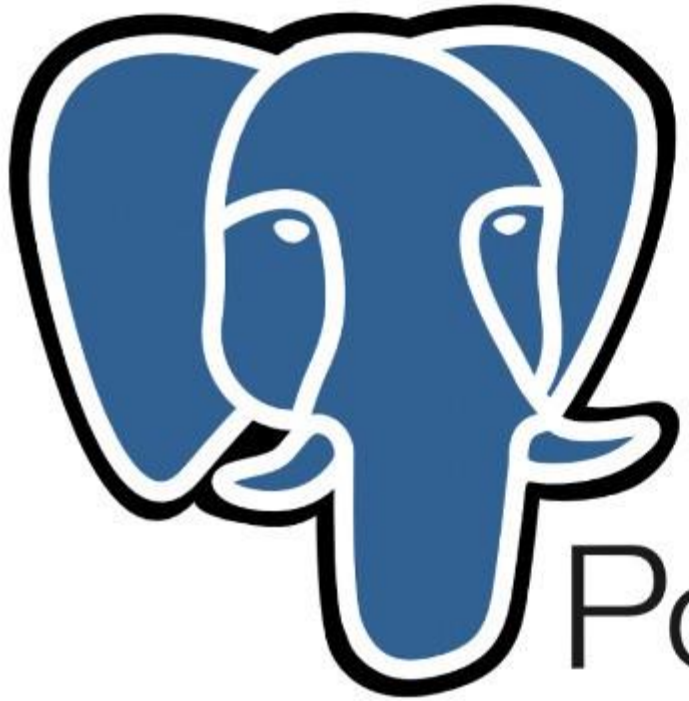
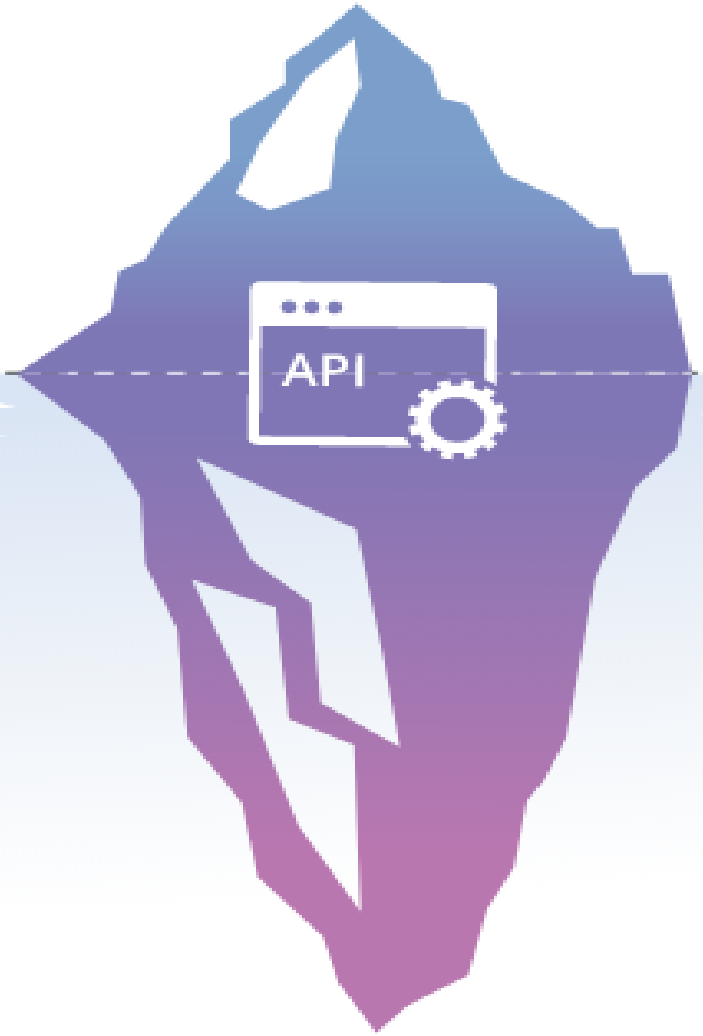


PostgreSQL

Frontend

(Developer builds)

- User interface
- Client-side logic



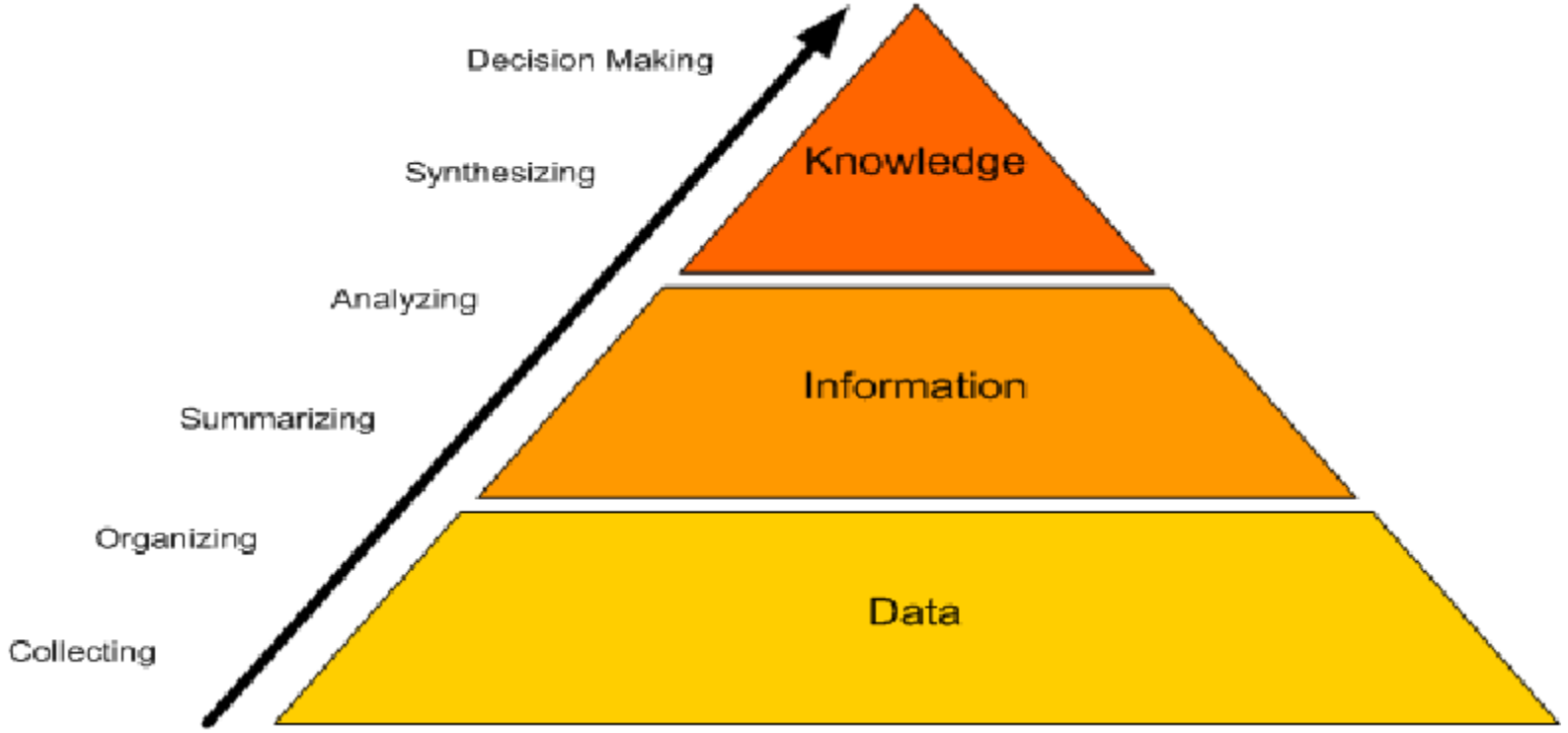
Backend

(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 an electronic 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 and process databases and all applications associated to them.
- 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 makes using a database a cakewalk as 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 an appropriate programming language
- 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


App or Website
Database Management System
Database

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

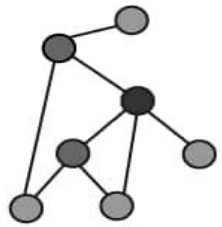
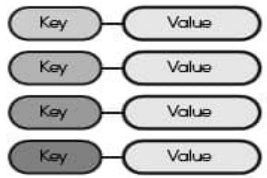
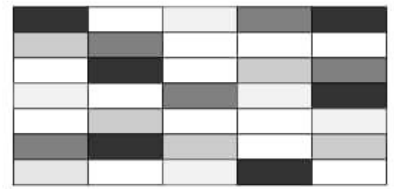
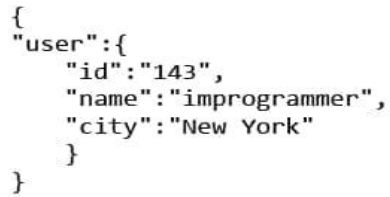
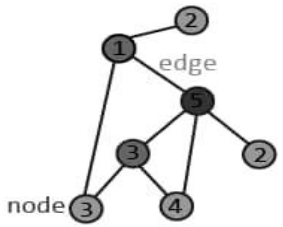
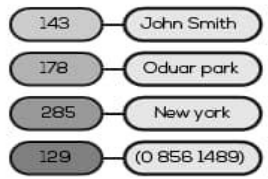
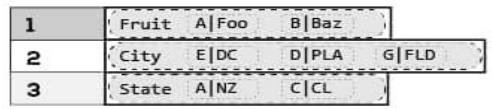
Non-relational

Newer field, lots of players

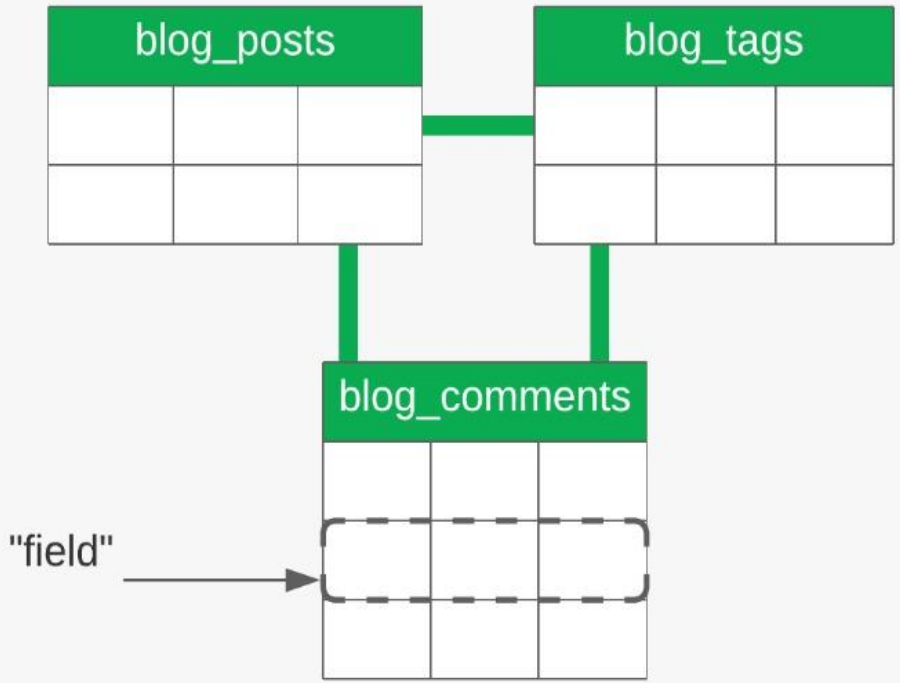
No-SQL Databases(Not Only SQL)

- 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.

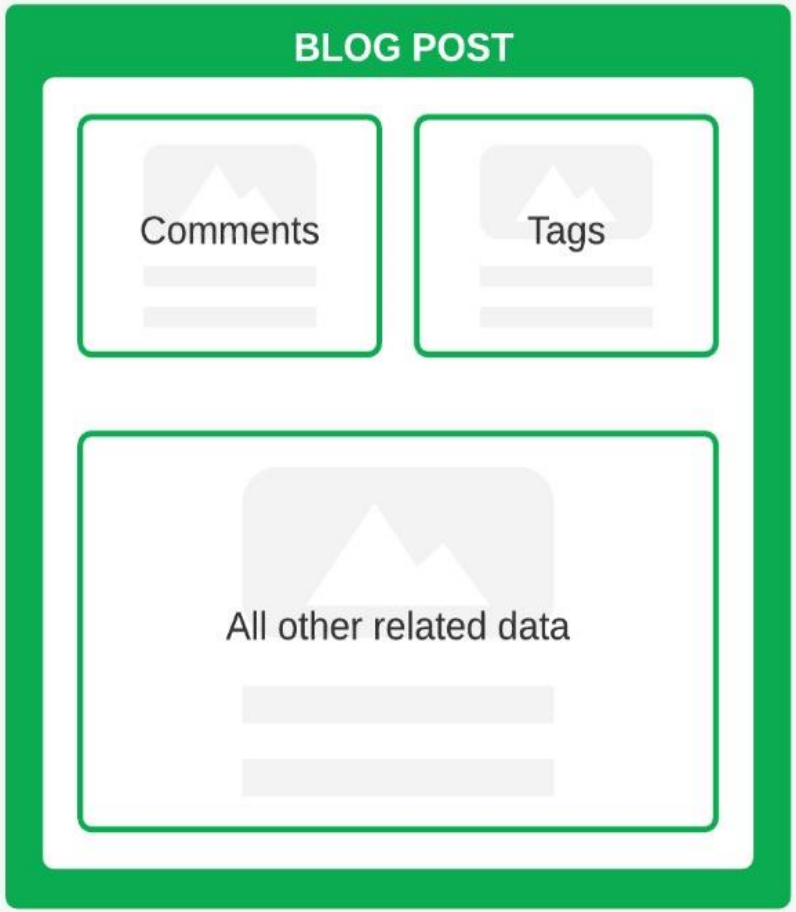
NoSQL DATABASE TYPES

Document	Graph	Key-Value	Wide-Column
			
			
			

Relational



Non-Relational



Relational

VS

Non-relational

Key highlights on SQL vs NoSQL:

SQL	NoSQL
RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)	Non-relational or distributed database system.
These databases have fixed or static or predefined schema	They have dynamic schema
These databases are not suited for hierarchical data storage.	These databases are best suited for hierarchical data storage.
These databases are best suited for complex queries	These databases are not so good for complex queries
Vertically Scalable	Horizontally scalable

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.

SQL Command Types

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*;

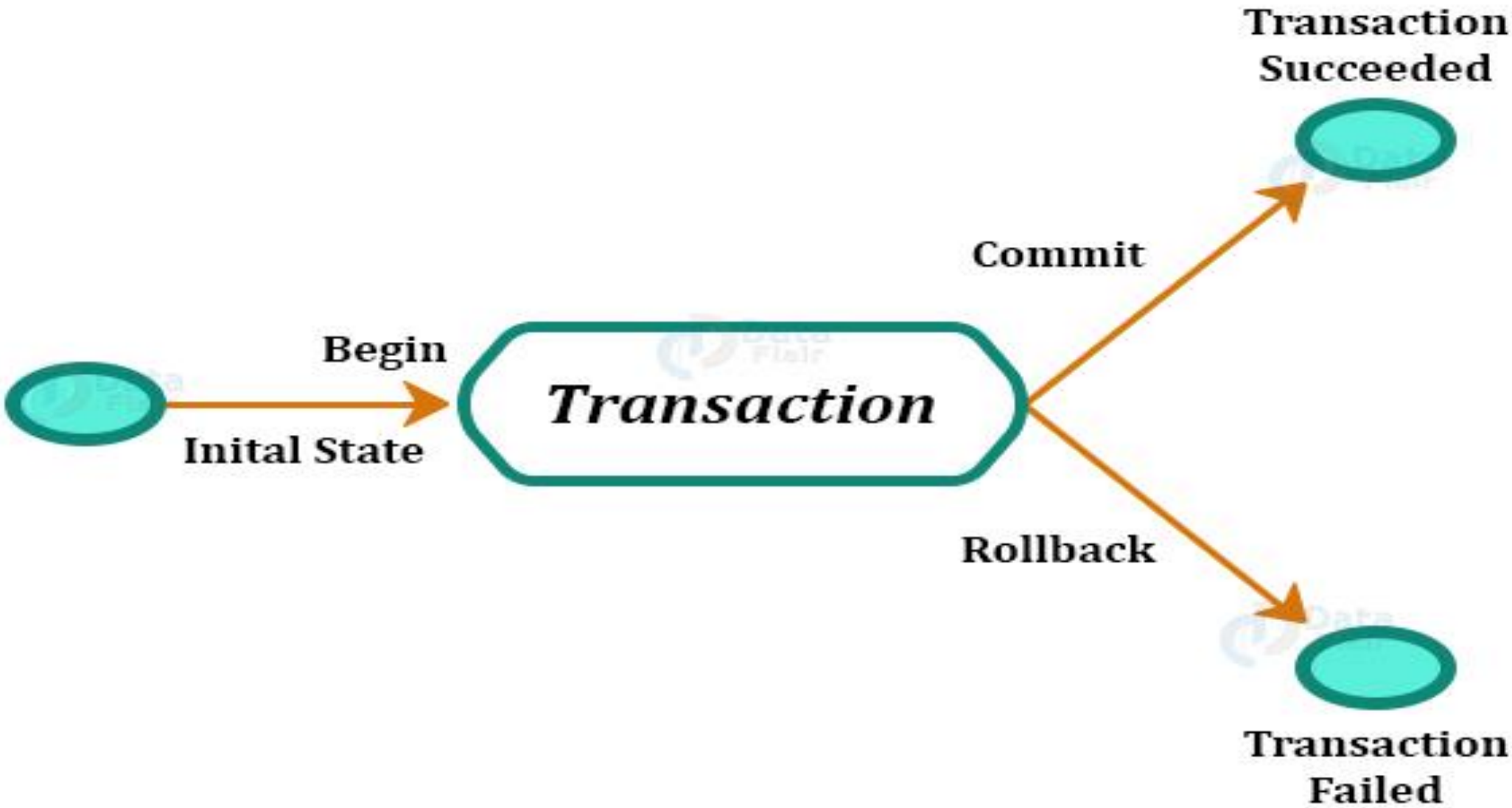
Transactional Control Commands

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

✓**COMMIT**

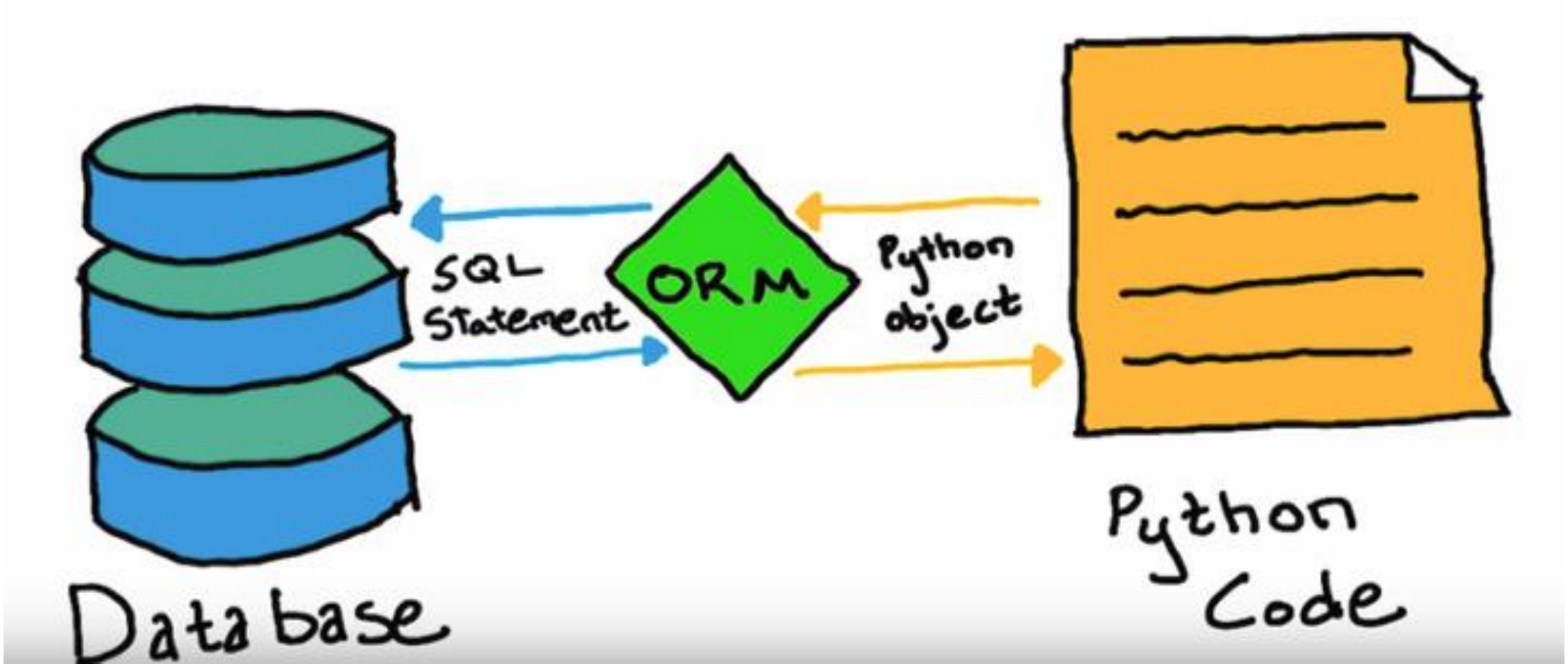
✓**ROLLBACK**

✓**SAVEPOINT**


Transaction
Succeeded
Commit
Begin
Transaction
Inital State
Rollback
Transaction
Failed

```
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)

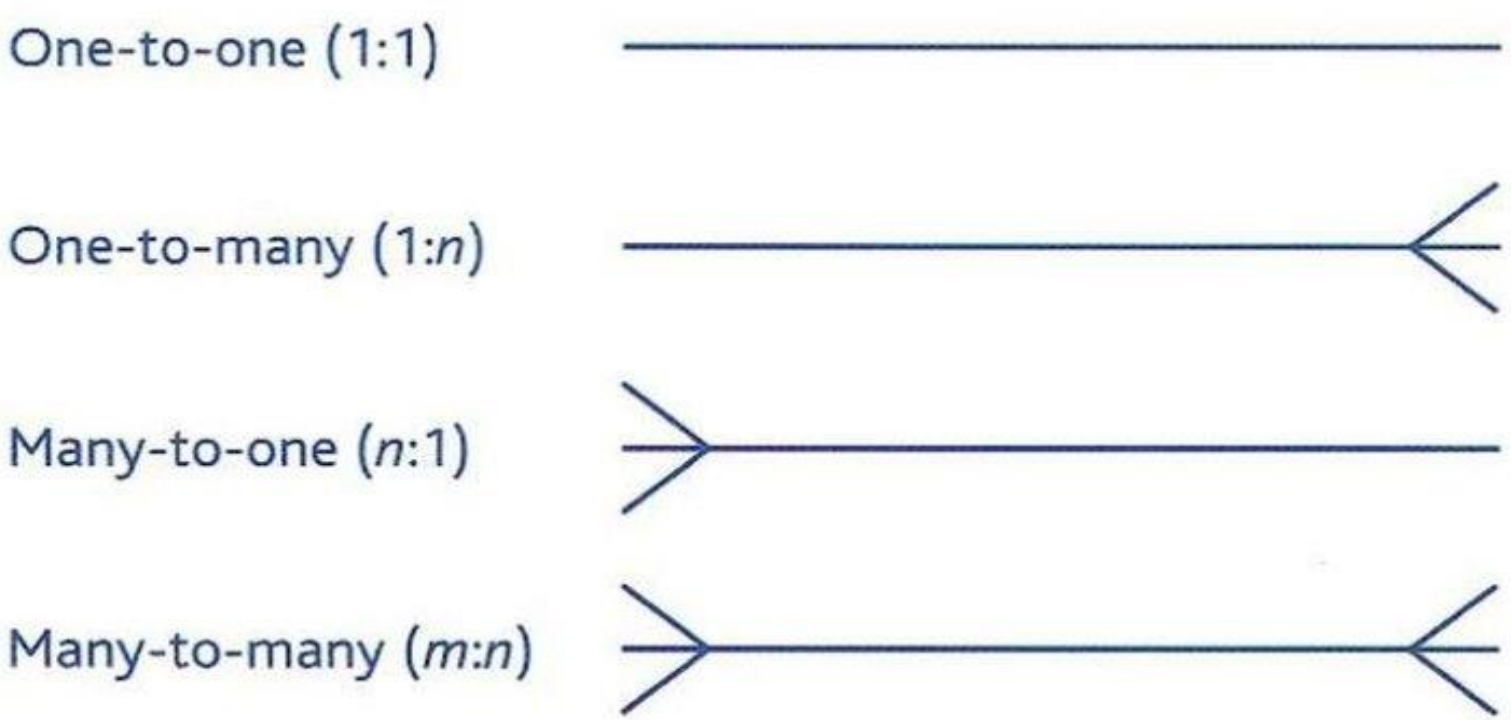


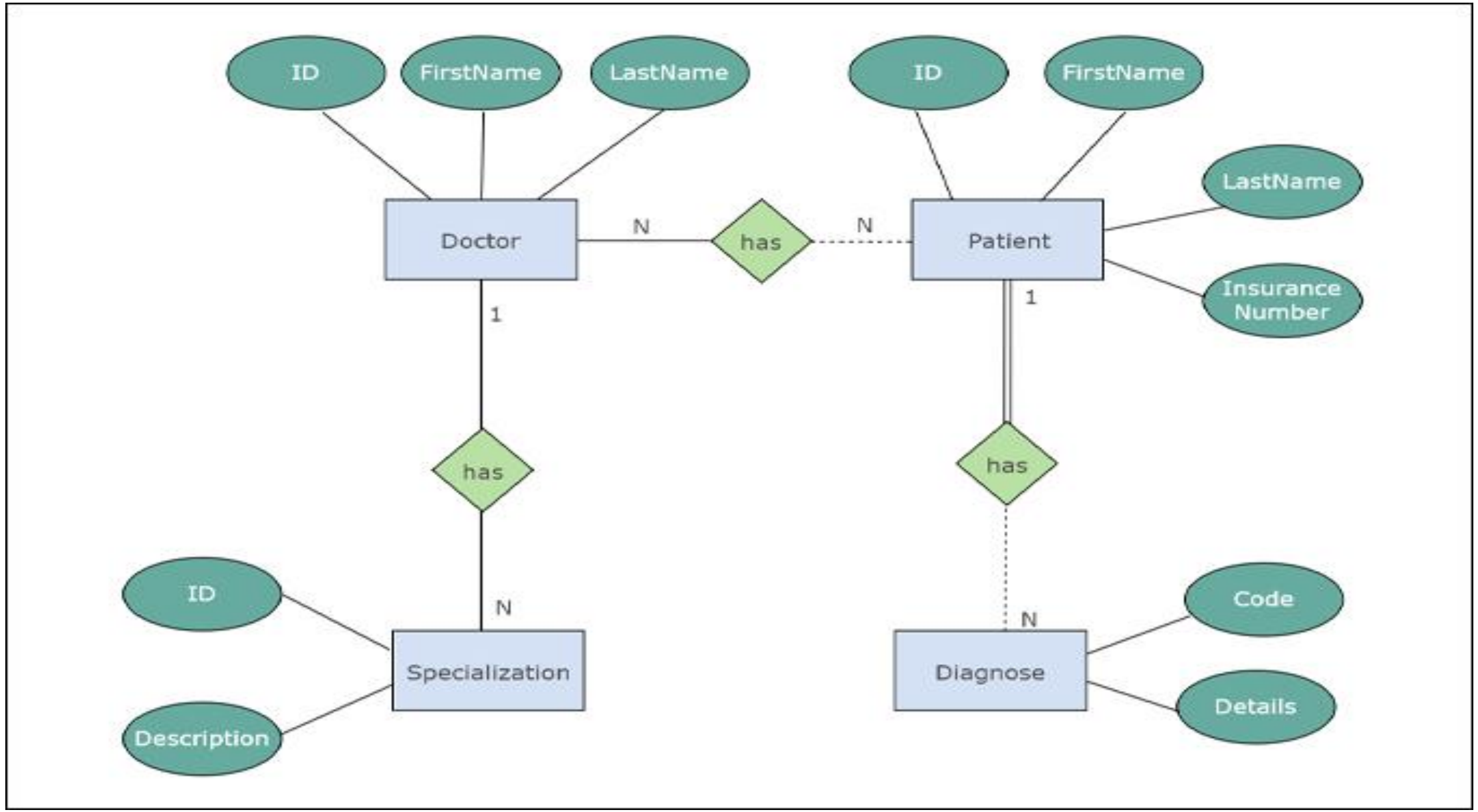
ERD(Entity Relationships Diagram)

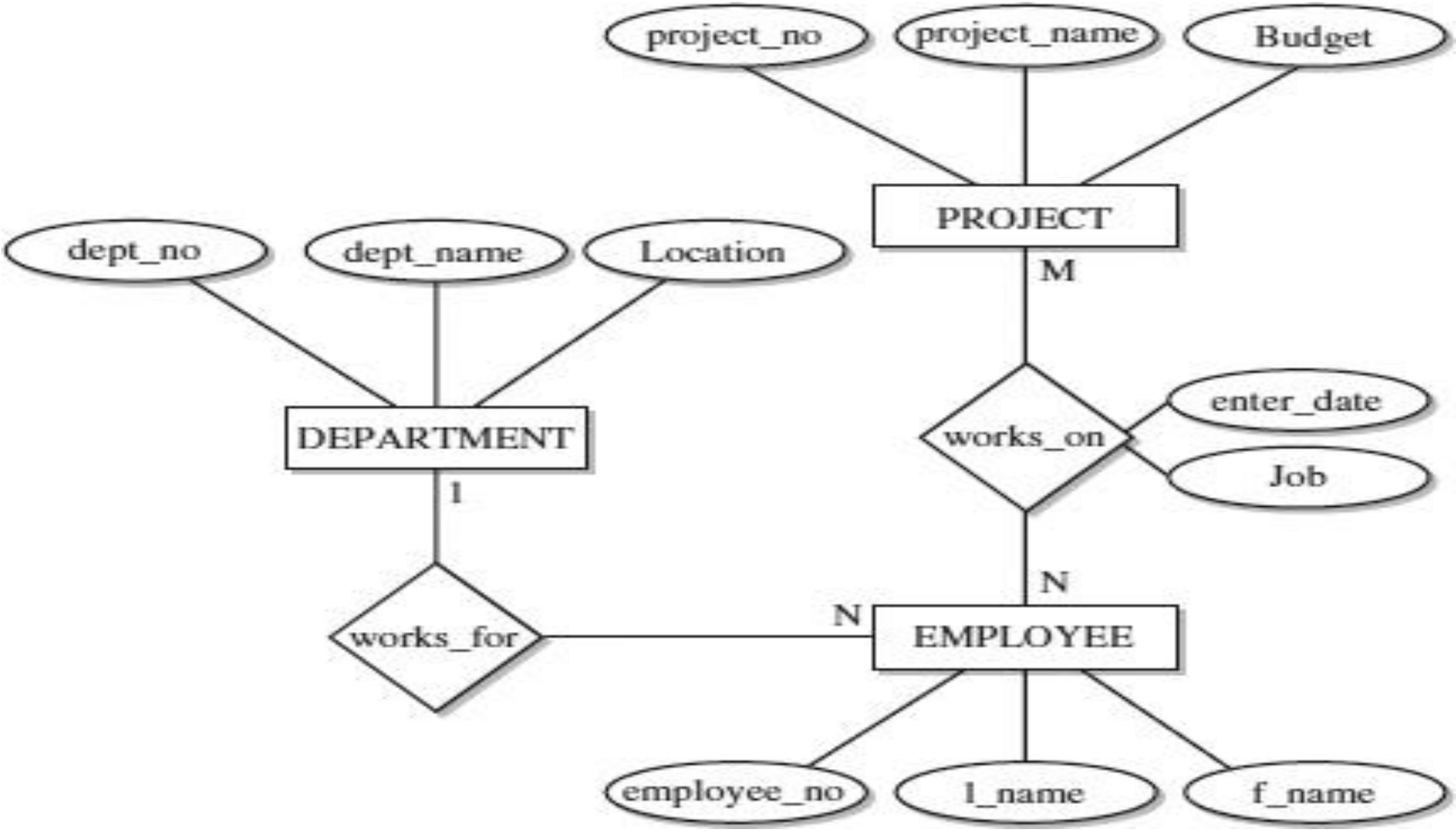
- Elements of the Conceptual Model are represented by diagrams, *Entity-Relationship or ER Diagrams*, that show the meanings and relationships of those elements independent of any particular database systems or implementation details.
- Can also be represented using other modeling tools (such as UML)

Database Relations

There are four possible degrees of relationship.




ID
FirstName
LastName
ID
FirstName
LastName
Doctor
N
has
N
Patient
Insurance Number
1
1
has
has
ID
N
N
Code
Specialization
Diagnose
Description
Details


project_no
project_name
Budget
PROJECT
dept_no
dept_name
Location
M
DEPARTMENT
works_on
enter_date
Job
1
N
works_for
N
EMPLOYEE
employee_no
l_name
f_name

PostgreSQL Database

- PostgreSQL is an object-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)

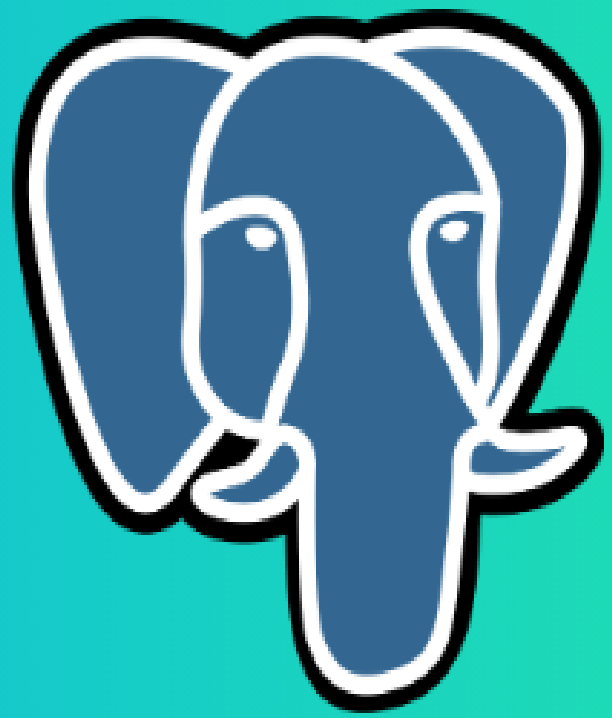
Data Types

- 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

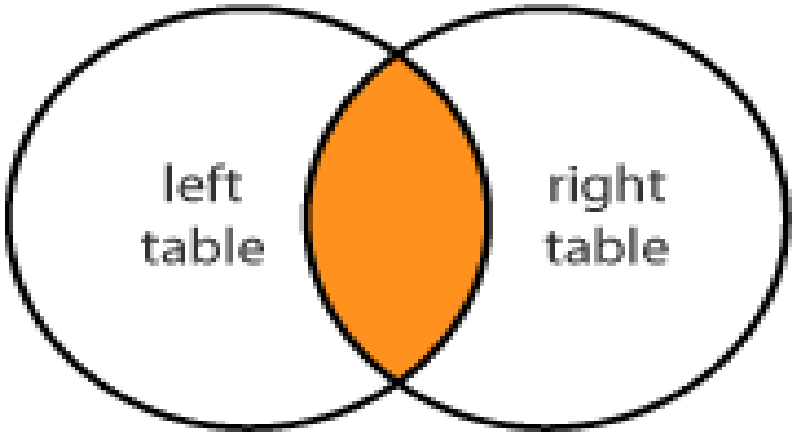


- Array
- Time Data Type
- UUID Data Type
- JSON Data Type
- Interval Data Type

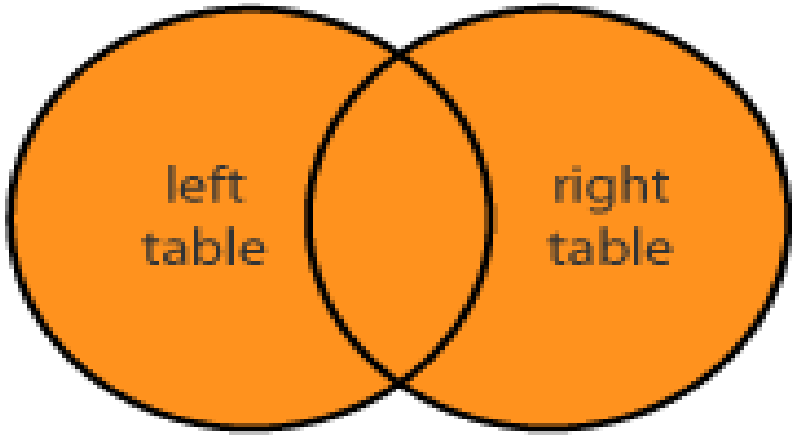
JOINS IN POSTGRESQL

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

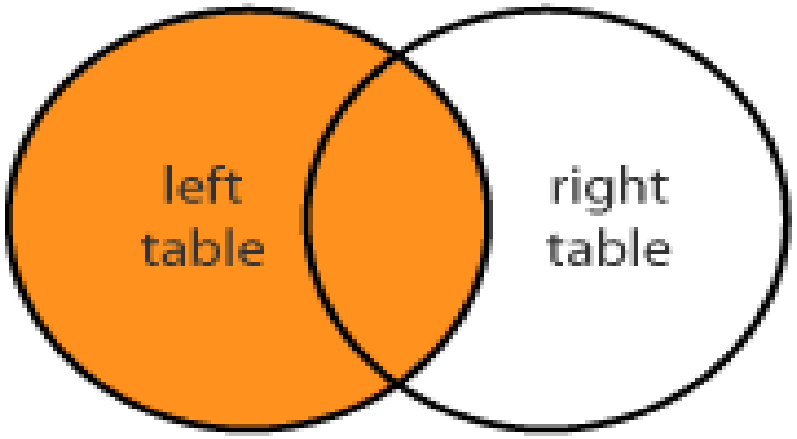
INNER JOIN



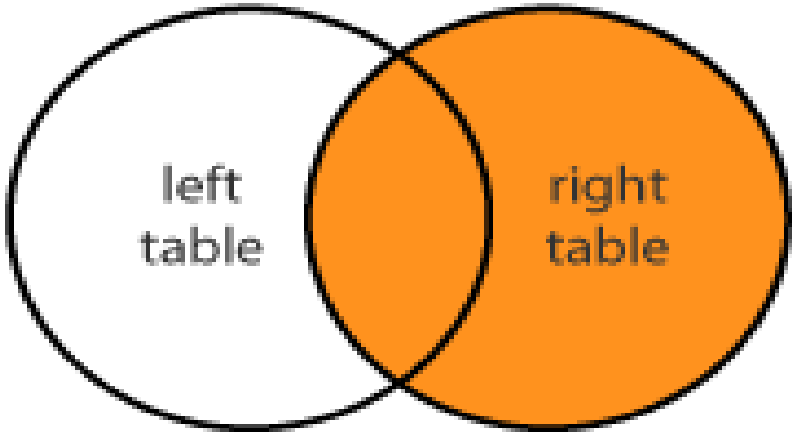
FULL JOIN



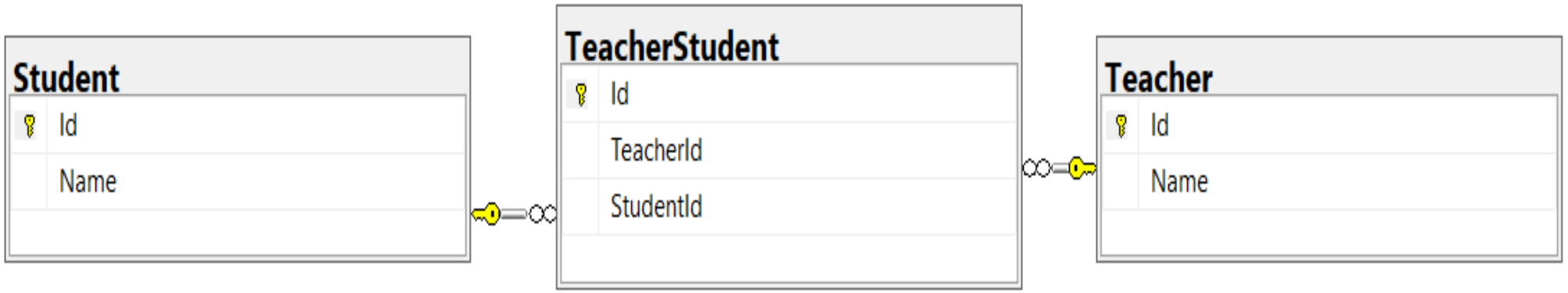
LEFT JOIN



RIGHT JOIN



Primary –Foreign Key(CONSTRAINT)



- Views
- Indexes
- Store Procedure
- Functions
- Triggers


pgAdmin