

Introduction to Database

INT205 Database Management System

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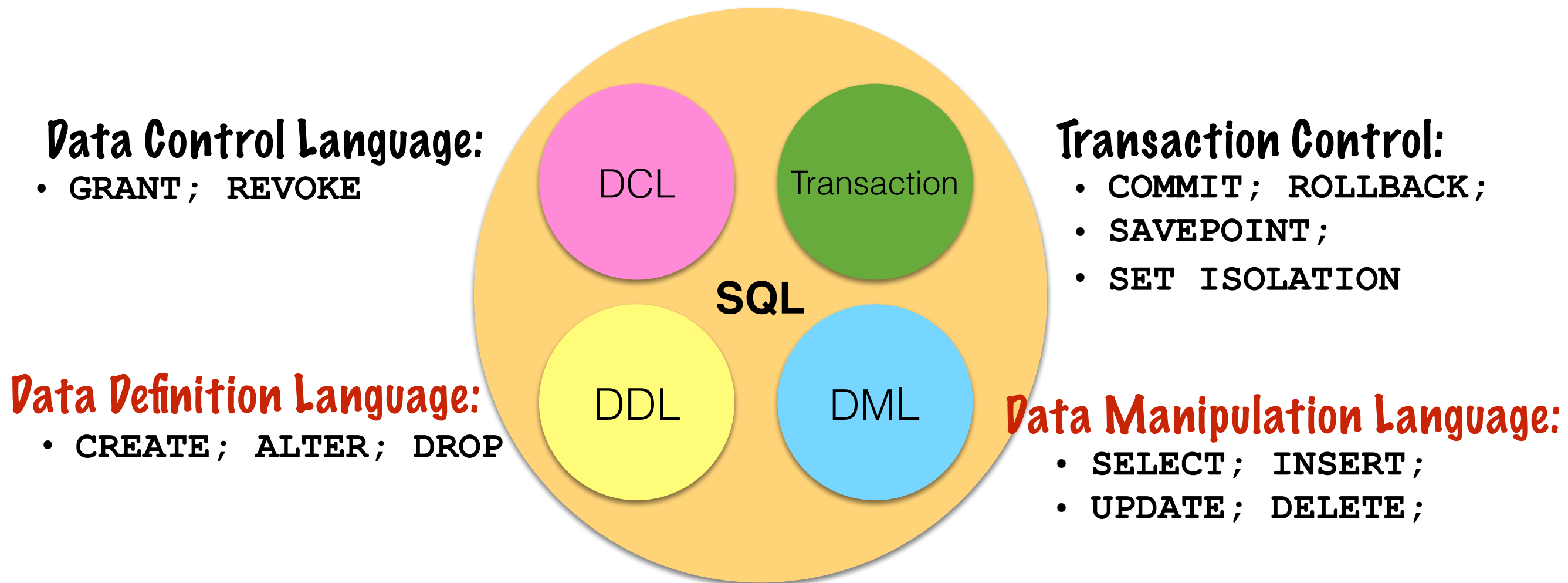
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What we will learn

- * SQL Review
- * Database Concept
- * Components in Database System
- * DataBase Management System (DBMS)
- * Actors in the Database Environment

SQL – Database Language

- * Originally: Structured English Query Language (SEQUEL)
- * Officially: Structured Query Language (**SQL**)=> Query Language



DML Statement

```
SELECT [DISTINCT] { * | column | expression [[AS] alias][, ...] }  
FROM table1 [, table2, table3, ...]  
[WHERE condition(s)]  
[GROUP BY columnList]  
[HAVING aggregate_condition]  
[ORDER BY { column|expr|alias } [ASC | DESC][, ...]] ;
```

- Aggregate functions are COUNT, COUNT DISTINCT, MIN, MAX, SUM, AVG, ...
- SET operations: UNION, UNION ALL, EXCEPT/MINUS, INTERSECT

DML Statement

```
INSERT INTO table_name (column1, column2,..., columnN)
VALUES ( value1, value2,..., valueN);
```

```
UPDATE table_name
SET column1 = value1 [,column2 = value2,...]
[WHERE condition(s)];
```

```
DELETE [FROM] table_name
[WHERE condition(s)];
```

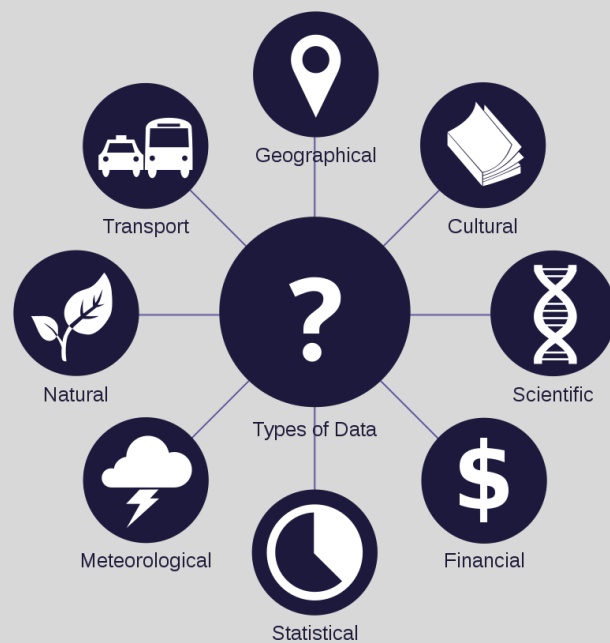
```
COMMIT; / ROLLBACK;
```

Data vs. Information

Data & Information



data



Data is facts collected together for reference or analysis.



Data can be any set of characters text, numbers, pictures, sound, or video that has been gathered.



Data is a raw and unorganized fact that required to be processed to make it meaningful.



Data operations are performed by a computer, transmitted in the form of electrical signals, and stored on magnetic, or optical media.

Information Process



IPO Model

Data & Information



information



Information is a set of data which is processed in a meaningful way.



Information is processed, structured, or presented in a given context to make it meaningful and useful.



Information depend on data and requirements to carried the new meaning.



Information is widely used for decision making.



<https://www.pexels.com/photo/items-organized-on-shelves-3687999/>



Purchases from the supermarket

When you **purchase goods** from your local supermarket, it is likely that a **database is accessed**. The checkout assistant uses a **bar code reader to scan** each of your purchases. This reader is linked to a database application that uses the bar code to **find out the price** of the item from a product database. The application then reduces the number of such items in stock and displays the price on the cash register.

If the reorder level falls below a specified threshold, the database system may **automatically place an order** to obtain more of that item. If a customer telephones *the supermarket*, **an assistant can check whether an item is in stock** by running an application program that determines availability from the database.

A Database

- * What is a database?
- * Why do we need the database?
- * How does the database system work?



Database Definition

“A **shared** collection of logically **related data** (and a description of this data), designed to meet the information needs of an organization.”

“A collection of information that is organized so that it can **easily be accessed, managed and updated.**”

“A collection of **persistent** data that can be **shared and interrelated.**”

Why do we need the database?



Goal of Database System

- * To provide a way to store and retrieve database information conveniently and efficiently.
- * DBMSs must meet the following requirements:
 - * **Data Persistency** : the data must outlast their creators
 - * **System Reliability** : recover correctly and promptly, if crash
 - * **Scalability** : handle large numbers of data and lots of concurrent clients/users

Goal of Database System

- * **Common Characteristics** in Database Systems
 - * Self-Describing Nature
 - * Integrity Constraint Control
 - * Access Authorization
 - * Multiple Views (for different levels/groups of users)

Database Concepts

- * A Database System (DBS) consists of
 - A Database (DB) and
 - A Database Management System (DBMS)
- * A Database is
 - a collection of well-organized and interrelated data
- * A Database Management System is
 - a set of programs to manipulate those data

Simplified Database System Environment

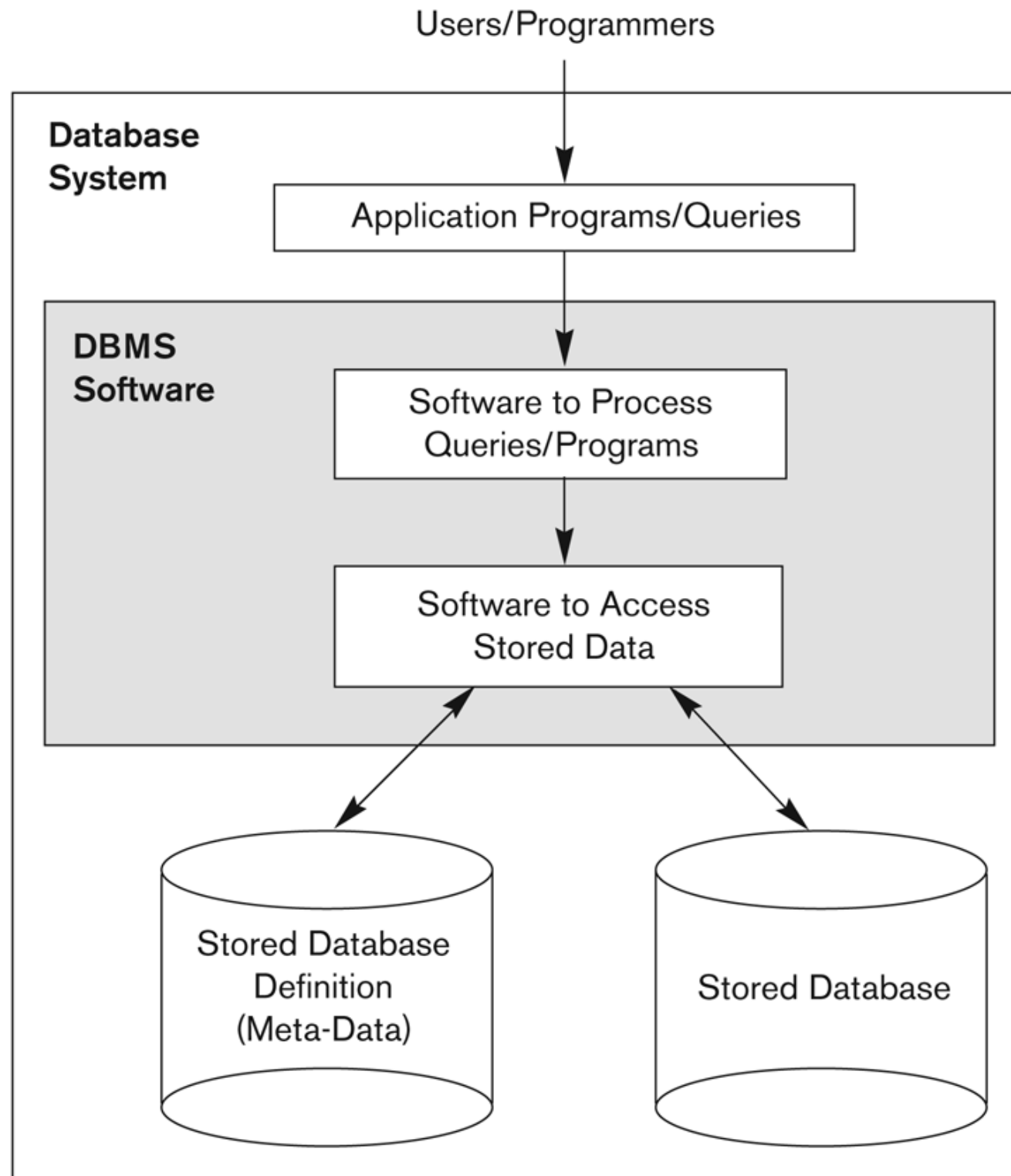
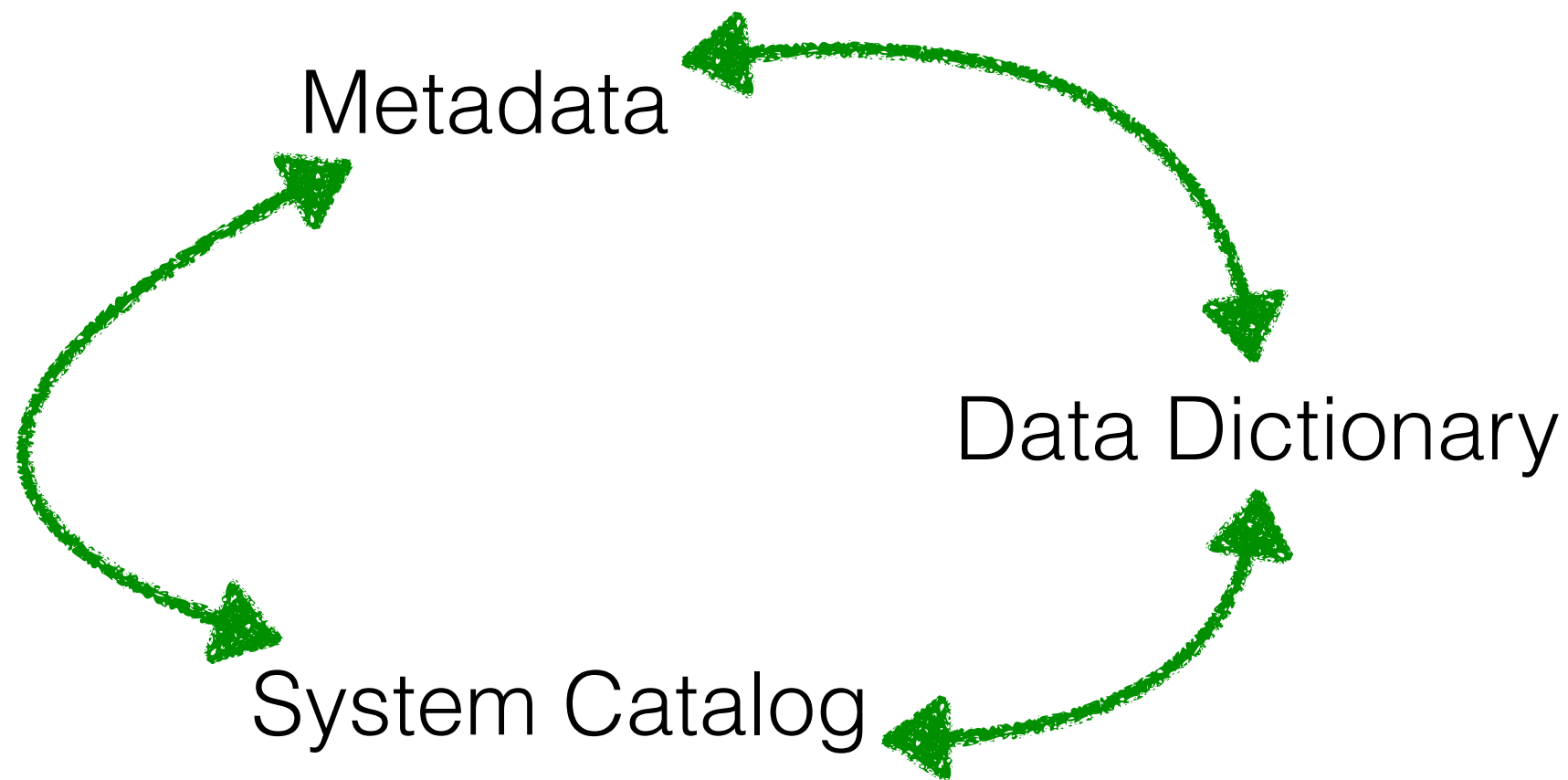


Figure 1.1
A simplified database
system environment.

Meta-Data

“The description of the data”

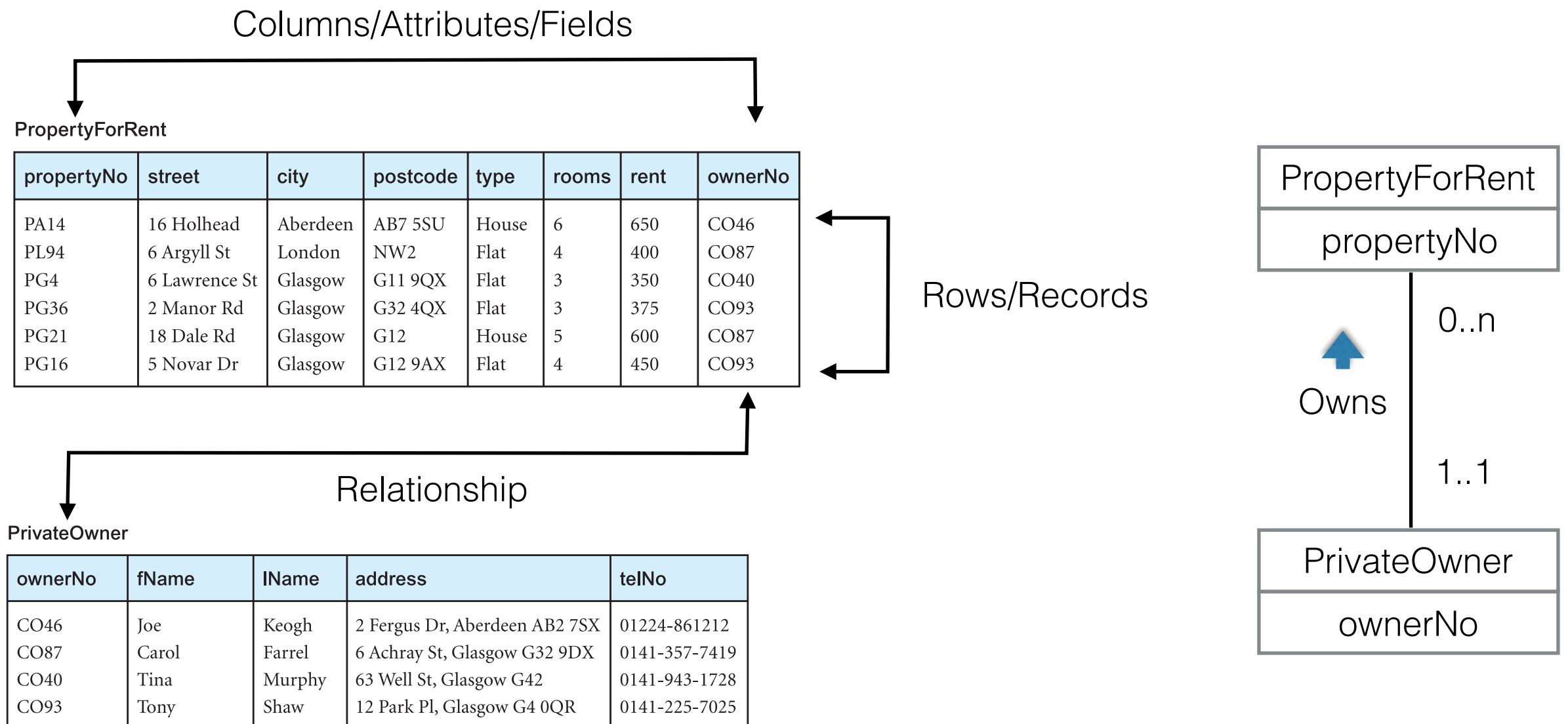


Relational Databases

- * **(Single) DBMS – Database Server**
 - * A DBMS consist of multiple databases
 - * Each Database consists of
 - * a set of **metadata** (information about data structures in the database)
 - * A set of **tables, views, users, triggers, indices, etc.**
 - * Each table consists of multiple **rows**
 - * Each row consists of multiple **columns**
 - * Usually, one data item is equivalent to one row of data in a table

Tables

“A named, two dimensional arrangement of data that consists of a heading part and a body part”



Database Management System (DBMS)

**“A software system that enables users to
define, create, maintain, and control
access to the database”**



DBMS

Relational DBMS

Example of SQL

ORACLE®



PostgreSQL



NoSQL Database

Example of NoSQL



redis



mongoDB



APACHE
HBASE

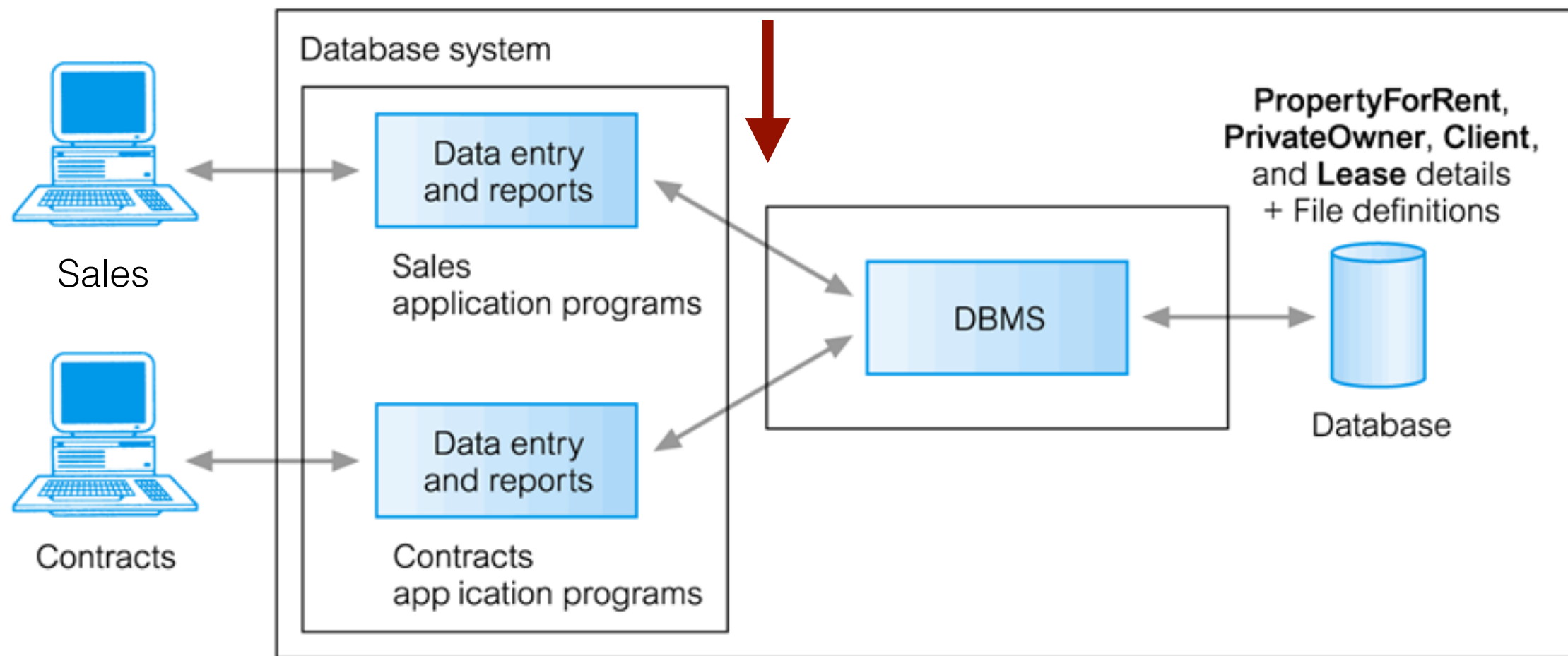


cassandra

edureka!

Sample: Database System

```
SELECT propertyno, type, rooms, rent
FROM propertyforrent
WHERE propertyno = 'PA14'
```



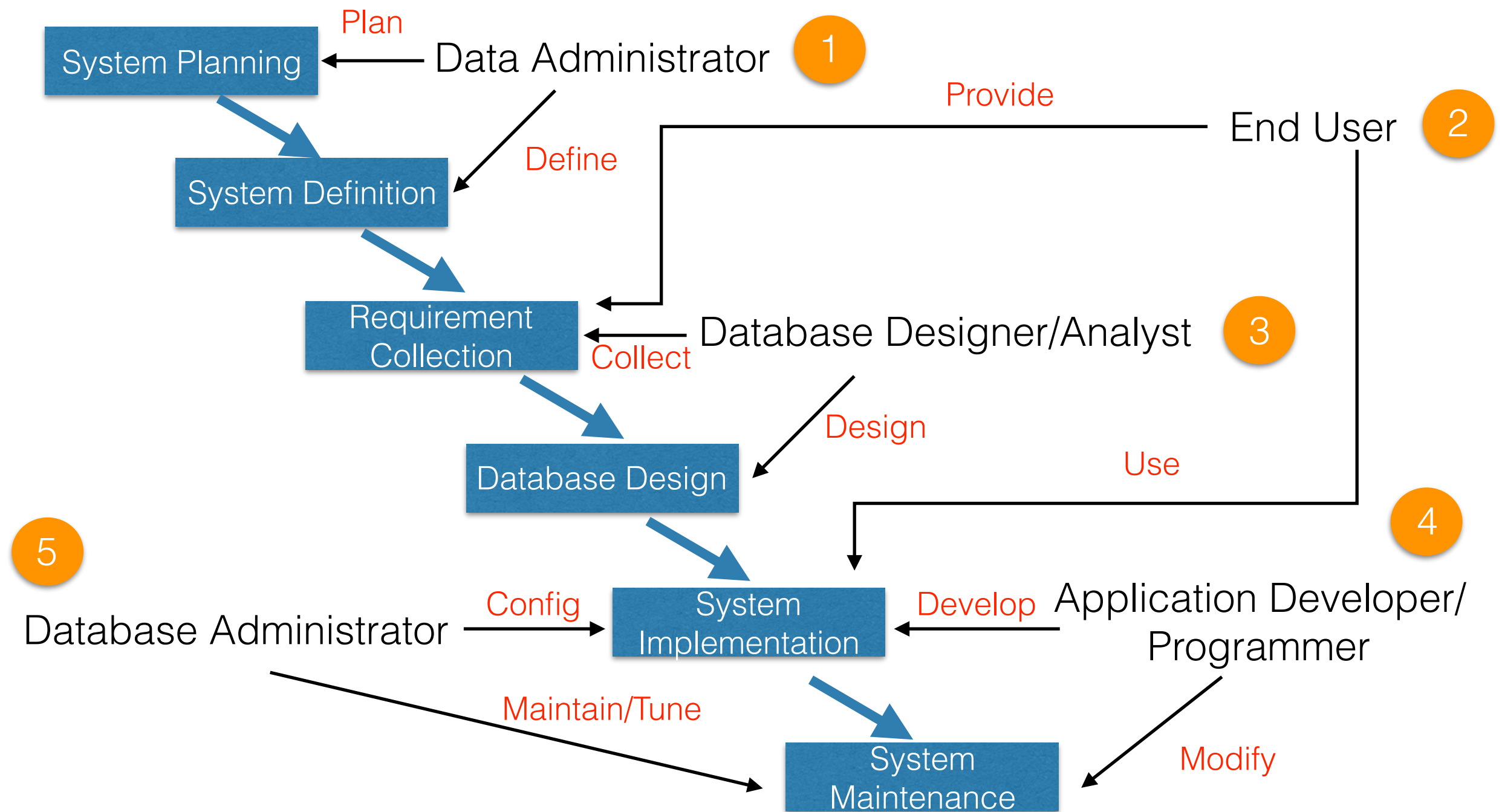
PropertyForRent (propertyNo, street, city, postcode, type, rooms, rent, ownerNo)

PrivateOwner (ownerNo, fName, lName, address, telNo)

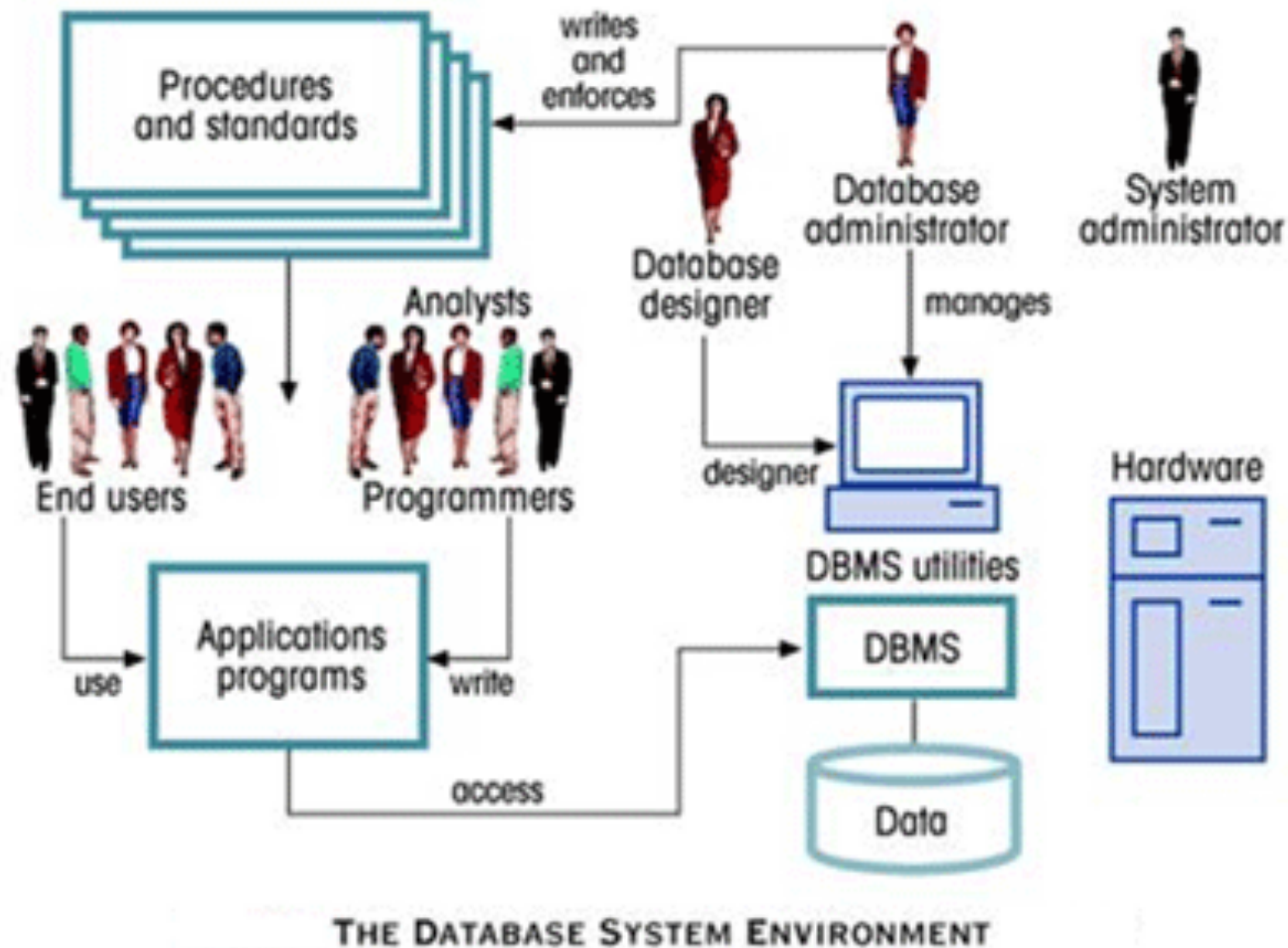
Client (clientNo, fName, lName, address, telNo, prefType, maxRent)

Lease (leaseNo, propertyNo, clientNo, paymentMethod, deposit, paid, rentStart, rentFinish)

Actors in the Database Environment



Database System Environment



Source: <http://dbms-ii.blogspot.com/p/dbms-architecture.html>

References

- * Database Design, Application Development, and Administration, Michael V. Mannio (Third edition), McGrall Hill.
- * Database Systems A Practical Approach to Design, Implementation and Management, Thomas Connolly, Carolyn Begg, (Fifth edition), Addison Wesley.
- * Fundamentals of Database Systems, Elmasri, Navaho (Seventh edition), Pearson.