easy to implement if you look carefully at the ternary relationship after get the standard solution, just need to add a constraint to it or change the PK from the standard one).

4.1. Relational logic modelling

Make the E-R diagram conversion to tables, indicating the constraints and comments to clarify the operation and record any semantic loss.

- No attribute domains are required to be indicated here.
- Specify in natural language what to do with each semantic loss and with each weakness if necessary.

Apply the necessary modifications on the obtained model, table by table, to comply with the third normal form (3NF). You can do this immediately or in as many steps as you consider.

Follow the structure provided by the template.

4.2. DDL physical modelling. Metadata creation

Specify the necessary statements to incorporate the tables of the previous exercise to a MySQL database.

Read the full document before choosing data types.

List the statements in the correct order so that they can be sequentially executed without causing any errors.

4.3. DDL physical modelling. Metadata modification

Specify the necessary statements to perform these modifications in MySQL:

- Now ATTACKs can be registered without being detected by anyone, participation (1,1) turns (0,1) on *Detects*.
- The *cost* cannot be less than 0 or greater than 1000000.
- Default value for *timestamp_at* is the current timestamp when that record is created.
- Now the *email* address of the EMPLOYEEs is also stored.
- Deleting an ATTACK will erase its corresponding EFFECTS and the information on which TARGETs it was directed at (not the TARGETs themselves).

4.4. DML physical modelling. Data manipulation

> Taking into account the changes made in the previous section, recreate a real situation and list the statements needed to enter and modify the following data. The statements must be in the correct order so that they can be executed sequentially without causing errors. Act as if there were already some data on the database.

Fill in the values of the omitted fields and/or add the necessary records, justifying the reason for their creation:

- Create 2 AT_TYPEs with this information:
  - *code_type* "PH951" *name* "Phishing" *type_description* "A fraudulent attempt to obtain sensitive information by disguising oneself as a trustworthy entity".
  - *code_type* "DD468" *name* "DDoS" *type_description* "A distributed denial-of-service attack that overwhelms a target with a large amount of traffic from multiple sources".
- There has been a "DDoS" ATTACK with *index_at* "35" on the TARGET with *ip_target* "213.0.87.46" and *service* "Web Server". The only EFFECT caused by the ATTACK has been a 30 minutes of web service denial with a severity of 25%.
- UPDATE the severity of that EFFECT to 30%.
- DELETE that ATTACK.