Database Schema

A database schema is a blueprint or architecture of how data is organized and structured in a database. It defines the tables, fields, relationships, views, indexes, and other elements that make up the database. Here's a breakdown of the main components of a database schema:

Tables

Tables are the primary structure in a database where data is stored. Each table consists of rows (records) and columns (fields).

> ***Example: A table named Customers with columns CustomerID, Name, Email, and PhoneNumber.***

Fields (Columns)

Fields represent the individual attributes or properties of the data stored in a table.

> ***Example: In the Customers table, CustomerID, Name, Email, and PhoneNumber are fields.***

Records (Rows)

Records are individual entries in a table, representing a single instance of the entity described by the table.

> ***Example: A single row in the Customers table might be {CustomerID: 1, Name: 'John Doe', Email: 'john.doe@example.com', PhoneNumber: '123-456-7890'}.***

Primary Keys

A primary key is a unique identifier for each record in a table. It ensures that no two records have the same primary key value.

> ***Example: CustomerID in the Customers table might be the primary key.***

Foreign Keys

Foreign keys are fields in a table that establish a link between data in two tables. They refer to the primary key in another table.

> ***Example: An Orders table might have a CustomerID field that is a foreign key referencing the CustomerID in the Customers table.***

Indexes

Indexes are used to speed up the retrieval of data by creating a quick lookup reference for a table's columns.

> ***Example: Creating an index on the Email field of the Customers table to quickly search by email.***

Views

Views are virtual tables created by querying one or more tables. They present data in a specific way without storing it physically.

> ***Example: A view named ActiveCustomers that shows only customers who have placed an order in the last 30 days.***

Relationships

Relationships define how tables are related to each other. They can be one-to-one, one-to-many, or many-to-many.

> ***Example: A one-to-many relationship between Customers and Orders, where each customer can have multiple orders, but each order is associated with only one customer.***

Constraints

Constraints are rules enforced on data in tables to ensure accuracy and reliability. Common constraints include primary key, foreign key, unique, not null, and check constraints.

> ***Example: A NOT NULL constraint on the Email field of the Customers table ensures that every customer must have an email address.***

Schemas (Namespace)

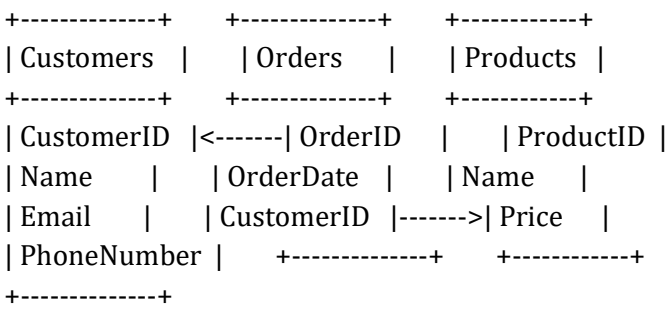
In some database systems, a schema is a logical container that holds a set of tables, views, and other database objects.

> ***Example: In a PostgreSQL database, you might have a public schema and a sales schema, each containing different tables and views.***

Visual Representation of a Database Schema

To visualize a database schema, entity-relationship diagrams (ERDs) are often used. An ERD shows tables as entities, fields as attributes, and relationships between tables with connecting lines.

Example ERD for a Simple E-commerce Database:



In this example:

- - Customers table has a primary key CustomerID.
- - Orders table has a primary key OrderID and a foreign key CustomerID referencing Customers.
- - Products table has a primary key ProductID.
- - Orders table has a foreign key ProductID referencing Products.