



**TÉCNICO**  
LISBOA

INSTITUTO SUPERIOR TÉCNICO

MEEC

Information Systems and Databases

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## SIBD Project - Part 1

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Laboratory' shift: **b\_SIBD77L03** — Lab 6 Monday (9:30 - 11:00)

***Group 30:***

Matilde Moreira, 84137—8hours—36%

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# 1 Entity-Relationship Model

In this section is presented the *E-R model*, a design of an information system to manage a Power Grid, which is planning to archive and organize different types of information/data requirements of this application. The diagram, which depicts our interpretation and approach to the problem presented, is shown in Figure 1.

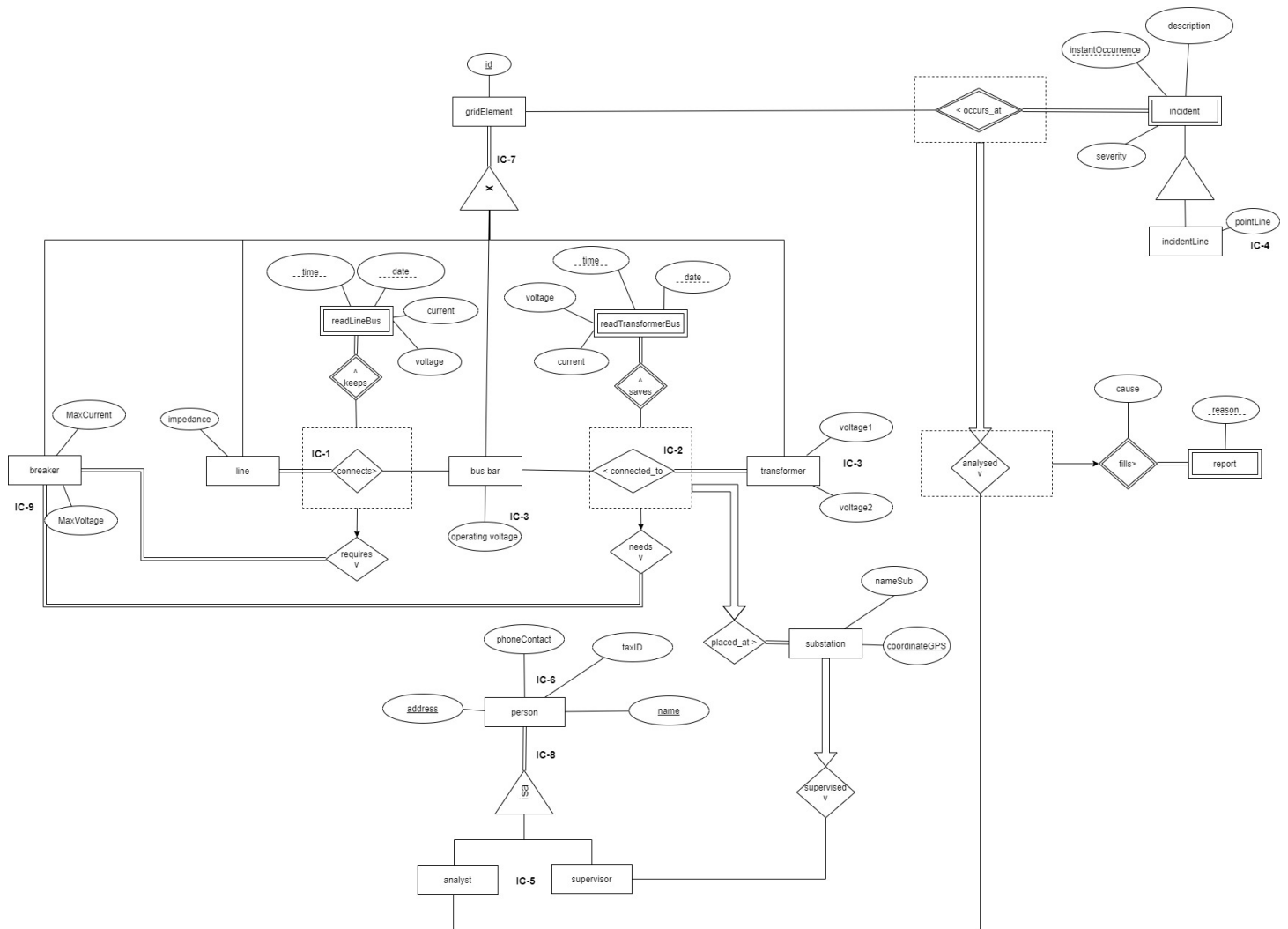


Figure 1: *Entity-Relationship Model* for a Power Grid system

## 2 Integrity Constraints

This section represents the list of integrity constants (IC's) listed in Figure 1. Integrity constraints are a set of rules and ensure that changes made to the database, such as insertion, or updating, by authorized users do not result in a loss of data consistency. So, integrity constraints guard against accidental damage to the database.

IC-1: Each line must be connected to two **different** bus bars.

IC-2: A transformer must also be connected to two **different** bus bars.

IC-3: The voltages of the bus bars must **match** the voltages of the transformer

IC-4: The point in the line where the incident occurs is saved in a **format** with **3 integer digits and 2 decimals** (e.g 310.02 meters).

IC-5: No person can analyse incidents regarding elements that he/she supervises.

IC-6: Phone and Tax ID numbers are **unique**.

**Mandatory Specialization and Disjointness** IC-7: A grid element **must** be a line or a bus bar or a transformer or a breaker.

**Mandatory Specialization** IC-8: A person is a supervisor or/and an analyst.

IC-9: A breaker will only be used for a specific connection at any time.

## 3 Notes for the teacher

**Note 1:** It was created an entity called gridElement so that it can store the ID of every element of the Power Grid avoiding the same ID for different elements.

**Note 2:** The line, bus bar and the transformer correspond to a disjointed specialization of gridElement, e.g a line cannot be a transformer and vice versa. Moreover, the specialization is mandatory because each element of Power Grid can either be a line, a bus bar, transformer or a breaker.

**Note 3:** Both entities readLineBus e readTransformerBus are considered weak entities due to different connection points that can be measured at the same time and date.

**Note 4:** It was considered an aggregation between the readLineBus and the connects because in order to read the data is necessary to have the connection between the line and the bus bar.

**Note 5:** It was considered an entity named Incident as weak because for the same instantOccurrence there can be more than one incident for different gridElement.

**Note 6:** The analyst and the incident were not directly associated because the incident is a weak entity and is already associated to the gridElement. If the analyst and the incident were associated, the weak entity would be associated to two strong entities.

**Note 7:** The incidentLine was created because it corresponds to a concrete type of incident and it is necessary to store the point of the line where the incident( an attribute) occurs.

**Note 8:** It was considered the report as an entity and not as an attribute, because each incident may occur for several reasons and not just one. Moreover, it was considered the reason as an attribute of the proper Report. Report is a weak entity because the incidents can be different but the reasons are the same and that is the key point to argue that it exists an association between Report and analysed. There is the place where the information related to the cause is stored.

**Note 9:** The entity person specializes into analyst and supervisor and no more than those two entities. It was not considered a disjointness because a supervisor can be an analyst, as long as it's not the analyst of the substation that is being supervised.