

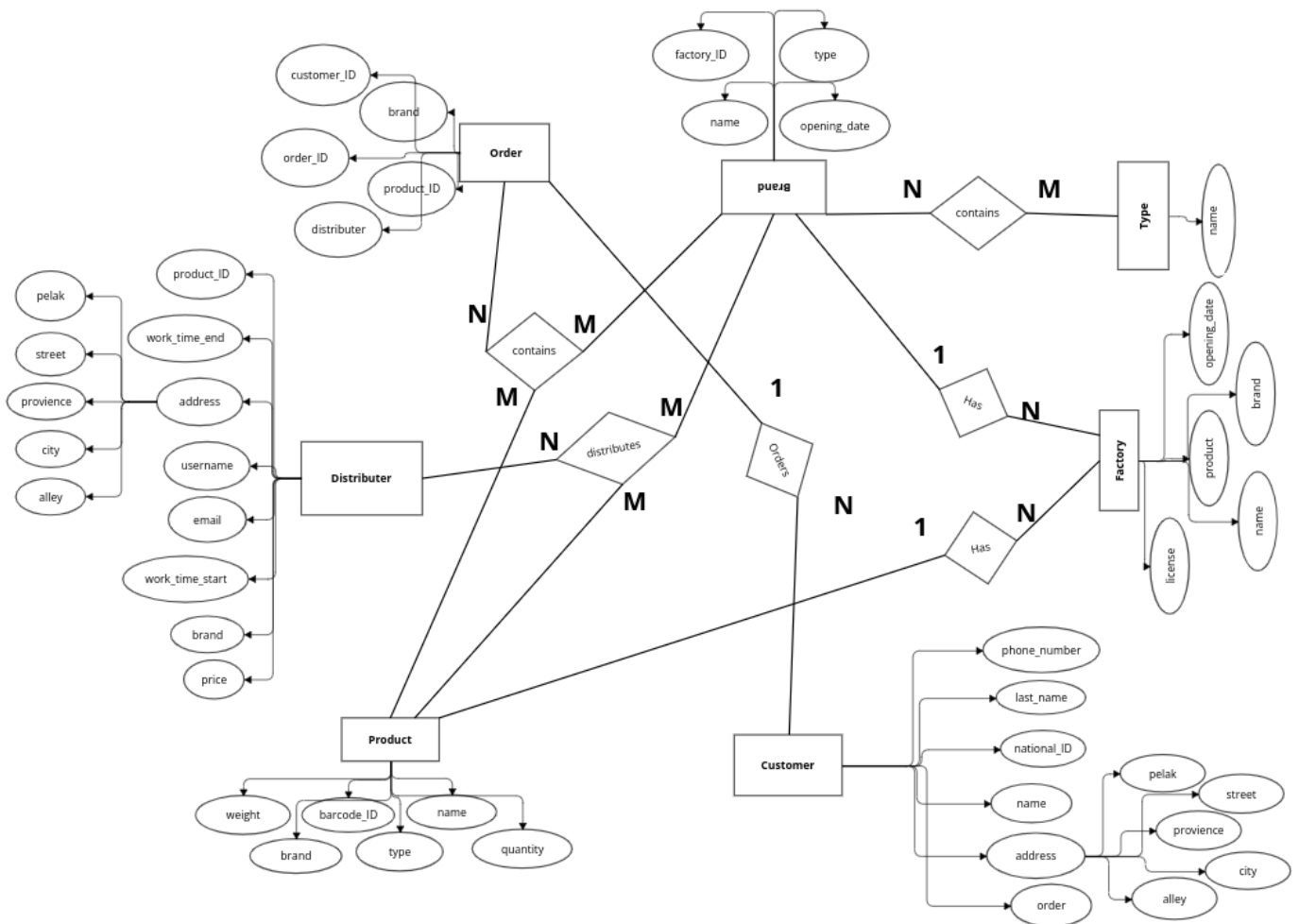
# Phase-1

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## BCNF conversion report

First, we must convert the flat table into 1NF.



As you can see in the table, the "Brand" and "Factory" tables had date field in which contained multi-valued data. Also, the "customer" table and the address field got split into its parts. So, they got split into three parts as day, month and the year so it can fit in the First-Normal-Form.

now we must move forward to the second normal form. To ensure that a table is in second normal form (2NF), the following conditions must be met:

1. The table must already be in first normal form (1NF).
2. There should be no partial dependencies in the table, i.e., no non-key attributes should depend on only a portion of the primary key.
3. All non-key attributes should depend on the entire primary key.

To reach to this aim, we apply:

Brand:

bname --> opening\_day, opening\_month, opening\_year, factory\_ID, type

Factory:

License --> product, brand, fname, opening\_day, opening\_month, opening\_year

fname, opening\_day, opening\_month, opening\_year --> license, brand, product

Order:

Order\_ID --> product\_ID, brand, distributor, customer\_ID

Product\_ID, brand, customer\_ID --> distributor

Customer\_ID --> order\_ID

Product:

Barcode\_ID , brand --> name, weight, quantity, type

Type:

Name --> name

Distributor:

Username --> email, province, city, street, alley, Pelak, work\_time\_start, work\_time\_end,  
product\_ID, brand

Username, product\_ID, brand --> price, amount\_remaining

Customer:

National\_ID --> name, last\_name, province, city, street, alley, phone\_number

So here we can see some conflicts in which won't let the database to be in 2NF. These conflicts are in tables {brand, distributor}; because there are some subkeys from the candidate key in which we can reach to other attributes. To move into 2NF, we have to remove these partial dependencies in this way:

**Brand:**

Brand\_info(name, opening\_day, opening\_month, opening\_year);

Brand (name, factory\_ID, type);

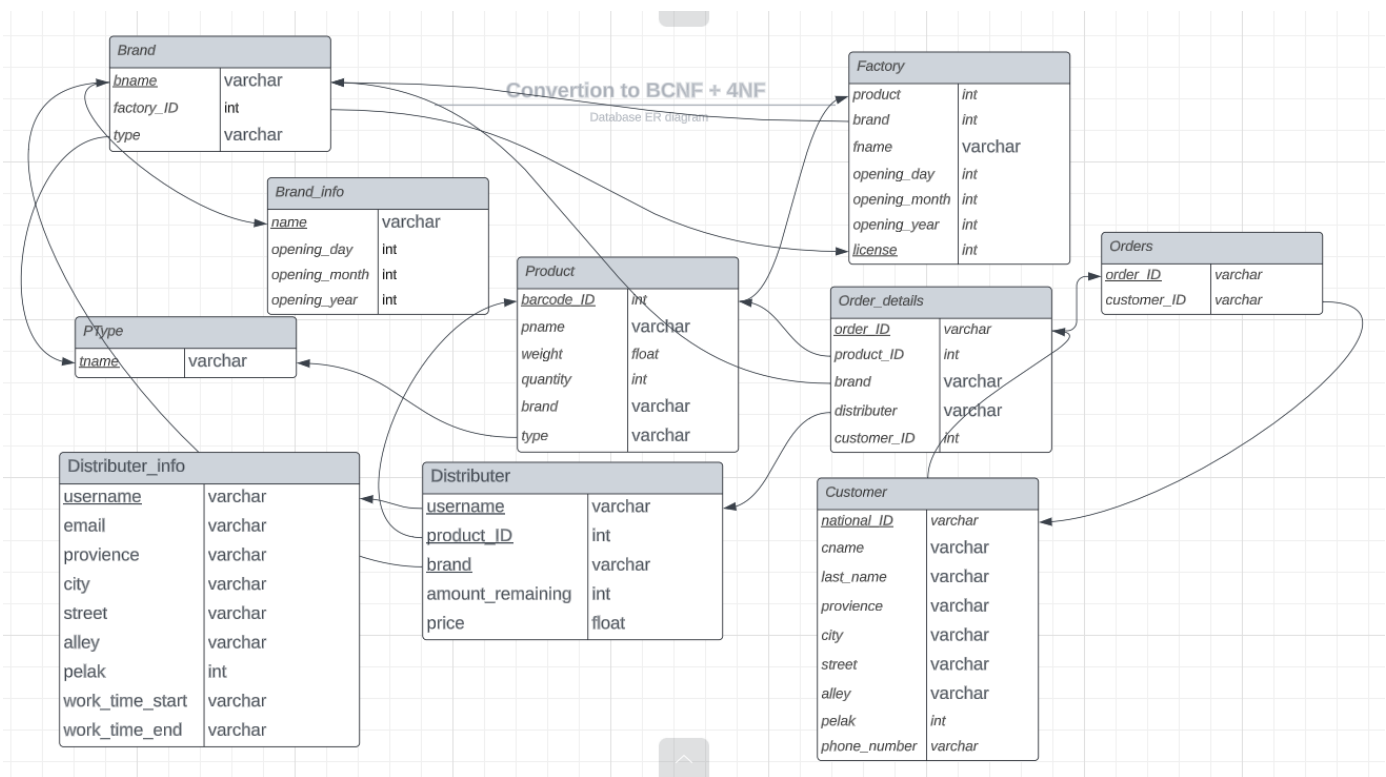
**Distributor:**

Distributor\_info(username, email, province, city, street, alley, work\_time\_start,  
work\_time\_end);

Distribuer(username, product\_ID, brand, price);

And in the end to simplify our database management for queries and other things, we divide the orders table into two parts:

Orders (order\_ID, customer\_ID) + order\_details(order\_ID, product\_ID, brand, distributor);



Tables brand and distributor had some partial dependencies so to fix this conflict we split the tables into two parts so that there exist no partial dependencies.

Now we go through the next normal form, the 3NF; To ensure that a table is in Third Normal Form (3NF), the following conditions must be checked:

4. The table must be in Second Normal Form (2NF).
5. Every non-prime attribute (i.e., attribute that is not part of any candidate key) must be directly dependent on the primary key.
6. There should be no transitive dependency in the table.

As it is visible in the diagram above, while converting into 2NF, the expected conditions for the Third-normal-form have been created too. The diagram is in 3NF already!

Finally, the last normal form, BCNF; To ensure that a table is in Boyce-Codd Normal Form (BCNF), the following conditions must be checked:

7. Every determinant (i.e., every candidate key) of the table must be a unique and irreducible set of attributes.
8. Every non-prime attribute (i.e., attribute that is not part of any candidate key) must be fully functionally dependent on every candidate key in the table.

Same like the 3NF, without any need for further changes, the diagram is in BCNF too!  
 Because it fits all the conditions for BCNF. So, the expected diagram for the database would be like this:

