Database Modeling

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I. Introduction

The modeling of a database is a very important stage in the design process. Catching mistakes, or conflicts, at this stage is fundamental to avoid future problems. The first step consists of a conceptual modeling where not everything is laid out on the diagrams, but it gives a good about entities and relationships. The second step, we start including more details about what the attributes are and what role they play in the relationship. The last step, it is the final sketch with the physical design, where no details are left out.

This article introduces the process of designing these models. In section 2, I include a description of the conceptual model. In section 3, a brief description of the logical model, followed by the physical model design.

II. Conceptual Model

The model should be able to handle individual sensors that are Power Distribution Units (PDUs). The experiments that own the racks keep track of this, but according to individual experiments' records, not all the PDUs are being monitored as individuals but as an aggregate. The PDUs are located in different buildings, which consist of different rooms, or floors. Racks pile equipment (servers) monitored by the PDUs in the rack. The number of devices is highly dependent on the dimensions of the device. Therefore, this is information is negligible for now. Rooms are not property of a single experiment, but each rack needs belong to only one experiment to avoid different maintenance schedules. Also, it is rare to have equipment relocated, but it has happened in the past.

The rooms are filled with other sensors that measure temperature and humidity. These sensors are located on both sides of the racks. The sensors are identified by labeling them as being in hot, or cold aisles. There is a threshold set for the room. Moreover, it is defined by the aisles (hot/cold). This information is only important when dealing with the temperature sensors. No information has been collected about humidity sensors yet.

In a future, this project can be extended to the other sensors in the rooms, such as the temperature and humidity sensors. Right now, we focus only on PDUs, but we leave room for future expansion. Consequently, establishing thresholds and aisles are beneficial for the future. Moreover, the measurement units can change if we have different types of sensors being recorded.

Given the above high overview of the model, we can identify some attributes and tables that can be used. We also get some information about the elements that are fixed as a check point (e.g buildings/rooms). The idea is to establish some abstract model that allows for future addition of other sensors in the room to make a sophisticated software that contains all information needed about the sensors monitoring the data centers. The following section goes more in detail about the use of this attributes.

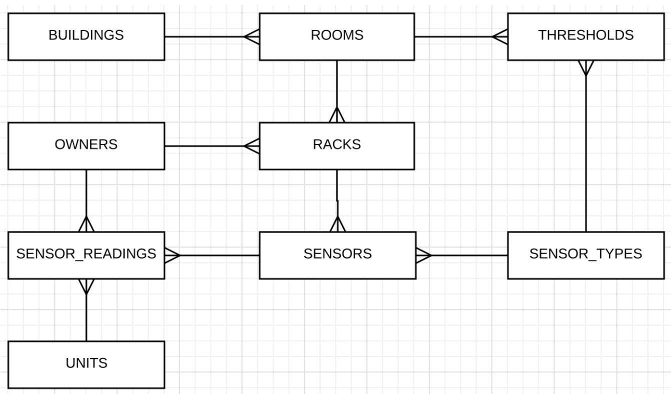

Fig. 1. Conceptual Model Diagram.

III. Logical Model

The "world" did not change. The relations between the entities stayed as shown in Figure **??**. The big difference between coming up with the conceptual and logical model was to define the relationships and the reasons. The first sketch was done by already attempting to avoid doing many iterations of making sense of the "world." In this section, the logic to the scheme is exposed and explained.

Buildings have code name for short that is used widely, but it is useful to have the complete name. The buildings will contain from one to many rooms. These rooms also have a code name and a descriptive name that groups building and name. It was commented in the previous section that each room sets a temperature threshold. This is not unique to the sensor, aisle, or position. In addition, the room contains multiple racks with their own identifiers. Each rack contain many sensors that measure power, temperature, or humidity. The temperature sensor will have different thresholds. Also, in order to deal with aisles, temperature will be subdivided into hot and cold temperature. These sensors have readings (the values we are interested in) that are taken in ten minutes intervals. Those readings belong to an experiment. Also, the equipment contained in the racks are part of an experiment. The model is not normalized, the racks can change owners over time. Therefore, this cycle is necessary.

The following is the sketch for the logical model, Figure **??**. We have the entities and its attributes. Also, the connection between entities show the relationship between entities.

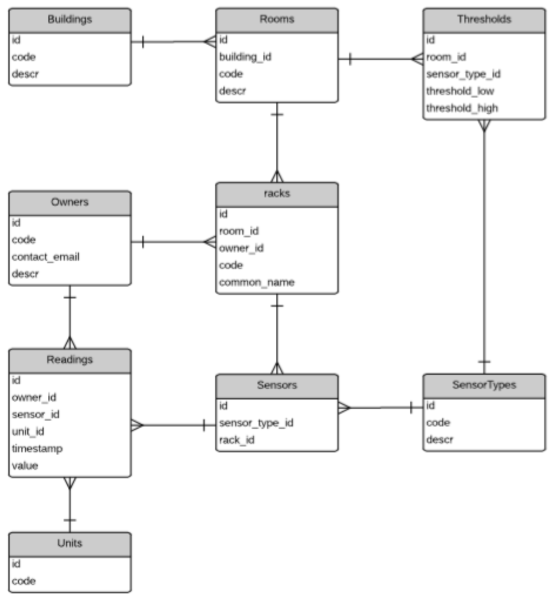

Fig. 2. Logical Model Diagram.

IV. Physical Model

The final sketch includes the keys and types for each attribute. Everything else remained the same from the discussion above. The final step is to choose the database (PostgreSQL) and to run the commands to create the tables with their values. Figure **??** is good reference and visual representation of what the database will create for us.

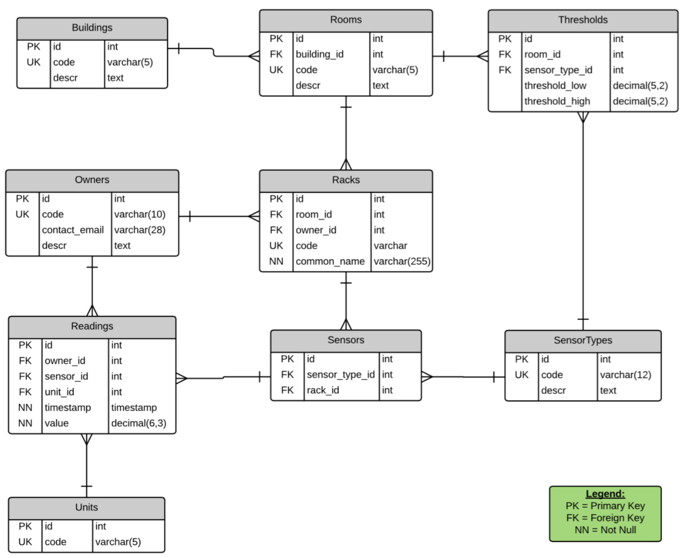

Fig. 3. Physical Model Diagram.

V. Conclusion

Every step was carefully discussed with the team. Hopefully, this is a good model that standardizes the collection of power readings from the data centers. The model will be soon implemented and tested.