

PostgreSQL



Frontend

(Developer builds)

- User interface
- Client-side logic



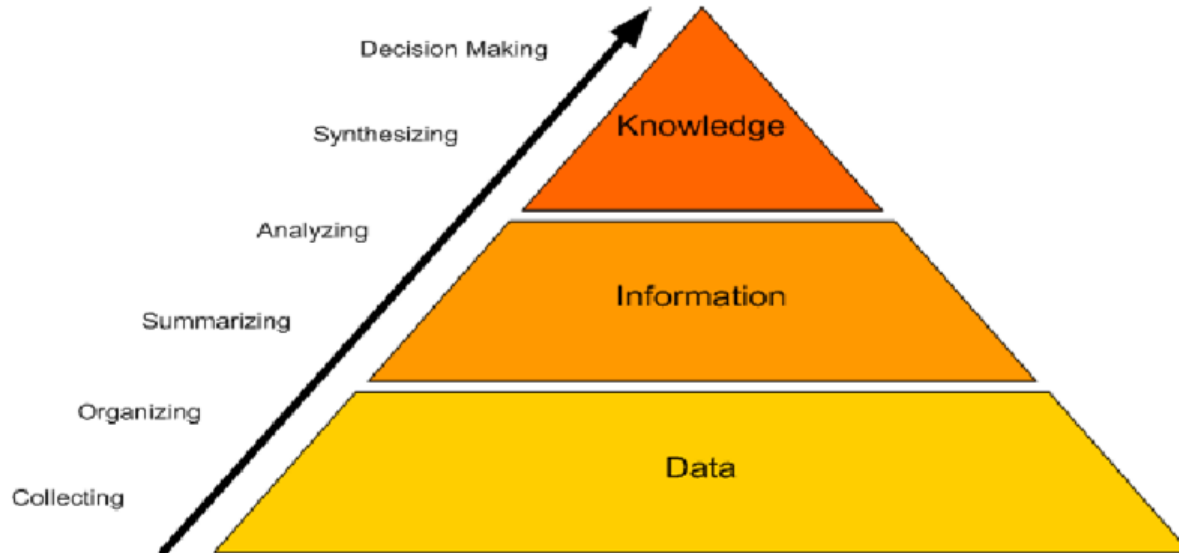
Backend

(Vendor provides as a service)

- Database management
- Cloud storage
- User authentication
- Push notifications
- Hosting

What is DATA(DIK)

Data is any sort of information which is stored in computer memory. This information can later be used for a website, an application or any other client to store for future purpose.



What is Database (DB)?

Database (DB) are organized, they have a structure, and all the data they store it fits into that structure. More specifically, a database is a system that allows data to be ***stored***, easily ***accessed, manipulated and updated***.

A database needs to be hosted or created on some special ***database platform***, some of the famous Database platforms are:

- ***PostgreSQL***
- ***MySQL***
- ***Microsoft SQL Server***
- ***SQLite***
- ***Oracle(nosql)***

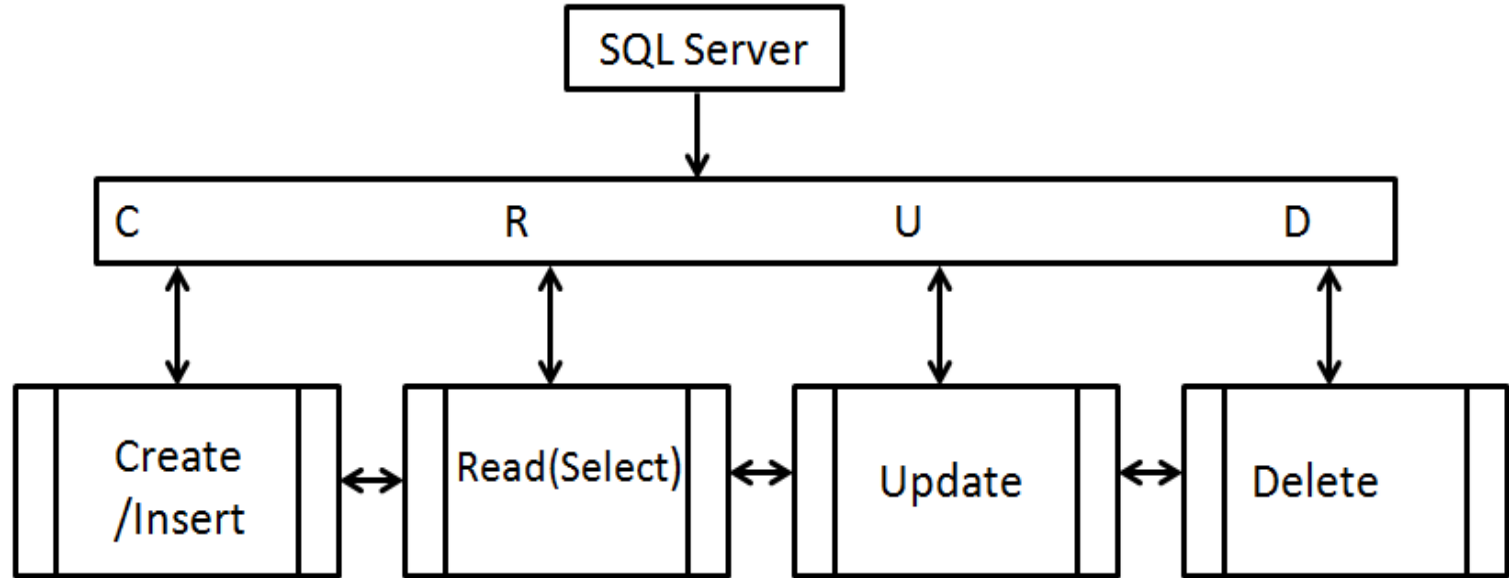
What is a Database Management System (DBMS)?

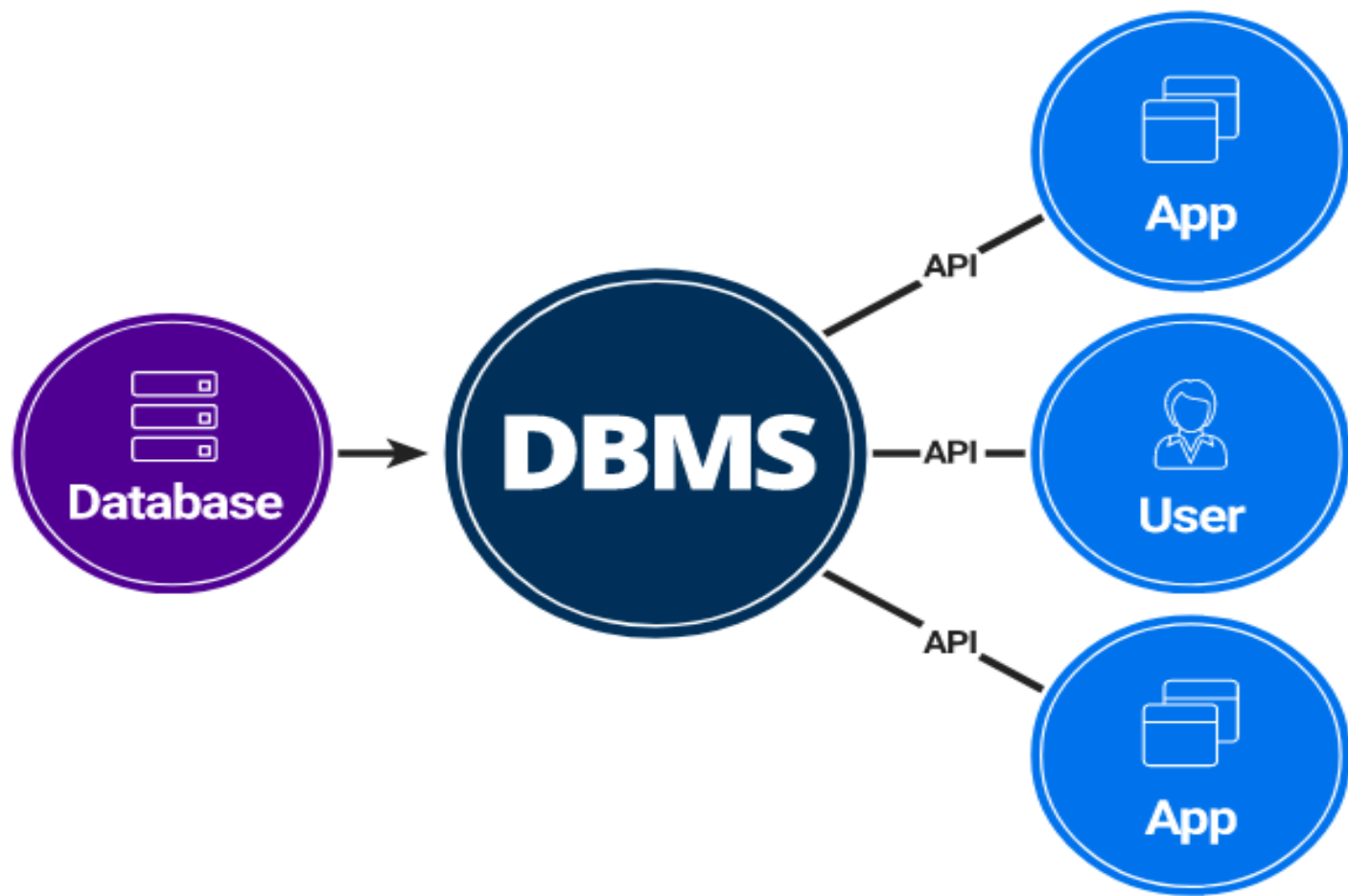
- A database management system, or simply DBMS, is an important programming tool that consists of a set of programs that define, manage databases.
- Through this, you are able to build a structure and operate on the valuable data that the database holds in a very efficient way.
- A database management system acts as the backbone of a database and it makes access and management of data a lot easier.

The following are the key features of a DBMS: (CRUD, Recovery, Accessible)

- Allows the creation of new databases and their data structures
- Allows data query and modification using SQL
- Allows the storage of vast amounts of data over a long period of time
- Enables database recovery in times of failure, error or intentional misuse
- Controls data access from many users at once

CRUD operations





Types of Database

- ***Relational Databases***
- ***No-SQL(Non-Relational) Databases***
- ***Hierarchical Databases***
- ***Network Databases***
- ***Object-Oriented Databases***

Relational Database

- **Tables** contain the actual data
- **Forms** simplify entering and viewing data
- **Queries** let you view parts of the data
- **Reports** format and print selected data
- **Macros** let you automate command sequences

Relational

Tend to be larger,
monolithic



ORACLE



IBM
DB2



Non-relational

Newer field, lots
of players



splunk >



Solr



No-SQL Databases(Not Only SQL)

- NoSQL databases (aka "not only SQL") are non tabular, and store data differently than relational tables.
- The main types are document, key-value, wide-column, and graph.
- They provide flexible schemas and scale easily with large amounts of data and high user loads.

NoSQL DATABASE TYPES

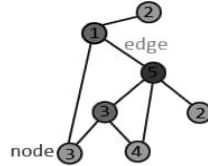
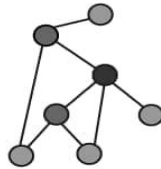
Document



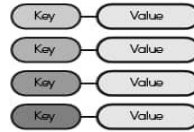
```
{
  "user": {
    "id": "143",
    "name": "improgrammer",
    "city": "New York"
  }
}
```



Graph



Key-Value



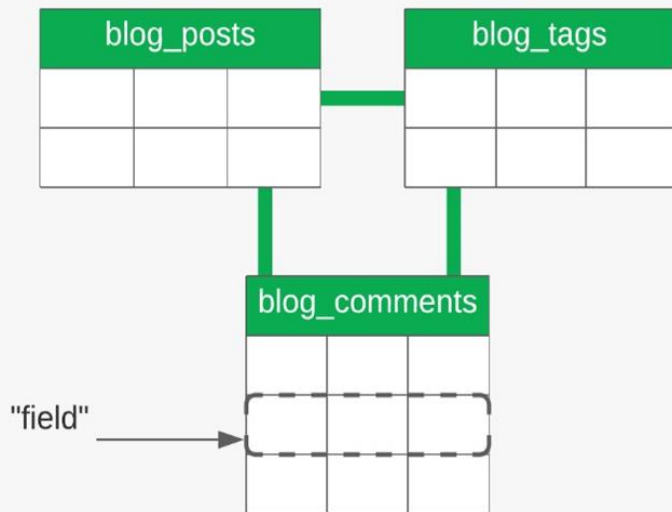
Wide-Column



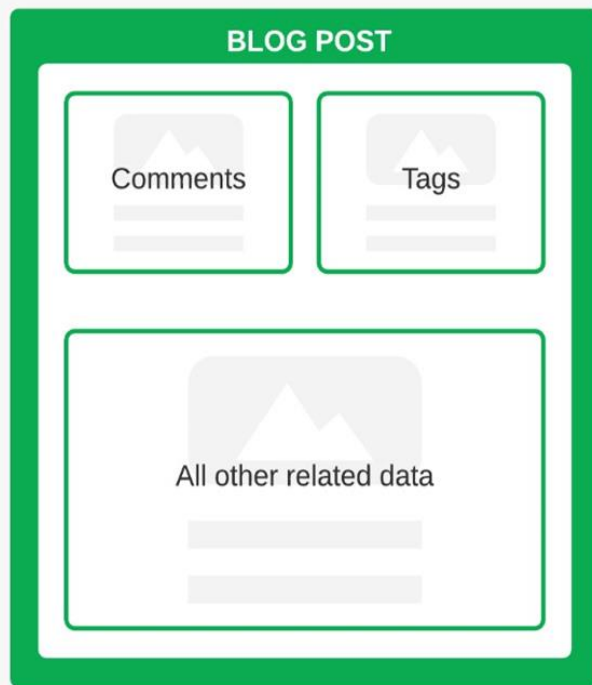
1	Fruit	A Foo	B Baz	
2	City	E DC	D PLA	G FLD
3	State	A NZ	C CL	



Relational



Non-Relational





Relational



Non-relational

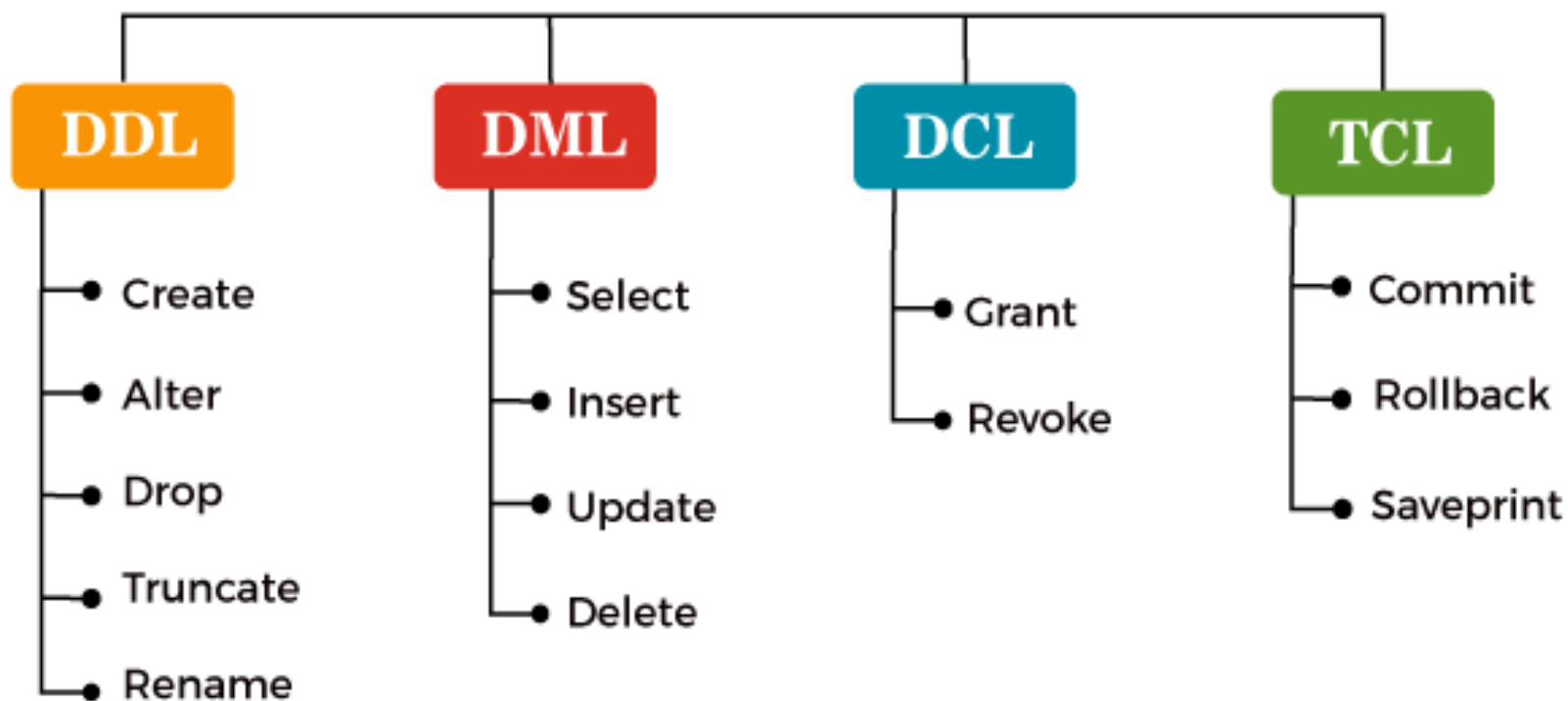


	SQL	NoSQL
Database Type	Relational Databases	Non-relational Databases / Distributed Databases
Structure	Table-based	<ul style="list-style-type: none"> • Key-value pairs • Document-based • Graph databases • Wide-column stores
Scalability	Designed for scaling up vertically by upgrading one expensive custom-built hardware	Designed for scaling out horizontally by using shards to distribute load across multiple commodity (inexpensive) hardware
Strength	<ul style="list-style-type: none"> • Great for highly structured data and don't anticipate changes to the database structure • Working with complex queries and reports 	<ul style="list-style-type: none"> • Pairs well with fast paced, agile development teams • Data consistency and integrity is not top priority • Expecting high transaction load

What is SQL

- Pronounced as *ees-que-ell* or *see'qwl*, SQL is a computer language initially invented by IBM (International Business Machines Corporation) way back 1970s
- It was originally called *SEQUEL* that handled queries on the collection and organization of data - or simply known as a database.
- Now, thanks to *SQL*, that brought about such transformation in accessing and manipulating data in a very meaningful way.

Types of SQL Commands



Data Definition Language (DDL)

- Data Definition Language (or simply DDL) enables you to create, change or restructure, and even destroy the basic elements that are contained in a relational database.
- Some of the most common DDL commands:

✓CREATE

✓ALTER

✓DROP

Data Manipulation Language (DML)

- Data Manipulation Language (or simply DML) consists of SQL commands that handle data maintenance functions. This means that you are able to manipulate the data contained within the relational database objects.
- The DML statements commonly used:
 - ✓ **INSERT**
 - ✓ **UPDATE**
 - ✓ **DELETE**

Data Query Language (DQL)

- Data Query Language (or simply DQL) consists of commands that perform data selection, which is the main focus of relational database users in the world of SQL.

✓ ***SELECT DISTINCT COLUMN1, COLUMN2 FROM
TABLE1, TABLE2;***

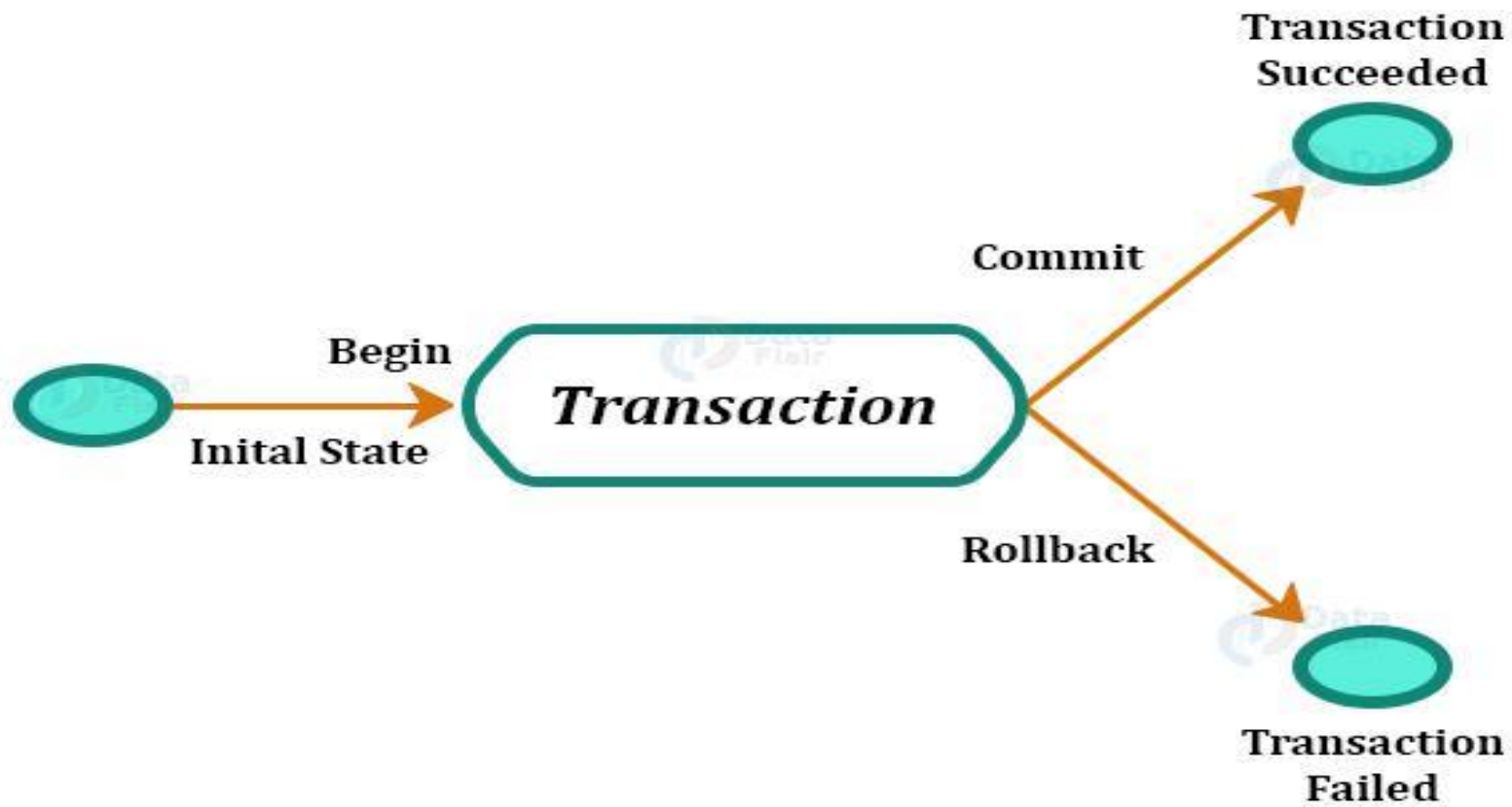
Transactional Control Commands

- Transactional control commands allow users to manipulate various transactions in maintaining database integrity.

✓COMMIT

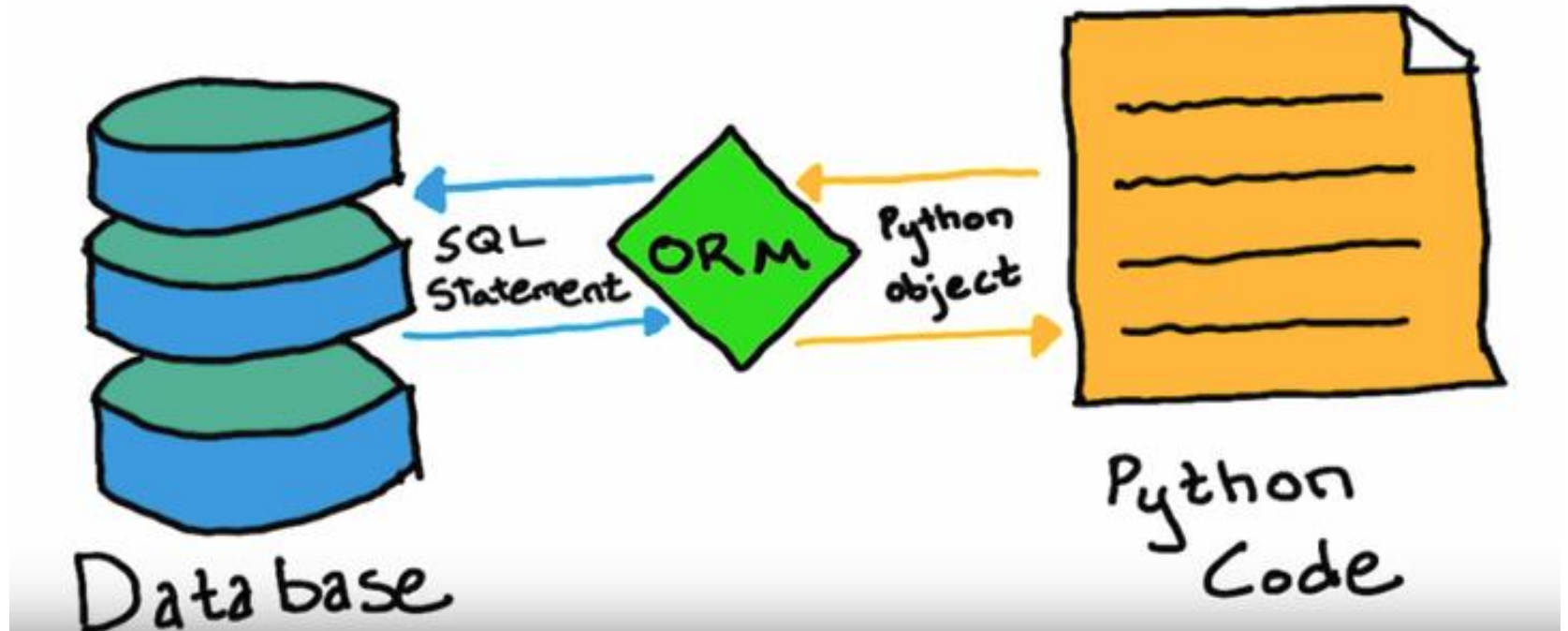
✓ROLLBACK

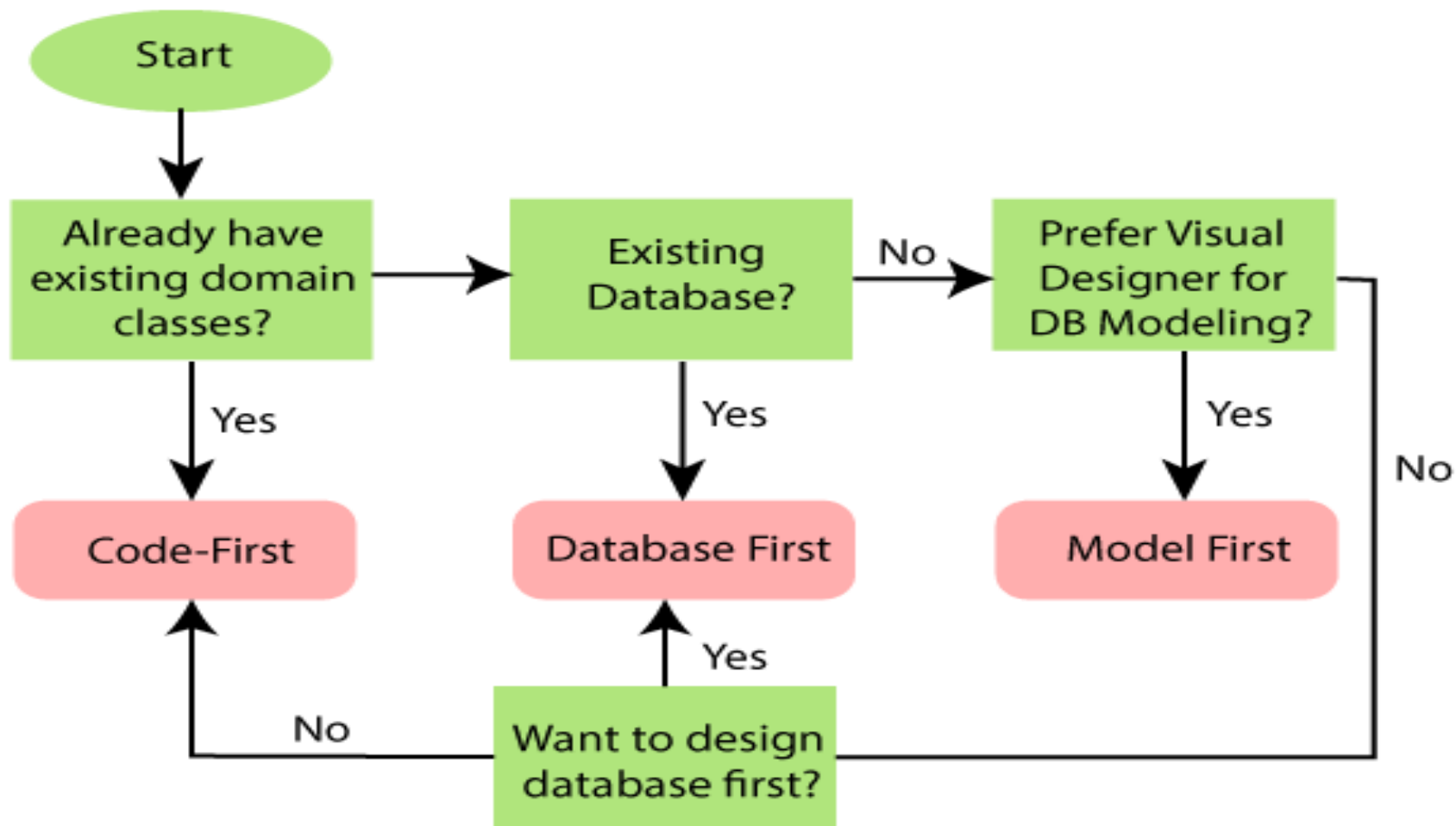
✓SAVEPOINT



```
BEGIN
    DECLARE @inControl MONEY;
    SELECT @inControl = Balance FROM Accounts WHERE AccountID =
@SenderId;
    IF @inControl >= @Amount
    BEGIN
        BEGIN TRANSACTION
            UPDATE Accounts
            SET Balance = Balance - @Amount
            WHERE AccountID = @SenderId
        IF @@ERROR <> 0
        ROLLBACK
            UPDATE Accounts
            SET Balance = Balance + @Amount
            WHERE AccountID = @PurchaserID
        IF @@ERROR <> 0
        ROLLBACK
        COMMIT
    END
    ELSE
    BEGIN
        SET @retVal = -1;
        RETURN @retVal;
    END
END;
```


ORM(Object Relational Mapping)

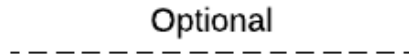
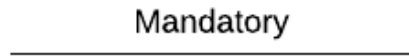
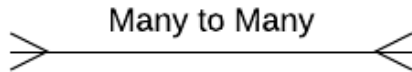
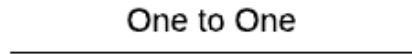
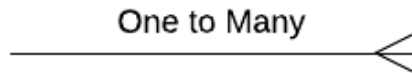
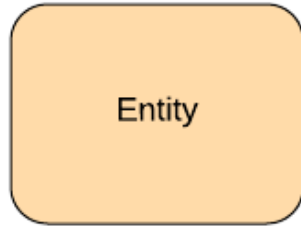


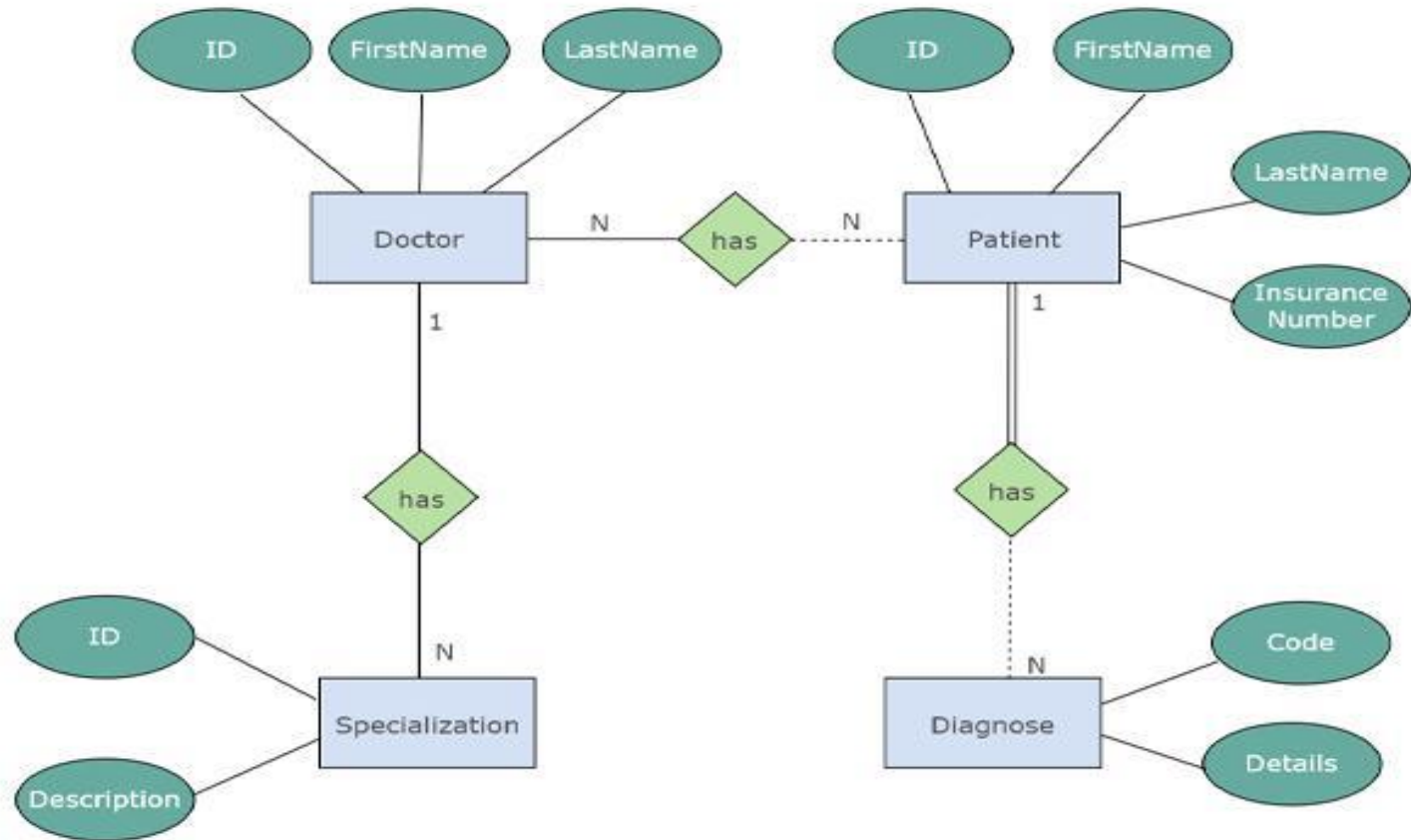


ERD(Entity Relationships Diagram)

- ❖ *Elements of the Conceptual Model are represented by diagrams, Entity-Relationship or ER Diagrams, that show the meanings and relationships of those elements independent of any particular database systems.*
- ❖ *ER Diagrams are most often used to design relational databases*
 - Entity
 - Attribute
 - Relationship

Database Relationships





PostgreSQL Database

- PostgreSQL is a relational and open-sourced database management system developed at the University of California.
- It supports a large part of the SQL standard and offers many modern features:

- ✓complex queries
- ✓foreign keys
- ✓triggers
- ✓updatable views
- ✓transaction management
- ✓multiversion(every year a major version)

Data Types

- Primitives: Integer, Numeric, String, Boolean
- Structured: Date/Time, Array, Range, UUID
- Document: JSON, XML, Key-value (Hstore)
- Geometry: Point, Line, Circle, Polygon
- Customizations: Composite, Custom Types

✓ <https://www.postgresql.org/docs/9.1/datatype.html>

PostgreSQL Data Types

Boolean

Char Data Type

Text Data Type

Integer Data Type

Varchar(n) Data Type



Array

Time Data Type

UUID Data Type

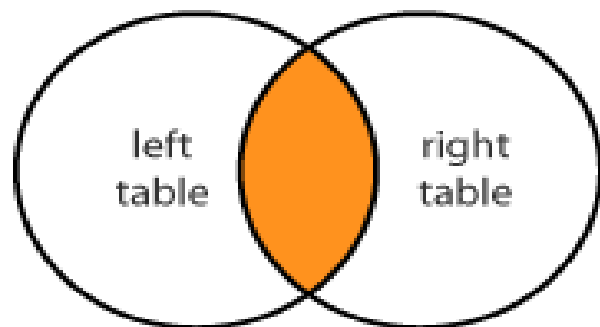
JSON Data Type

Interval Data Type

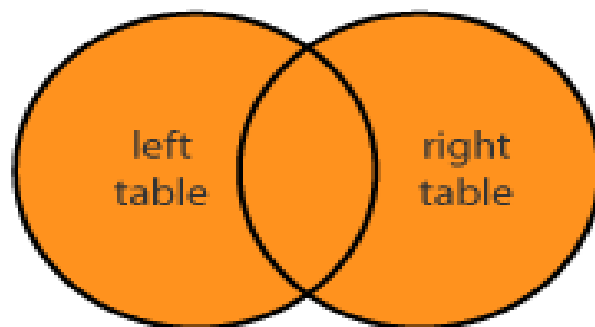
JOINS IN POSTGRESQL

- INNER JOIN
- LEFT JOIN
- RIGHT JOIN
- FULL JOIN
- UNION*

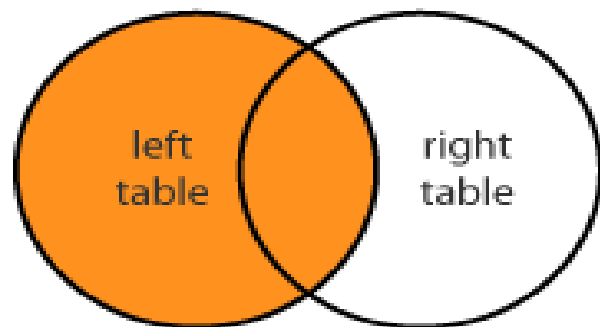
INNER JOIN



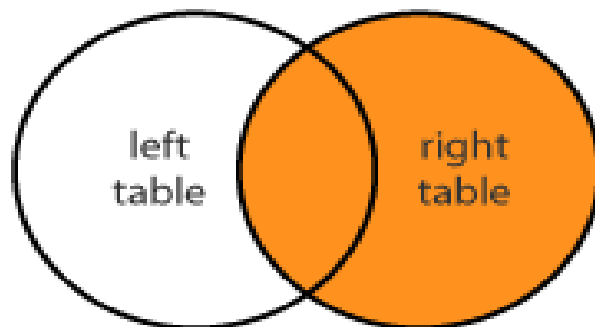
FULL JOIN



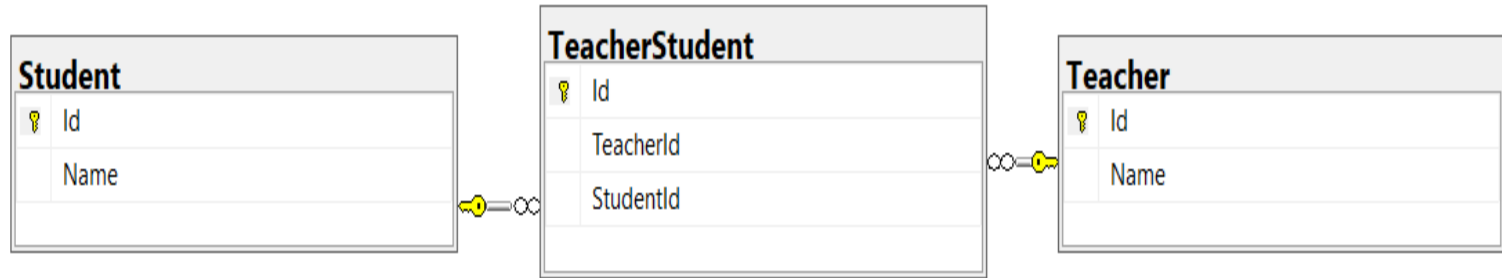
LEFT JOIN



RIGHT JOIN



Primary –Foreign Key(CONSTRAINT)



- Views
- Indexes
- Store Procedure
- Functions
- Triggers

