

Database design

- Design goals
- From conceptual design to logical and physical design

Database design

Why is it so important?



Why is it important to focus on the design of the database?

- The database must serve the functions of the organization
- The database is an essential part of business oriented systems
- The users see user interfaces, reports and other parts of the system
- If the database behind is not well designed, the application itself will never be very good
- There will be extra work in the programming phase if the data structures are not well designed
- On the other hand, if the database is designed properly, the programming of the application is easy to do.



Properties of a well-designed database

- Offers many ways to fetch data
- Flexible, works well and gives the right data
 - [Consistency](#) => see ACID
 - Integrity, see SQL (e.g. referential integrity, CHECK)
- Adapts itself to the growth in the future (more data)
 - it should be possible to change the structure of the database (more tables or more columns in a table) with minimum changes to existing applications
 - a new database should work in cooperation with the other systems and databases of the organization.

Design goals

There are many goals for the design of a database; here are some:

1. The database is comprehensive: it includes all the needed data and connections.
2. The database is understandable: there is a clear structure which leads to easy, flexible and fast reading and updating of the data.
3. The database is expandable: it is possible to change the structure of the database with a minimum change to the existing software.
4. The database can be used in many organizations: the database can be adapted to different kinds of environments and customers without the need to change the database structure.
5. The integrity of the data: data must be correct, it must be consistent.
6. The application design and implementation is easy and fast.

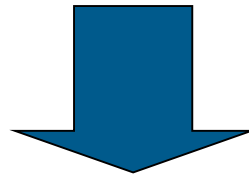


From conceptual design to logical and physical design

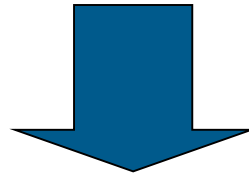


Three phases of database design

Conceptual design



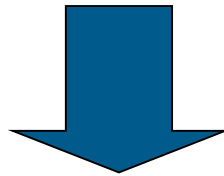
Logical design: choose a data model



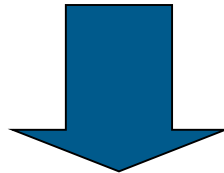
Physical design: select the DBMS

From a conceptual model to physical model

Conceptual model: UML class diagram
Describe the most essential concepts and their relationships



Logical model (database diagram):
Relational model (No many-to-many relationships, 3. NF)

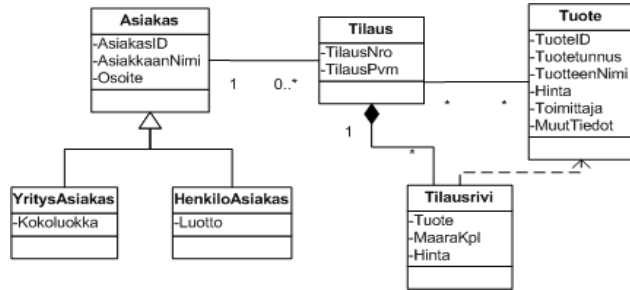


Physical model (create DDL script):
Oracle, SQL Server, MySQL etc.

Prototype

From class diagram to tables

Class diagram



ER diagram (crow's feet)

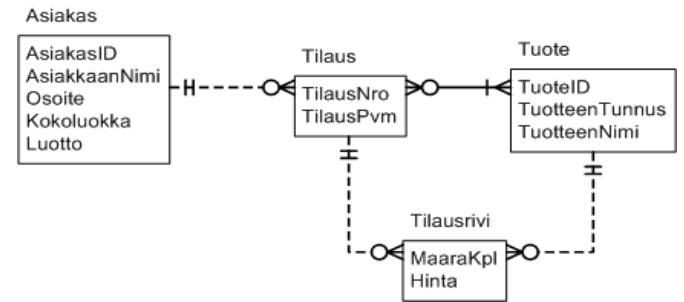
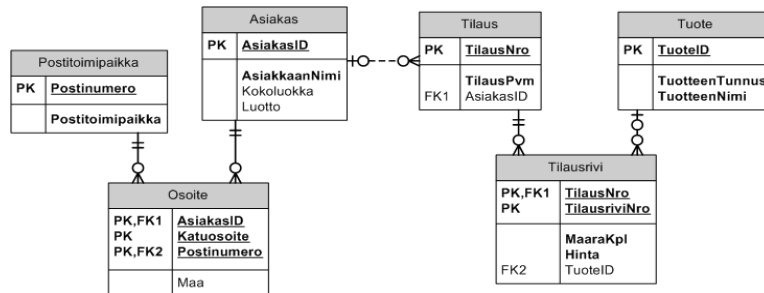


Table schema (3 NF)



Database tables

