Task 1: Designing an Entity-Relationship Model

Fast Airconditioning Case Study

Fast Airconditioning (FA) is a company that sells air-conditioning products in Australia. The following are the requirements for managing data about staff, offices, and properties for FA.

Stores

FA has stores throughout Australia. Each store is allocated several staff members. One staff member manages the operations of the store. The data describing a store includes a unique store number, address (i.e., street, suburb, and postcode), several contact types (e.g., email, fax, phone), and the name of the staff member who currently manages the store. FA keeps track of the date each manager starts his/her position at the store he/she is managing.

Staff

It is important to distinguish between two types of FA staff members (i.e., supervisors and agents) as supervisors have additional responsibilities. Supervisors are responsible for the day-to-day activities of a team of staff called sales agents. Each supervisor is responsible for up to a maximum of 8 agents at any one time. Agents can be assigned to one supervisor and there may be agents yet to be assigned to any supervisors. Each sales agent is based in one store but must also travel to a prespecified list of other stores on demand. The data for each staff member includes a unique staff number, name, address, position, salary, and name of supervisor (where applicable).

Products

FA has a range of products that it sells to customers in Australia. At any given time at a store, a particular product may or may not be available in stock. The website of FA needs to show the list of all the stores where a particular product is available so customers can decide to go to another store if they wish. Some products are not available at any stores and can only be purchased online. Other data for each product includes a unique product number, cost of purchase, and price for sale. Each product is also associated with several other product that are considered as reasonable replacements for it.

Based on the given description, model the given business rules, and present your model as an Entity-Relationship (ER) diagram. Carefully state any assumptions that you make. In your ER diagram, you must properly denote all applicable concepts, including weak or strong entities, keys, composite or multi-valued attributes, relationships and their cardinality and participation constraints.

If you cannot represent any of this information in the ER model, clearly explain what limitations in the ER model restrict you from representing your model.

You **must** use UML notation and the diagramming tool Lucidchart to draw your diagram. Your diagram must be drawn to a high standard with minimal clutter. You are **not** required to map the ER model to relational model.

Task 2: Designing an Entity-Relationship Model

Part A: Initial Design

Vec4Proj Case Study

Vec4Proj is an Australian company that has several industrial vehicles for hire. The customers of Vec4Proj are other businesses (e.g., other companies) that hire the industrial vehicles for their projects. You are asked to design a database for managing Vec4Proj's contracts and cars. The information of the customers is not of interest. Requirements for the database are as follows:

1. Each staff of Vec4Proj is identified by a unique staff number. Other information kept for staff are first name, surname, and address (street no, street name, city, state, postcode).

2. There are several types of industrial vehicles that Vec4Proj owns. Each type is identified by a unique number, name, and description. There may be several vehicles of the same type available for hire. Each vehicle has a unique registration number, colour, and year made. Vec4Proj keeps track of the usage of vehicles by storing their current kilometres. It also maintains information about all potential types of industrial vehicles regardless of whether it owns a particular type.

3. Several vehicles may be assigned to a project and some vehicles may not be assigned to any projects. Each project is identified by a unique project number. Other information related to a project is start date, and description. Vehicles are shared between projects at any given time, and it is possible that a project will no longer requires a car.

4. Each project is supervised by one staff. Staff members supervise only one project at any given time. Vec4Proj wants to maintain a history of the assignments of staff to projects and keep track of if a supervisor is actively engaged in a project.

5. There is a contract associated with each project. Each contract has a unique number. Other information about a contract includes start date, end date, and the cost. Only the information about the active contract for each project is maintained.

Based on the given description, model the business rules of Vec4Proj, and present your model as an Entity-Relationship (ER) diagram. Carefully state any assumptions that you make. In your ER diagram, you must properly denote all applicable concepts, including weak or strong entities, keys, composite or multi-valued attributes, relationships and their cardinality and participation constraints.

If you cannot represent any of this information in the ER model, clearly explain what limitations in the ER model restrict you from representing your model.

You **must** use UML notation and the diagramming tool Lucidchart to draw your diagram. Your diagram must be drawn to a high standard with minimal clutter. You are **not** required to map the ER model to relational model.

Part B: Client Adjustments

After presenting your ER model to Vec4Proj management, you are asked if it can be used to perform the following additional tasks. Page 6 of 11

6. The management explained a change of mind in keeping customer information. Now, they believe it is important to keep a basic set of info about their customers too. Each customer is known by its unique Australian Business Number (ABN) and a name.

7. Customers of Vec4Proj can identify certain staff members as their favourites.

8. Each staff member can blacklist up to one customer.

9. In another change of mind, the management has also indicated that they wish to maintain a history of contracts associated with each project.

For each one of the tasks specified above, explain how your ER diagram is supporting it. If it is not possible to achieve any of the tasks above given your current design, state why, modify the model, provide the modified ER diagram (in addition to your original ER diagram), and explain how the new model achieves the missing requirements.