LISBON
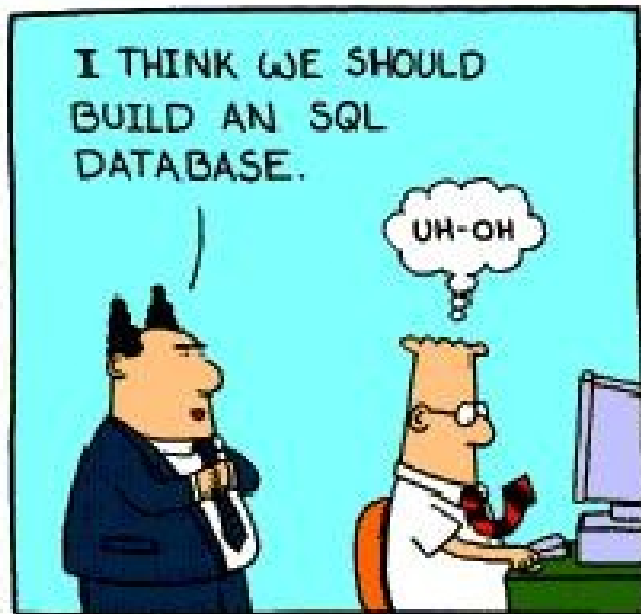# SCHOOL OF ECONOMICS & MANAGEMENT

UNIVERSIDADE DE LISBOA

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RELATIONAL MODEL

Concepts

- Tables
- Tuple
- Relation schema
- Database schema
- Primary key
- Foreign Key
- Attribute domain
- Relational Integrity Constraints

Relational Model

- The relational model was invented by Edgar F. Codd (Codd1969)

- Supported in the concept of groups from mathematics

- Implemented by the main database systems (DBMS):
    - Oracle
    - MySQL
    - MariaDB
    - MS SQL Server
    - MS Access
    - ...

Tables

- In relational data model, relations are saved in the format of Tables.

- This format stores the relation among entities.

- A table has rows and columns, where rows represents records and columns represent the attributes.

- Table / Relation

Tuple

- A single row of a table, which contains a single record for that relation is called a tuple.

Relation schema

- A relation schema describes the relation name (table name), attributes, and their names.

- Client(<u>IdClient</u>, Name, Adress)

Table

Database schema

- All the relation schemas of all tables of a specific database form the Database Schema.
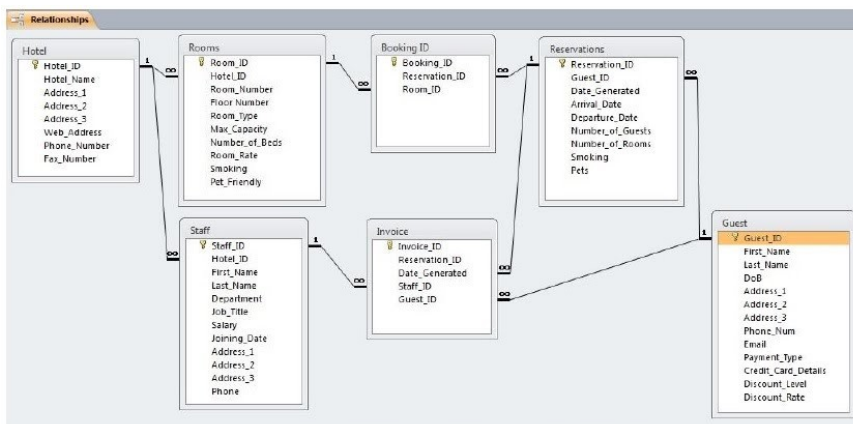

Relational Schemas for a University

- course (<u>courseno</u>, title, syllabus, credits)
- student (<u>sid</u>, name, program)
- instructor (<u>iid</u>, name, dept, title)
- course-offering (<u>courseno</u>, <u>secno</u>, <u>year</u>, <u>semester</u>, time, room)
- enrolls (<u>sid</u>, <u>courseno</u>, <u>secno</u>, <u>semester</u>, <u>year</u>, grade)
- teaches (<u>courseno</u>, <u>secno</u>, <u>semester</u>, <u>year</u>, <u>iid</u>)
- requires (<u>maincourse</u>, <u>prerequisite</u>)

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Primary key

- Each row has one or more attributes, known as relation key, which can identify the row in the relation (table) uniquely.

- Client(<u>IdClient</u>, Name, Adress)

Foreign Key

- A foreign key in one table points to a primary key in another table.
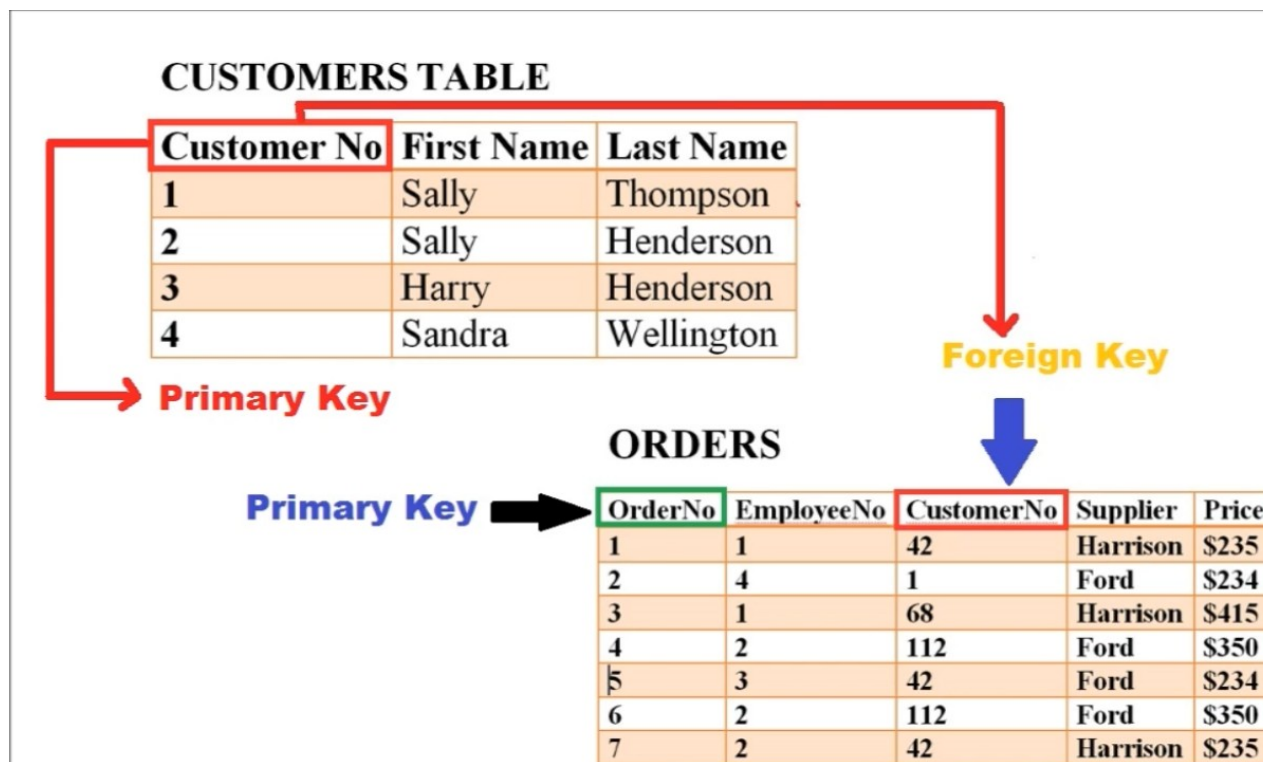
Attribute domain

- Every attribute has some pre-defined value scope, known as attribute domain.

Relational Integrity Constraints

- Every relation has some conditions that must hold for it to be a valid relation.
- These conditions are called Relational Integrity Constraints.

Relational Integrity Constraints

- There are three main integrity constraints:
  - Key constraints
  - Domain constraints
  - Referential integrity constraints

Key Constraints

- There must be <u>at least one minimal</u> subset of attributes in the relation, which can identify a tuple uniquely.

- This minimal subset of attributes is called key for that relation.

- If there are more than one such minimal subsets, these are called <u>candidate</u> keys.

Key Constraints

- Key constraints force that −
  - in a relation with a key attribute, <u>no two tuples</u> can have <u>identical</u> <u>values</u> for key attributes.
  - a <u>key</u> attribute <u>can not have NULL val</u>ues.
 - Key constraints are also referred to as Entity Constraints.

Domain Constraints

- Attributes have <u>specific values in real-world</u> scenario.
  - For example, age can only be a positive integer. The same constraints have been tried to employ on the attributes of a relation.
- Every attribute is bound to have <u>a specific range of values</u>.
  - For example, age cannot be less than zero and telephone numbers cannot contain a digit outside 0-9.

Referential integrity Constraints

- Referential integrity constraints work on the concept of <u>Foreign Keys</u>.

- A foreign key is a key attribute of a relation that can be referred in other relation.

- Referential integrity constraint states that if a relation refers to a key attribute of a different or same relation, then <u>that key element must exist</u>.

The Hard Life of a NoSQL Coder
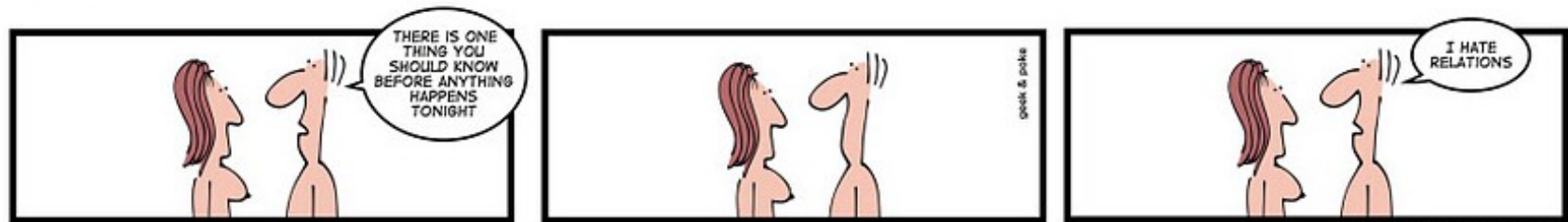
References

Codd, E.F (1969), Derivability, Redundancy, and Consistency of Relations Stored in Large Data Banks, Research Report, IBM.

Codd, E.F (1970). "A Relational Model of Data for Large Shared Data Banks". Communications of the ACM. Classics. 13 (6): 377–87