Data Management Systems
PostgreSQL

Matteo Devigili

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Database

A **database** is a collection of data, typically describing the activities of one or more related organizations. For example, a university database might contain information about the following:

- *Entities* such as students, faculty, courses, and classrooms.
- *Relationships* between entities, such as students' enrollment in courses, faculty teaching courses, and the use of rooms for courses.

Ramakrishnan and Gehrke, 2000, p.3

Relational Database

Intuition

Table: Single Table

Student_id	first_name	last_name	exam_1	grade_1
64768	Nikita	Dawe	SMM010	A
64769	Maksim	Kramer	SMM010	A+
64770	Tyla	McLeod	SMM010	B+

Relational Database

Intuition

Table: Single Table

Student_id	first_name	last_name	exam_1	grade_1	exam_2	grade_2
64768	Nikita	Dawe	SMM010	A	SMM090	B
64769	Maksim	Kramer	SMM010	A+	SMM090	B
64770	Tyla	McLeod	SMM010	B+	SMM090	B+

Relational Database

Intuition

Table: Single Table

Student_id	first_name	last_name	exam_1	grade_1	exam_2	grade_2	exam_3	grade_3
64768	Nikita	Dawe	SMM010	A	SMM090	B	...	...
64769	Maksim	Kramer	SMM010	A+	SMM090	B	...	...
64770	Tyla	McLeod	SMM010	B+	SMM090	B+	...	...

Relational Database

Intuition

Table: Multiple Tables

Table **A**

SMM_Code	Lecturer	Term
SMM010	Daniel Hill	T1
SMM090	Roy Williams	T2
SMM909	Oliver Powell	T3

Table **B**

Student_id	first_name	last_name
64768	Nikita	Dawe
64769	Maksim	Kramer
64770	Tyla	McLeod

Table **C**

SMM_Code	Student_id	Grade
SMM010	64768	A
SMM010	64769	A+
SMM010	64770	B+
SMM090	64768	B
SMM090	64769	B
SMM090	64770	B+

Relational Database

'A *relational database* is a type of database that stores and provides access to data points that are related to one another. Relational databases are based on the relational model, an intuitive, straightforward way of representing data in tables. In a relational database, each row in the table is a record with a unique ID called the key. The columns of the table hold attributes of the data, and each record usually has a value for each attribute, making it easy to establish the relationships among data points'

Source: Oracle

Key Words

1. Database
2. Table —

	clumns	...
rows	...	...
...	...	...

3. Relation —

	car_id	car_name
	1	...
	2	...

	car_id	country
	1	...
	2	...

Key Words

1. Database
2. Table —

	clumns	...
rows	...	...
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3. Relation —

	car_id	car_name
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	car_id	country
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Database Management System

A **database management system**, or DBMS, is software designed to assist in maintaining and utilizing large collections of data.

Ramakrishnan and Gehrke, 2000, p.3

What is PostgreSQL

PostgreSQL

- is an object-relational database management system
- is open source
- supports SQL
- is well-supported by an active community

What is SQL

Structured **Q**uery **L**anguage

- It is a standard language for Relational Databases
- It contains three 'sub-languages':
  1. Data Definition Language: supports the creation, deletion, and modification of definitions for tables and views (command such as CREATE, DROP, ALTER)
  2. Data Manipulation Language: allows users to pose queries and to insert, delete, and modify rows (command such as SELECT, INSERT, UPDATE)
  3. Data Control Language (such as GRANT, REVOKE)

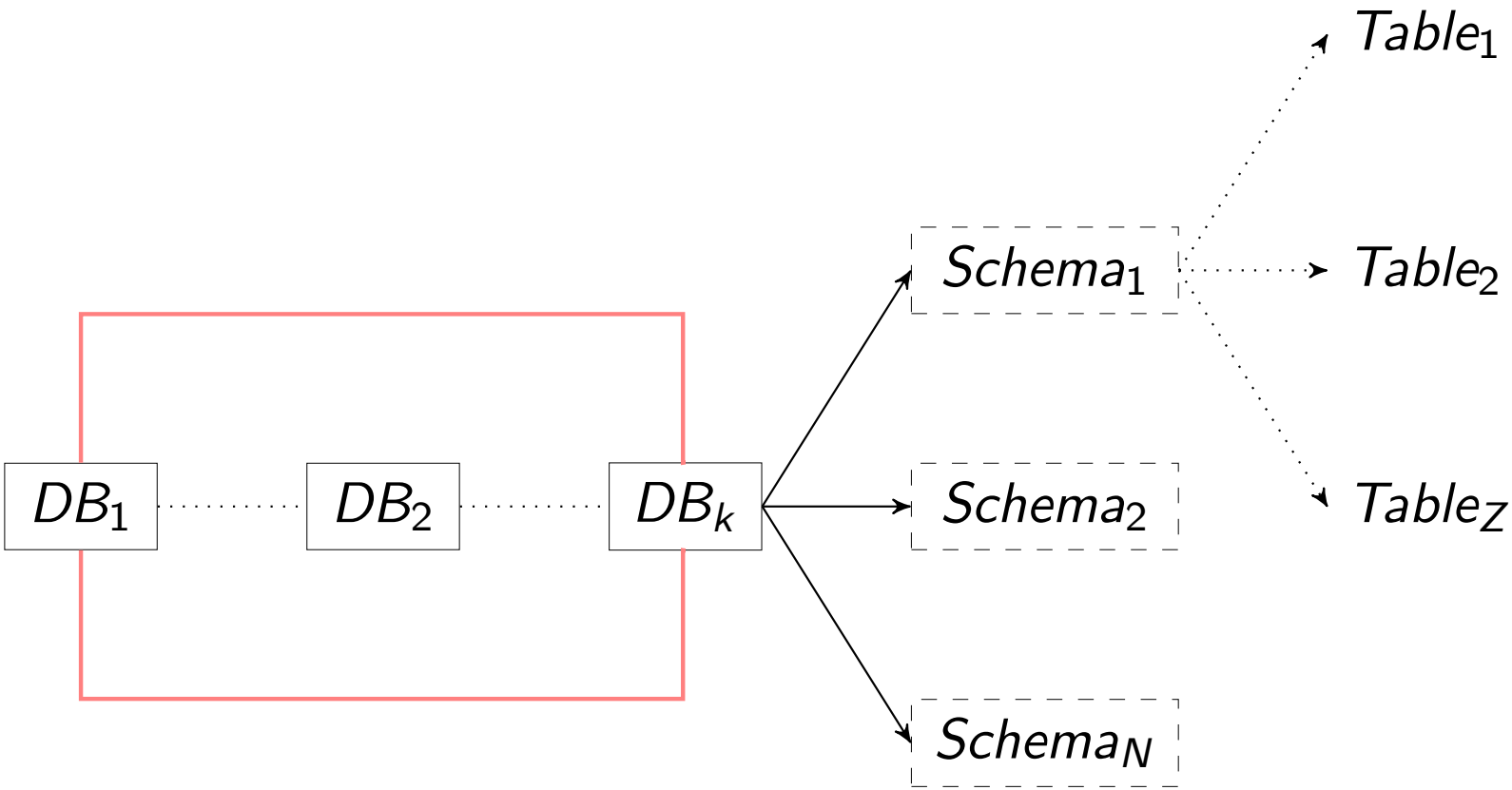
Download & Installation

1. Go to `https://www.postgresql.org/download/`
2. Under **Binary Packages** select your *operating system*
3. For both *MacOS* and *Windows*:
   - ↣ under **Interactive installer by EnterpriseDB** select *Download the installer*
4. In the new web page `https://www.enterprisedb.com/downloads/postgres-postgresql-downloads` select your *OS* in the latest PostgreSQL version
5. Follow the installer instructions

How to interact with Postgre

1. **psql** is a command-line interface
2. **PgAdmin4** is a Graphic User Interface (GUI) always kept in sync by PostgreSQL developers
3. Other administration tools, such as *phpPgAdmin* or *Adminer*, will not be discussed

Postgre basic structure



References

- Obe, Regina O., and Leo S. Hsu. PostgreSQL: Up and Running: a Practical Guide to the Advanced Open Source Database. "O'Reilly Media, Inc.", 2017.
- Oracle, "What is a Relational Database?" `https://www.oracle.com/database/what-is-a-relational-database/`
- PostgreSQL 12.2 Documentation `https://www.postgresql.org/docs/12/index.html`
- Ramakrishnan, Raghu, and Johannes Gehrke. Database management systems. McGraw Hill, 2000