Data and applications
Project Phase - 3
Grocery Store Database
Relational Database Model and Normalisation

Team 45

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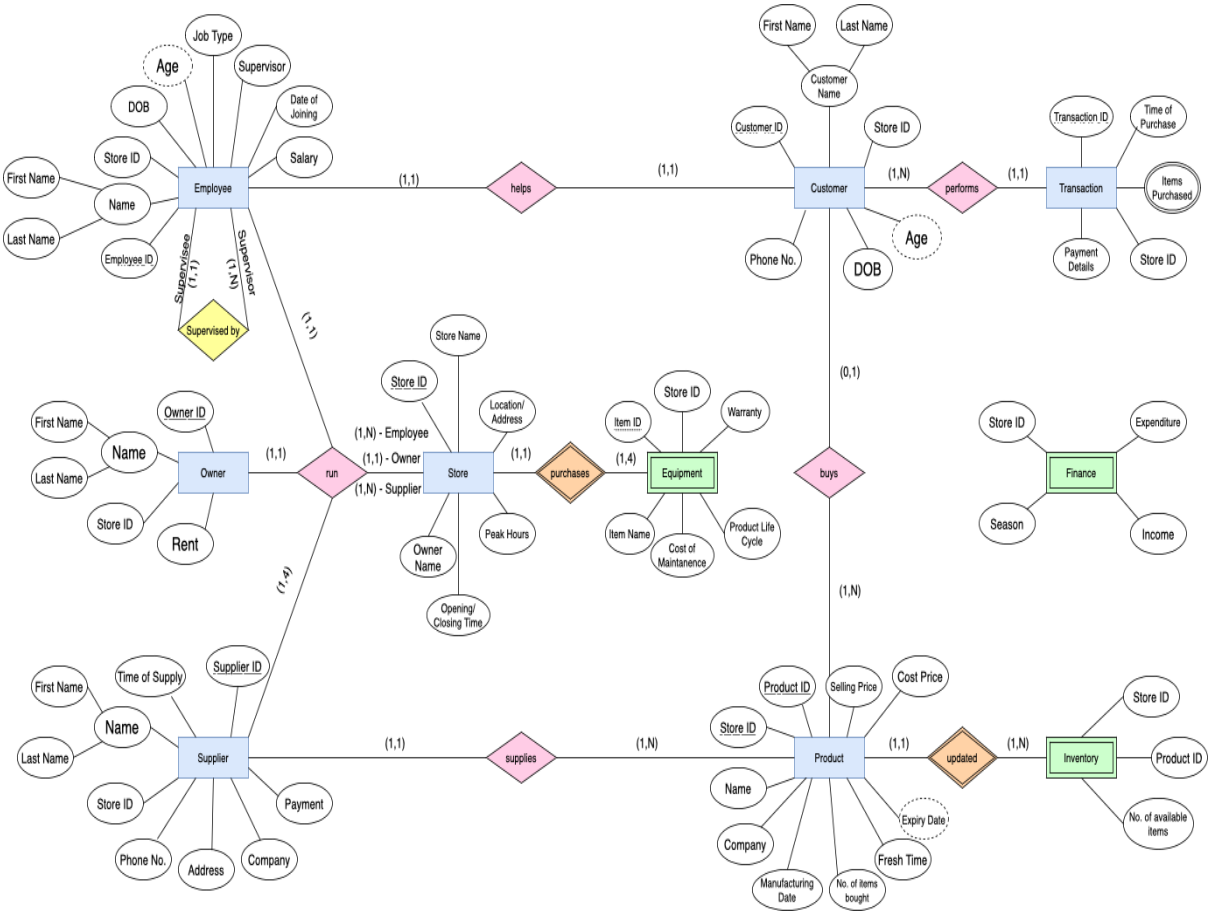
AIM: To convert the formed ER Diagram into a relational database model and normalise it.

1. Convert ER Diagram into relational data model.
2. Convert Relational Database model into 1NF model
3. Further convert into 2NF model
4. Finally, into 3NF model

STEP 1: Convert ER Diagram to relational database model

The ER Diagram referred:



Steps followed to convert into relational database:

Step 1: Mapping of Regular entity types
Step 2: Mapping of weak entity types
Step 3: Mapping of Binary 1:1 relationships
Step 4: Mapping of Binary 1:N relationships
Step 5: Mapping of Binary M:N relationships
Step 6: Mapping of Multivalued Attributes
Step 7: Mapping of N-ary relationships

Changes made to convert to relational database model:

1. The entity types are arranged and the relationships are included by adding foreign keys in entities having full participation. Both strong and weak entity types were converted into tables with their primary keys bolded.
2. The composite attributes are eliminated by converting all the sub attributes into simple attributes. Eg: The name attribute in Supplier, Owner and Customer have been replaced with 2 attributes keeping track of First Name and Last Name.
3. The multivalued attributes are also eliminated, wherein attributes like, Products purchased are all placed in a different table called Purchase having attributes, Transaction ID and Product ID. The separate tables include the primary key of the entity and its value and together they constitute the primary key of the entity.
4. The relationships like, help, run, supplies, etc, were inculcated with the help of introducing a foreign key attribute in the partial participation entity, which refers to the primary key of the entity displaying total participation. Remaining entries are replaced with NULL.
5. The 4-ary relationship was formed in a similar manner and the foreign keys were added which refer to the primary key of the participating relationships. StoreID was made the primary key of the relation and had total participation with all the other entities by including it in the tables storing information about the owners, customers, suppliers, etc.
6. No nested relations are present.

1NF Database model features:

- Disallows composite attributes, multivalued attributes and nested relations.
- The domain of an attribute must include only atomic (simple, indivisible) values and that the value of any attribute in a tuple must be a single value from the domain of that attribute.
- disallows relations within relations or relations as attribute values within tuples.
- Separate tables must be created for each set of related data.

All the above features are displayed in the relational table formed so far as it does not contain any composite attribute,multivalued attribute and does not have any nested relation.

2NF database model features:

- A relation is in 2NF if it has No Partial Dependency, i.e., no non-prime attribute (attributes which are not part of any candidate key) is dependent on any proper subset of any candidate key of the table

The relational database formed also has no partial dependencies. The primary keys of the table and the non-prime attributes form functional dependencies.

3NF database model features:

- A relation is in third normal form, if there is no transitive dependency for non-prime attributes as well as it is in second normal form.
- It essentially is a 2NF table with no transitive dependencies.

To convert from 2NF to 3NF no changes were made.

Given below is the snapshot of the relational database model.

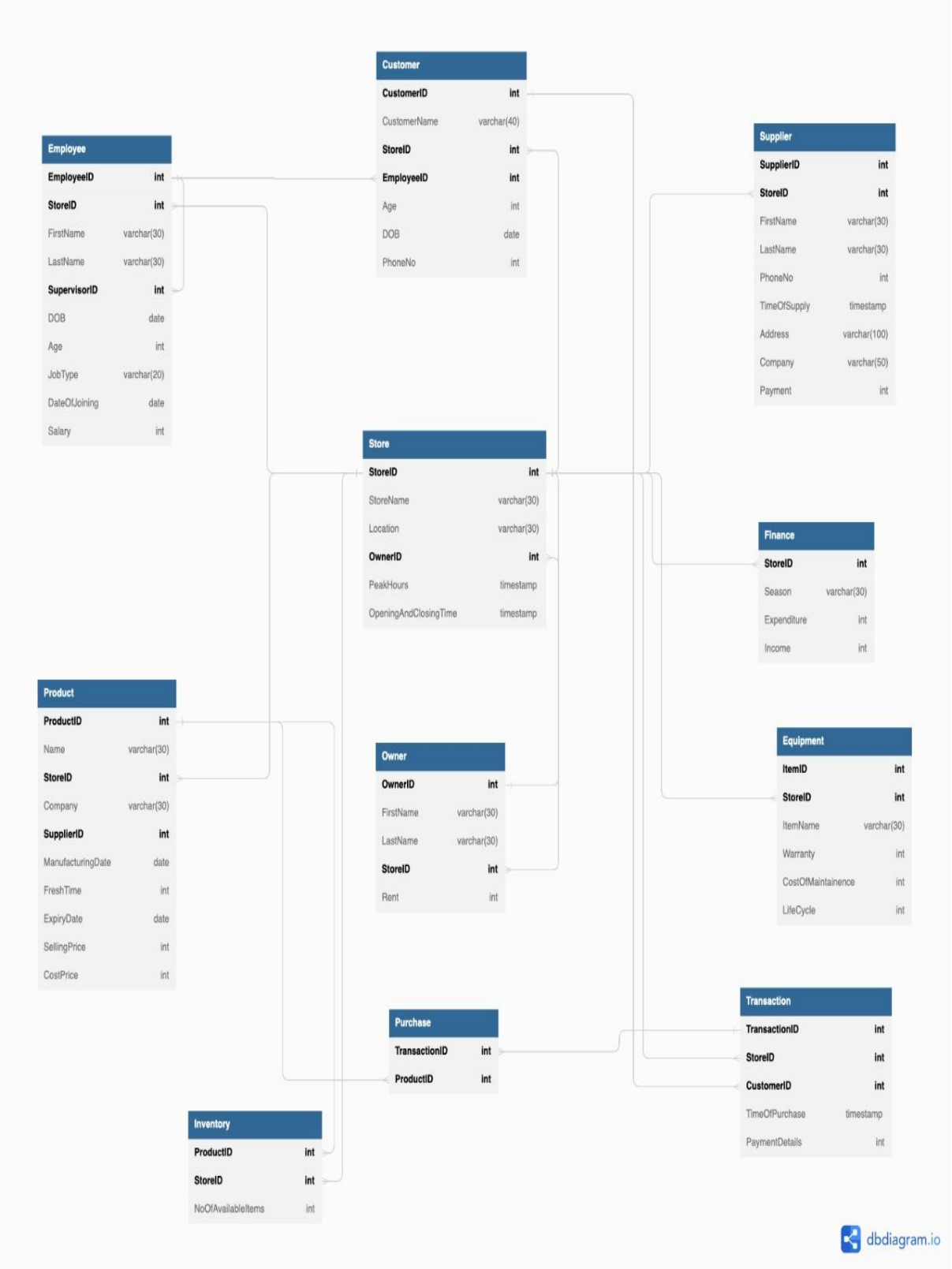


Figure: The relational database following the features of 1NF, 2NF, and 3NF.

(The grey lines represent the references made using foreign keys in each table.)