

Normalization is a database design technique that reduces data redundancy and improves data integrity by organizing data into tables in a way that minimizes duplication.

Goals of Normalization

- **Eliminate Redundancy:** Avoid storing the same data in multiple places.
- **Ensure Data Integrity:** Make sure data is consistent and accurate.
- **Simplify Data Management:** Make it easier to update, insert, and delete data.

Normal Forms

Normalization involves organizing data into different levels, known as "normal forms." The most common normal forms are:

- **First Normal Form (1NF):**
 - Eliminate repeating groups.
 - Each column should contain only atomic values (indivisible).
- **Second Normal Form (2NF):**
 - Must be in 1NF.
 - Eliminate redundant data.
 - Non-key attributes must be fully functionally dependent on the primary key.
- **Third Normal Form (3NF):**
 - Must be in 2NF.
 - Eliminate transitive dependencies.
 - Non-key attributes should not be dependent on other non-key attributes.

Benefits of Normalization

- **Reduced storage space:** Eliminating redundancy reduces the amount of space needed to store data.
- **Improved data integrity:** Ensures that data is consistent and accurate.
- **Easier data modification:** Updating data in one place reduces the risk of inconsistencies.
- **Better query performance:** Normalized tables can be queried more efficiently.