Project PreQL++

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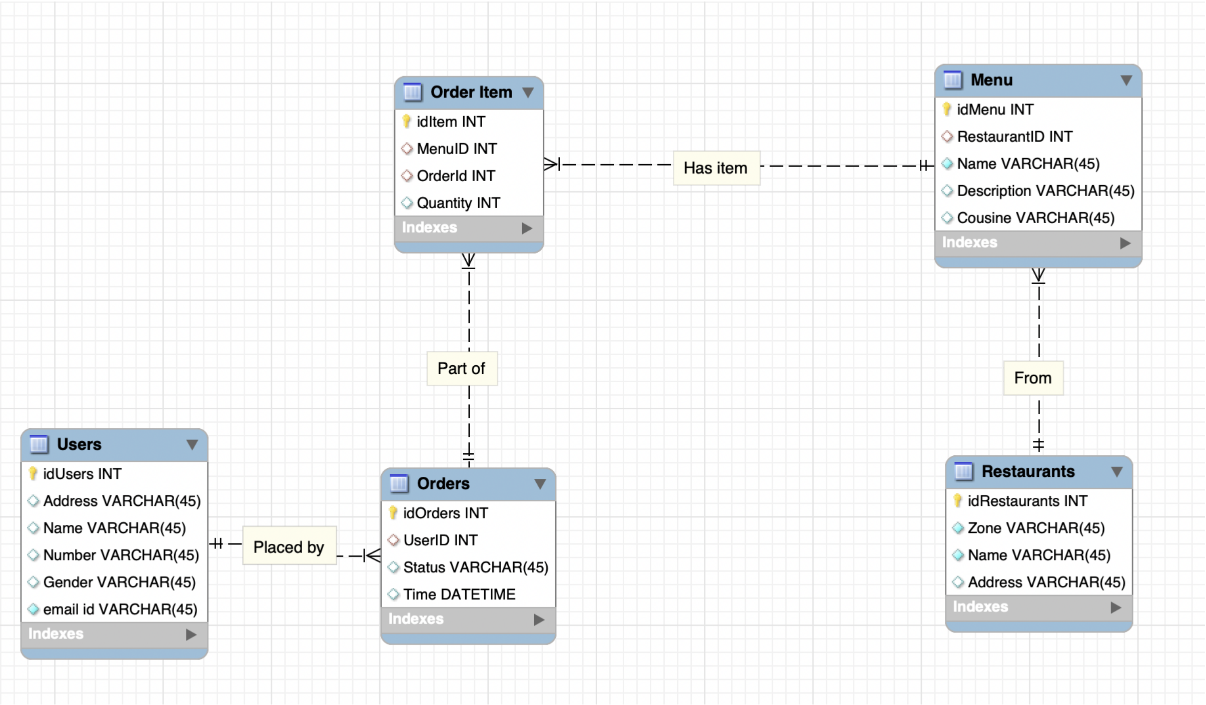
Description of Project

We have chosen the Restaurant delivery system to be our mini-world. Here, we have the restaurant database where each restaurant belongs to a zone, and serves a variety of Menu. Each order consists of a list of Menu items along with their quantity. A user can place an order based on their Address. We omit the information pertaining to the delivery partners of the delivery system for the purpose of simplicity and only focus on the side of the system that the end user interacts with.
For our system catalogue, we chose to have 4 tables, with the Relation table storing the list of tables, Columns table storing the list of columns, fragment table storing the list of fragment and site id, and Sites for list of sites, their hosts, ip, usernames etc.

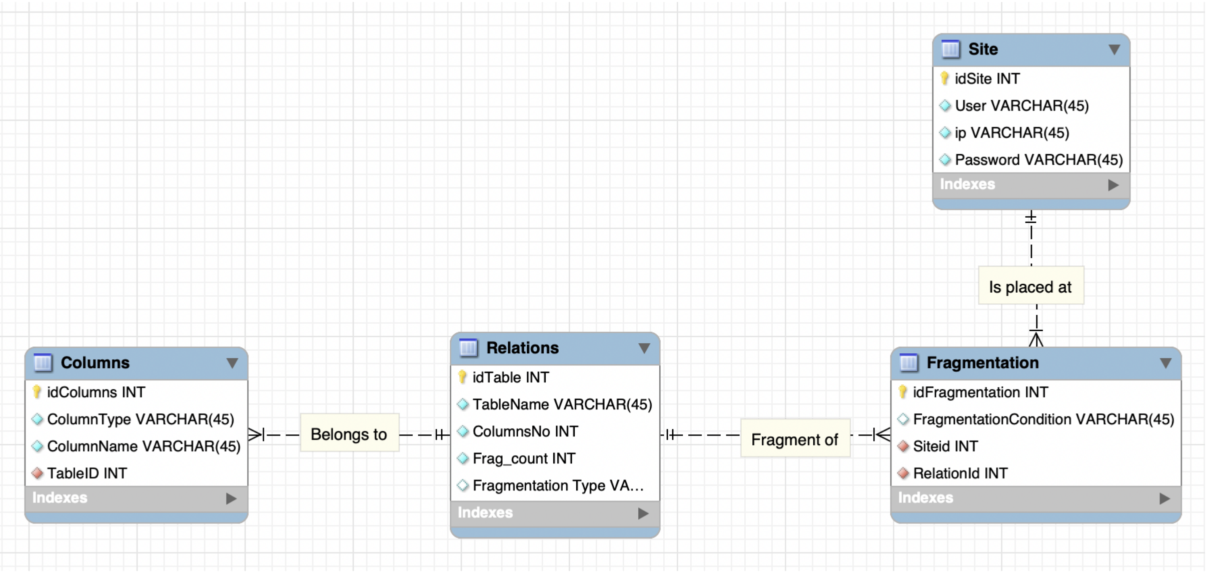
Converting to 1NF, 2NF and 3NF Form

- Since we only allow **only single addresses** for a single user, both our tables don't have any multi-valued attribute. Thus it is already in 1NF form.
- For no table, does any subset of the primary key determine any non-prime attribute. In other words, all our non-prime attributes are **fully-functional dependent** on candidate attributes.
- There does not exist any transitive dependency within any of the tables. Due to this, it is already in 3NF form.

Application ER Diagram



System Catalogue ER Diagram



Fragmentation

The following fragmentation was followed -

Table Name	**Fragmentation Type**	**Fragment Sites**
Restaurant	Horizontal (Based on ZONE)	5,6,7,8
Menu	Derived Horizontal (Based on Restaurant ZONE)	5,6,7,8
User	Vertical	5,6,7

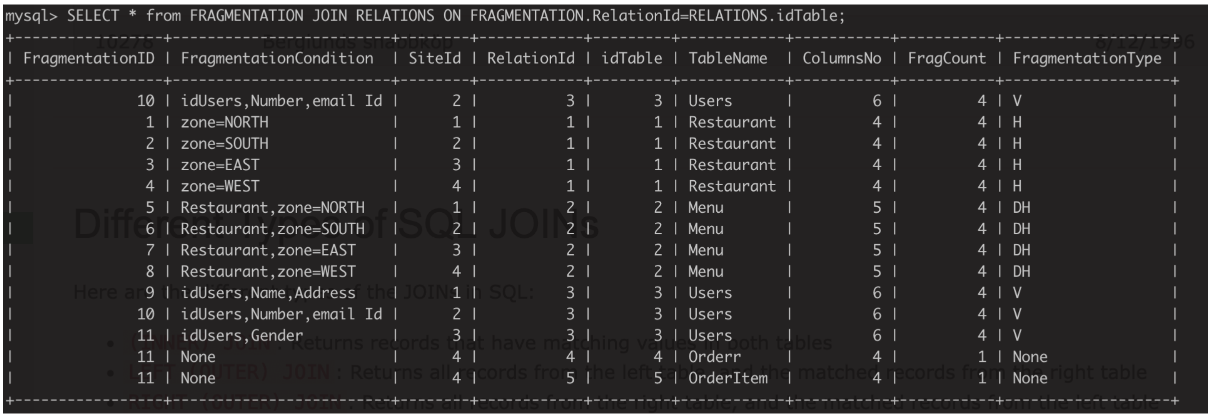
Explanation for the Fragmentation :

Horizontal fragmentation of restaurant : Since the restaurants in two different zones are entirely independent of each other, they can reside on different machines.
One machine will store all the informations about restaurants belonging to a particular zone

Derived Horizontal Fragmentation of Menu : Since a menu item is associated with just one restaurant, it makes sense that the site containing information of that particular restaurant also stores information of that menu item. Hence the relation menu is fragmented horizontally

Vertical Fragmentation of USER: Since the different attributes of the relation user would not be needed simultaneously very often, we can segment it vertically.

Example of system catalogue on all sites



```
mysql> SELECT * from FRAGMENTATION JOIN RELATIONS ON FRAGMENTATION.RelationId=RELATIONS.idTable;
+-----------------+-------------------------+--------+------------+---------+------------+-----------+-----------+-------------------+
| FragmentationID | FragmentationCondition  | SiteId | RelationId | idTable | TableName  | ColumnsNo | FragCount | FragmentationType |
+-----------------+-------------------------+--------+------------+---------+------------+-----------+-----------+-------------------+
|              10 | idUsers,Number,email Id |      2 |          3 |       3 | Users      |         6 |         4 | V                 |
|               1 | zone=NORTH              |      1 |          1 |       1 | Restaurant |         4 |         4 | H                 |
|               2 | zone=SOUTH              |      2 |          1 |       1 | Restaurant |         4 |         4 | H                 |
|               3 | zone=EAST               |      3 |          1 |       1 | Restaurant |         4 |         4 | H                 |
|               4 | zone=WEST               |      4 |          1 |       1 | Restaurant |         4 |         4 | H                 |
|               5 | Restaurant,zone=NORTH   |      1 |          2 |       2 | Menu       |         5 |         4 | DH                |
|               6 | Restaurant,zone=SOUTH   |      2 |          2 |       2 | Menu       |         5 |         4 | DH                |
|               7 | Restaurant,zone=EAST    |      3 |          2 |       2 | Menu       |         5 |         4 | DH                |
|               8 | Restaurant,zone=WEST    |      4 |          2 |       2 | Menu       |         5 |         4 | DH                |
|               9 | idUsers,Name,Address    |      1 |          3 |       3 | Users      |         6 |         4 | V                 |
|              10 | idUsers,Number,email Id |      2 |          3 |       3 | Users      |         6 |         4 | V                 |
|              11 | idUsers,Gender          |      3 |          3 |       3 | Users      |         6 |         4 | V                 |
|              11 | None                    |      4 |          4 |       4 | Orderr     |         4 |         1 | None              |
|              11 | None                    |      4 |          5 |       5 | OrderItem  |         4 |         1 | None              |
+-----------------+-------------------------+--------+------------+---------+------------+-----------+-----------+-------------------+
```

Files:-

- The files *system_catalogue.py* and *fragment_schema.py* are used to create the system catalogue database and Application DB Schema in the respective sites.
- The name of the database is **preql**.