

Database Design

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Database Design

- Requirement Formulation and Analysis
 - Collection and Documentation of Requirement
 - Analysis of Requirement
- Conceptual Design
 - Data Modeling
 - First Level – E-R Modeling
 - Second Level - Normalization
- Physical Design & Implementation

Requirement Analysis

The Objective is to answer the following questions:

- What are user-views of the data (present & future)?
- What data elements (or attributes) are required in these user-views?
- What are entities and their primary keys?
- What are the operational requirements reg. Security, Integrity etc.?

Conceptual Design

The relationship between the collection of data in a system may be graphically represented using data modeling. It provides a Simplified approach to the structured design of the complex system .

Data Modeling is achieved in two levels:

- ER Modeling
- Normalization

ER Diagram

Entity Relationship Diagrams (ERDs) illustrate the logical structure of databases. It uses three basic concepts

- Entities
- Their Attributes
- The Relationships that exist between the entities

ER Diagram

Graphical notations for ER Diagram :



Entity

An entity is an object or concept about which you want to store information.



Attributes

Attributes are the properties or characteristics of an entity.

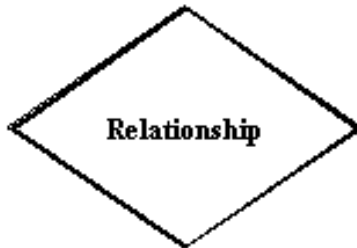


Key attribute

A key attribute is the unique, distinguishing characteristic of the entity. For example, an employee's social security number might be the employee's key attribute.

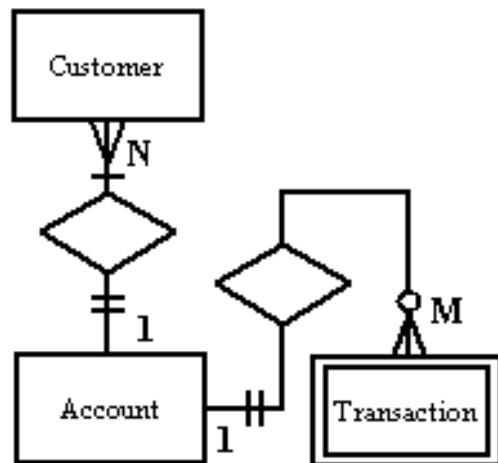
ER Diagram

Graphical notations for ER



Relationships

Relationships illustrate how two entities share information in the database structure.

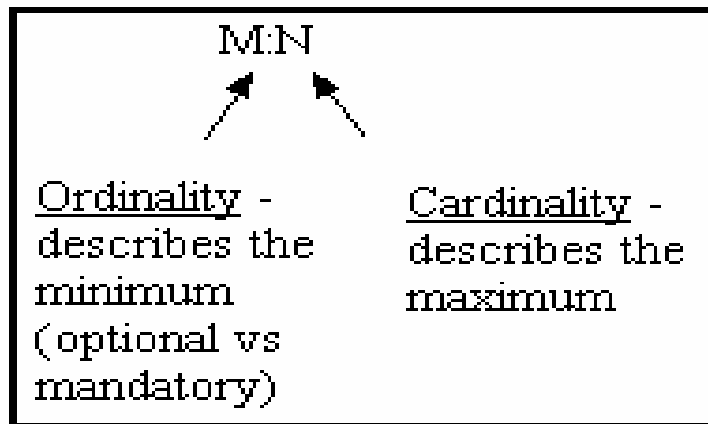


Cardinality

Cardinality specifies how many instances of an entity relate to one instance of another entity.

ER Diagram

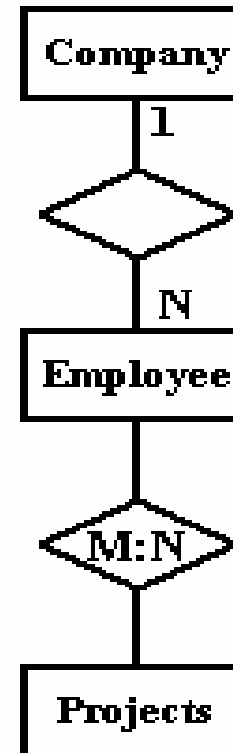
Chen style



1:N (n=0,1,2,3...)
one to zero or more

M:N (m and n=0,1,2,3...)
zero or more to zero or more
(many to many)

1:1
one to one



ER Diagram

Example

An Organization has employees assigned to specific departments. The employees may work on several projects at the same time.

The project uses parts which are supplied by different suppliers, and stored in various warehouses.

ER Diagram Process

- Identify the entities that your database must represent
- Determine the cardinality relationships among the entities and classify them as one of
 - One-to-one
 - One-to-many
 - Many-to-many
- Draw the entity-relationship diagram
- Determine the attributes of each entity
- Define the (unique) primary key of each entity

From E-R Model to Database Design

- Entities with one-to-one relationships should be merged into a single entity
- Each remaining entity is modeled by a table with a primary key and attributes, some of which may be foreign keys
- One-to-many relationships are modeled by a foreign key attribute in the table representing entity on the "many" side of the relationship
- Many-to-many relationships among two entities are modeled by a third table that has foreign keys that refer to the entities. These foreign keys should be included in the relationship table's primary key, if appropriate
- Commercially available tools can automate the process of converting a E-R model to a database schema

Normalization

- Refinement of E-R Model
- Improves database design
- Ensures minimum redundancy of data

An Un-normalized Data Structure contains redundant and disorganized data which need to be organized, by dividing the data over several tables to avoid redundancy. This is achieved by going through the process of Normalization.

Normalization

Example

- Invoice No.
- Invoice Date
- Order No.
- Challan No.
- Customer No.
- Customer Name
- Item No.
- Item Desc.
- Qty Sold
- Rate
- Discount
- Invoice Value

This table presents several difficulties in Insertion, Updation, Deletion of Fields.

Normalization

Steps in Normalization

First Normal Form

- Identify repeating groups of fields
- Remove repeating groups to a separate table
- Identify the keys for the table
- Key of parent table is brought as part of the concatenated key of the second table

A Table is in 1NF when it contains no repeating groups.

Normalization

First Normal Form

- **Invoice Table**
 - Invoice No.
 - Invoice Date
 - Order No.
 - Challan No.
 - Cust. No.
 - Cust Name
 - Invoice Value
- **Invoice Items**
 - Invoice No,
 - Item No.
 - Item description
 - Qty Sold
 - Rate
 - Discount

Normalization

Second Normal Form

- Check if all fields are dependent on the whole key
- Remove fields that depend on part of the key
- Group partially-dependent fields as a separate table
- Name the tables
- Identify key(s) to the table(s)

A Table is in 2NF if all its non-key fields are fully dependent on the whole key.

Normalization

Second Normal Form

- Invoice Table
- Invoice Items
 - Invoice No.
 - Item No.
 - Qty sold
 - Discount
- Item Table
 - Item No.
 - Item description
 - Rate

Normalization

Third Normal Form

- Remove fields that depend on other non-key fields
- Remove fields that can be calculated or derived from logic.
- Group interdependent fields as separate tables.

A Table is in 3NF if all the non-key fields of the table are independent of all other non-key fields of the same table.

Normalization

Third Normal Form

- **Invoice Table**
 - Invoice No.
 - Invoice Date
 - Order No.
 - Challan No.
 - Cust. No.
 - Invoice Value
- **Customer Table**
 - Cust No.
 - Cust name
- **Invoice Items**
 - Invoice No.
 - Item No.
 - Qty sold
 - Discount
- **Item Table**
 - Item No.
 - Item description
 - Rate

Features of Oracle9i

An overview of the changes that have been made to Oracle 9i to improve the following technical aspects :-

- database performance
- ease of management
- scalability
- security
- availability

Application areas:

- Internet content management
- ecommerce integration
- packaged applications
- Business Intelligence

Features of Oracle9i

INTERNET CONTENT MANAGEMENT

Oracle 9i can be used for the storage and manipulation of many different types of data. The new features are:-

- Internet File Store improvements
- searching/indexing of multimedia and XML data
- support for collaborative projects via the creation of shared workspaces, allowing multiple versions of content to exist simultaneously
- ability to create applications to make use of location information of clients and services (e.g. for use with mobile phones)

ECOMMERCE INTEGRATION

The enhancements Oracle 9i provides in this area are:

- pre-built objects for creating store fronts, exchanges and portals to provide a faster time-to-market and enable easier integration with the back-end
- support for standard messaging formats to enable faster integration of the store front with the back-end and external systems