10 Database Modeling

10.1 Relationships in ER

Model the following relationships in ER.

a) An apartment is located in a house in a street in a city in a country.

b) Two teams play football against each other. A referee makes sure the rules are followed.

c) Men and women have a father and a mother each.

10.2 ER Modeling

10.2.1 ER Diagram

Assume there is a library system with the following properties:

- The library contains one or several copies of the same book.
- Every copy of a book has a copy number and is located at a specified location in a shelf. A copy is identified by the copy number and the ISBN number of the book.
- Every book has a unique ISBN, a publication year, a title, an author, and a number of pages.
- Books are published by publishers.
- A publisher has a name as well as a location.
- Within the library system, books are assigned to one or several categories.
- A category can be a subcategory of exactly one other category. A category has a name and no further properties.
- Each reader needs to provide his/her family name, his/her firstname, his/her city, and his/her date of birth to register at the library. Each reader gets a unique reader number.
- Readers borrow books.
- Upon borrowing the return date is stored.

Create an ER diagram of this mini world.

10.2.2 Big Relation

What happens if you implement the ER diagram from Exercise 10.2.1 with a single relation (instead of one relation per entity and relationship)?

10.3 MySQL

In this exercise you will create a MySQL Database, import data and run simple queries.

10.3.1 Create a MySQL Database

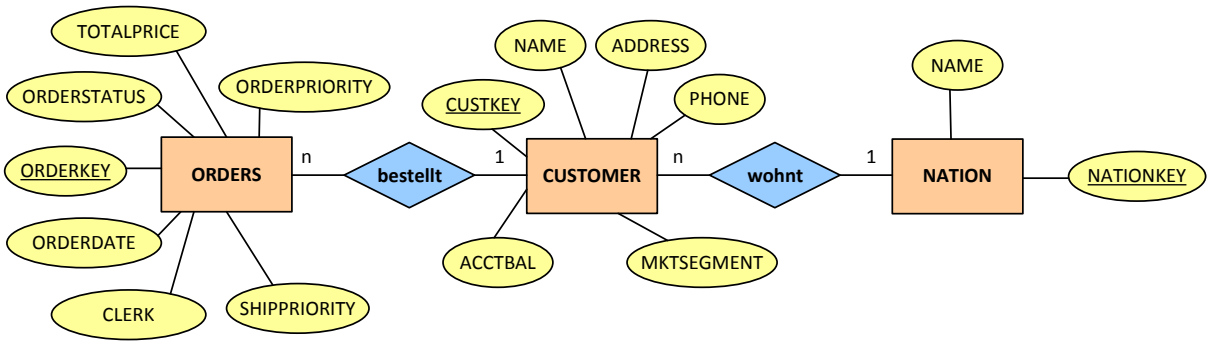
The "ETH Informatikdienste" offer a hosted MySQL database for free, which you can access within the ETH network. Thus, you do not need to install your own MySQL server.

Go to `http://password.ethz.ch/` and select *My Services* and *MySQL*. On this page you have to set a password and install a new database. Remember the hostname of the MySQL server (e.g., *mysqlweb1.ethz.ch*) and the password you have chosen. The database name corresponds to your NETHZ username.

Using the PhpMyAdmin tool you can administer the database. Log to `https://phpmyadmin.ethz.ch/` using your NETHZ username and the password defined above and click on *MySQL V4*.

10.3.2 Import Data

In this task you import data into the new database you created. We consider a database of a small mail order business. The database contains the tables *ORDERS*, *CUSTOMER* and *NATION*. This database has the following schema:



Both the schema and the payload data can be imported to the database server by means of a MySQL Dump. You can download the dump from `http://informatik2.baug.ethz.ch/data/versand_small.sql.gz`

In PhpMyAdmin, please select the name of the database from the menu on the left. Next, klick on *Import* and upload the dump of the database (after clicking OK it can take a few seconds). All 3 tables will be created automatically and data is inserted.

Now you can select the table from the left and check the content of the table.

10.3.3 SQL Hello World

After setting up the database and inserting data, you are able to run queries on it. In PhpMyAdmin, select the name of the database and click on *SQL* in the top menu. Enter the following query:

```
SELECT COUNT(*)
FROM customer
WHERE acctbal < 100
```

This query returns the number of customers whose balance is smaller than 100.