Data Abstraction

- Database systems are made-up of complex data structures. To ease the user interaction with database, the developers hide internal irrelevant details from users. This process of hiding irrelevant details from user is called data abstraction.

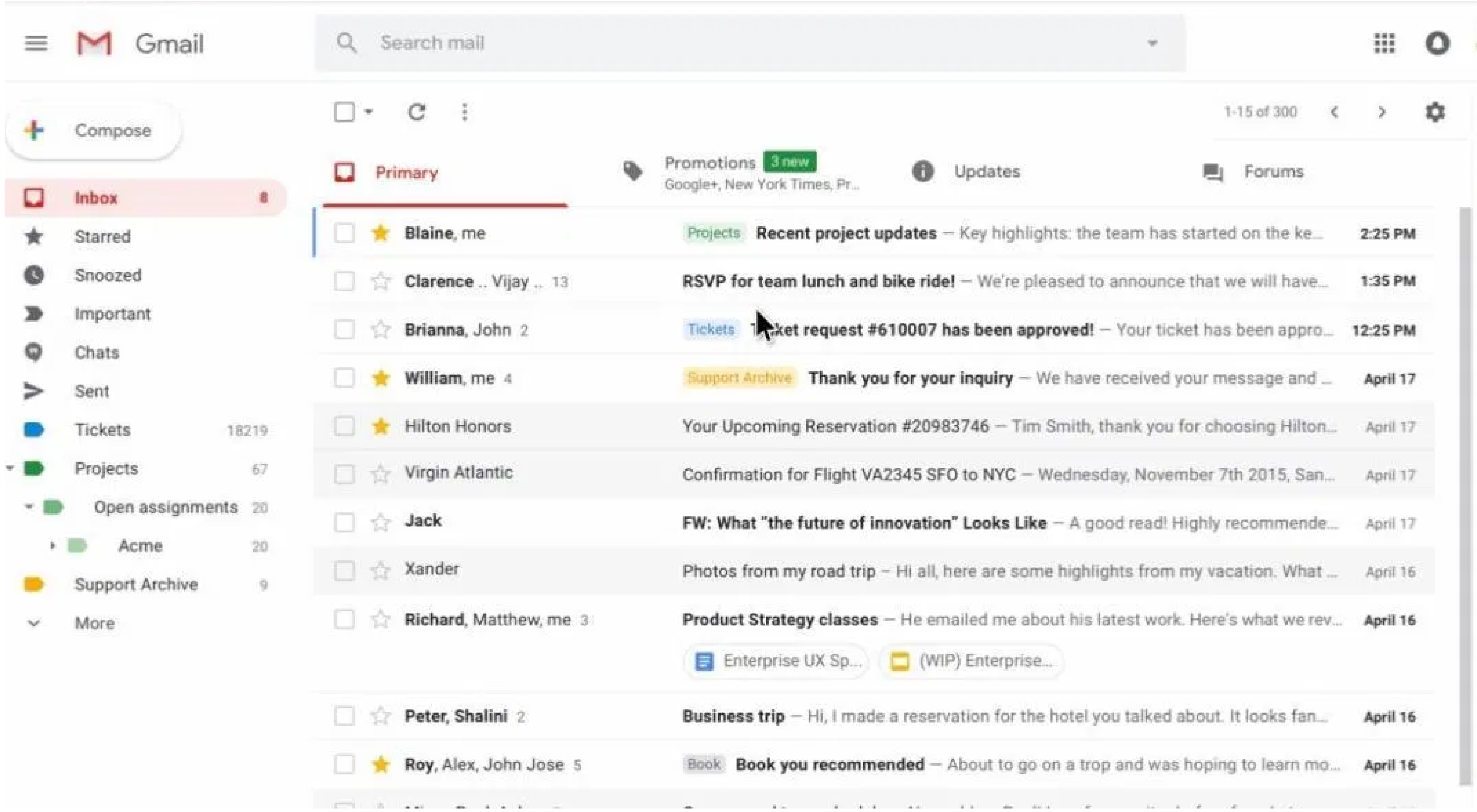
Real-Life Example

Fig: ATM

- A real-life example of Abstraction is ATM Machine.

- We can perform operations on the ATM machine like cash withdrawal but we don't know internal details about ATM.

Example



★ **Blaine**, me	Projects **Recent project updates** – Key highlights: the team has started on the ke...	**2:25 PM**
☆ **Clarence** .. Vijay .. 13	**RSVP for team lunch and bike ride!** – We're pleased to announce that we will have...	**1:35 PM**
☆ **Brianna**, John 2	Tickets **Ticket request #610007 has been approved!** – Your ticket has been appro...	**12:25 PM**
★ **William**, me 4	Support Archive **Thank you for your inquiry** – We have received your message and ...	**April 17**
★ Hilton Honors	Your Upcoming Reservation #20983746 – Tim Smith, thank you for choosing Hilton...	April 17
☆ Virgin Atlantic	Confirmation for Flight VA2345 SFO to NYC – Wednesday, November 7th 2015, San...	April 17
☆ **Jack**	**FW: What "the future of innovation" Looks Like** – A good read! Highly recommende...	April 17
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☆ **Richard**, Matthew, me 3	**Product Strategy classes** – He emailed me about his latest work. Here's what we rev... Enterprise UX Sp... (WIP) Enterprise...	**April 16**
☆ **Peter, Shalini** 2	**Business trip** – Hi, I made a reservation for the hotel you talked about. It looks fan...	**April 16**
★ **Roy**, Alex, John Jose 5	Book **Book you recommended** – About to go on a trop and was hoping to learn mo...	**April 16**

For example in a website like Gmail, we can send and receive emails but we don't know how and where the data are stored and maintained.

Levels of Data Abstraction

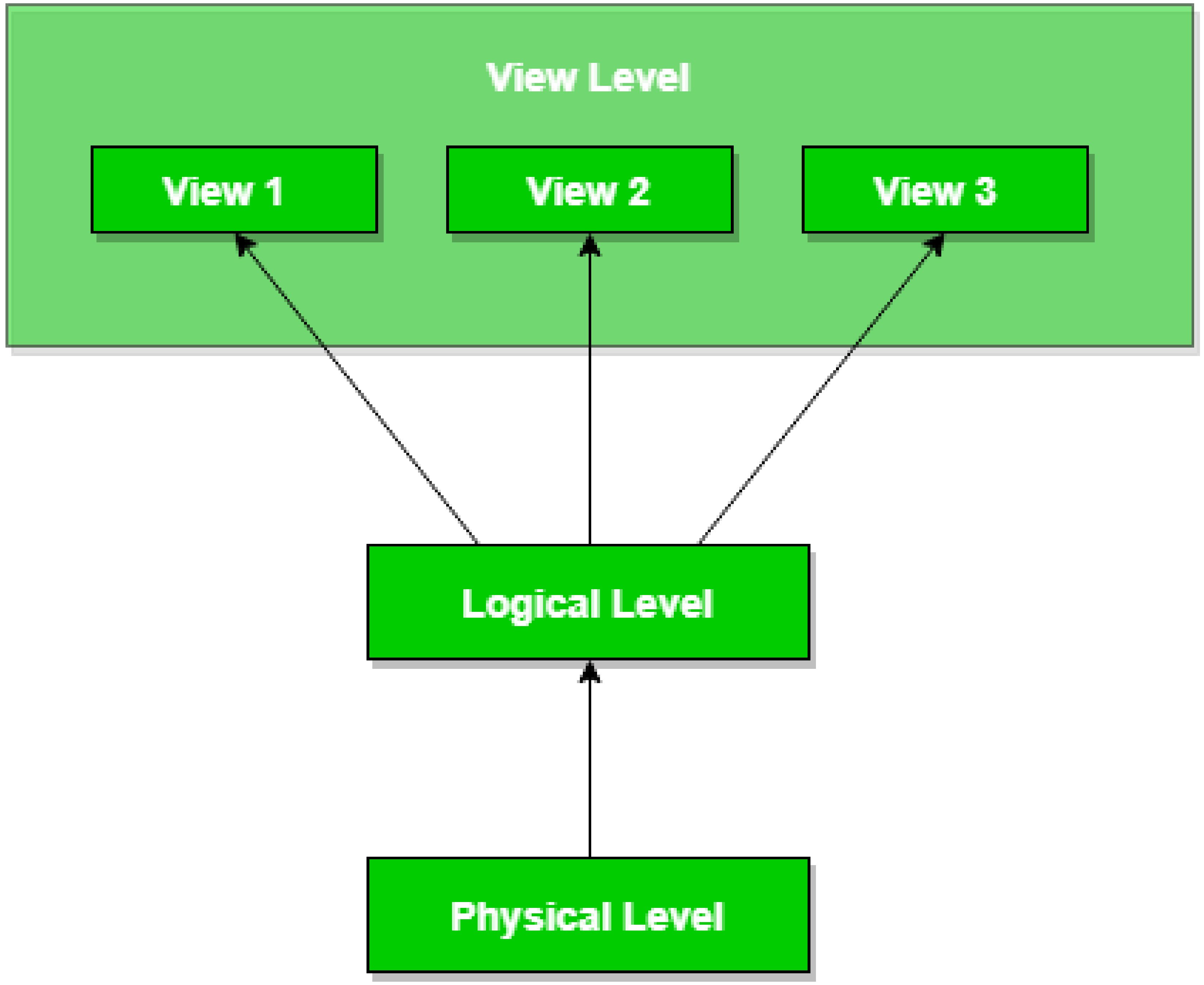

Fig: Levels of Data Abstraction

1. Physical Level

- This is the lowest level of data abstraction that means very less data is kept hidden at this level.
- It describes how data is actually stored in a database.
- You can get the complex data structure details at this level

2. Logical level

- It is the next higher level of abstraction.
- It describes what data is stored in a database.

3. View level

- Highest level of data abstraction.
- It provides interfaces to various users.
- It describes a specific part of the database.
- There can be many views of the same database.

Real-Life Example

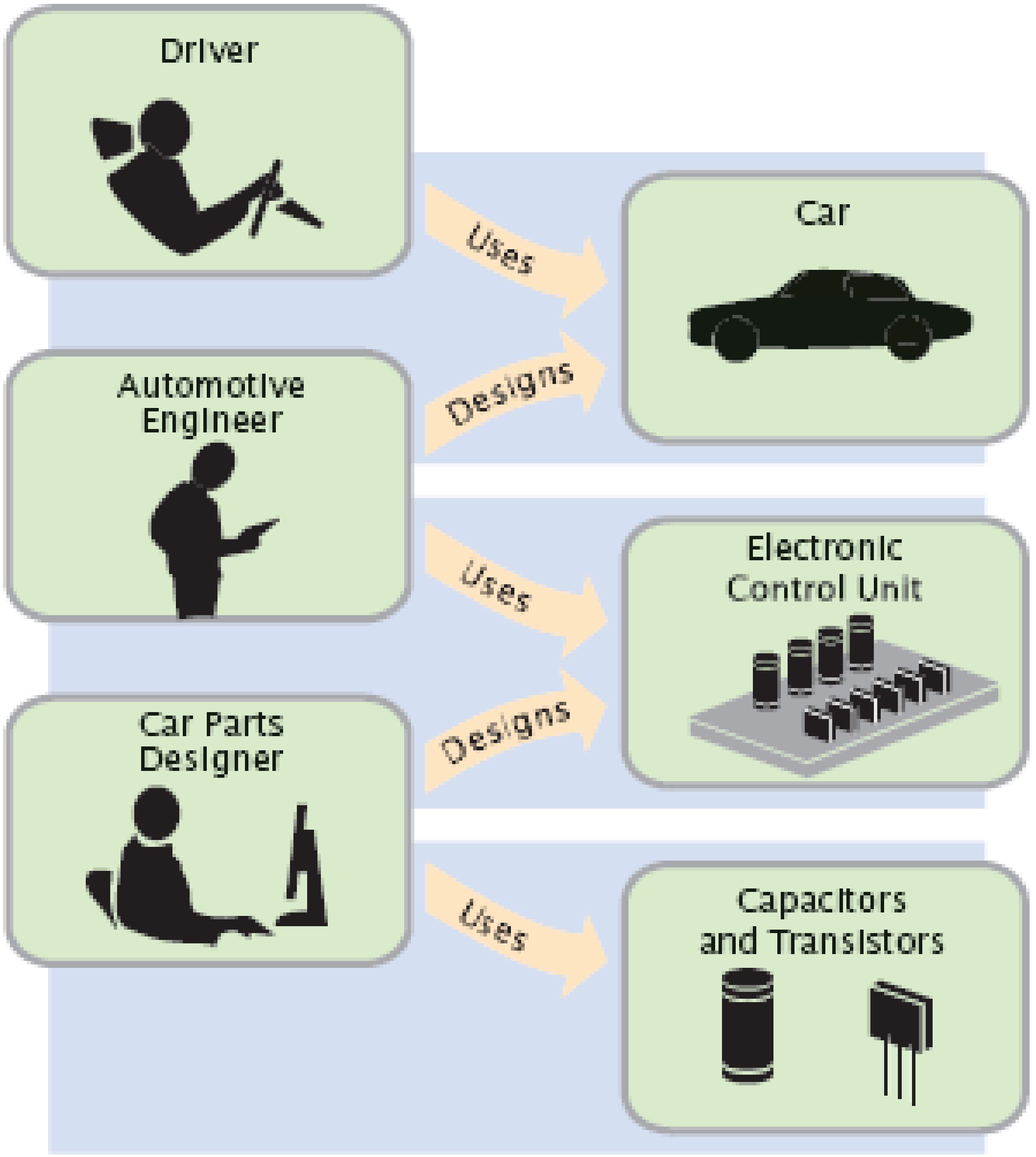

Figure 1
Levels of Abstraction in Automotive Design

Example of levels of abstraction

Let’s say we are storing customer information in a customer table. At the physical level, these records can be described as blocks of storage (bytes, gigabytes, terabytes, etc.) in memory. These details are often hidden from the programmers.

At the logical level, these records can be described as fields and attributes along with their data types, their relationship with each other can be logically implemented. The programmers generally work at this level because they are aware of such things about database systems.

At the view level, users just interact with the system with the help of GUI and enter the details at the screen, they are not aware of how the data is stored and what data is stored; such details are hidden from them.

Data Independence

- Data independence refers characteristic of being able to modify the schema at one level of the database system without altering the schema at the next higher level.

Why Data Independence?

- It is very important that the changes in one level should not affect the data at other levels of the database. This would save the time and cost required while changing the database.

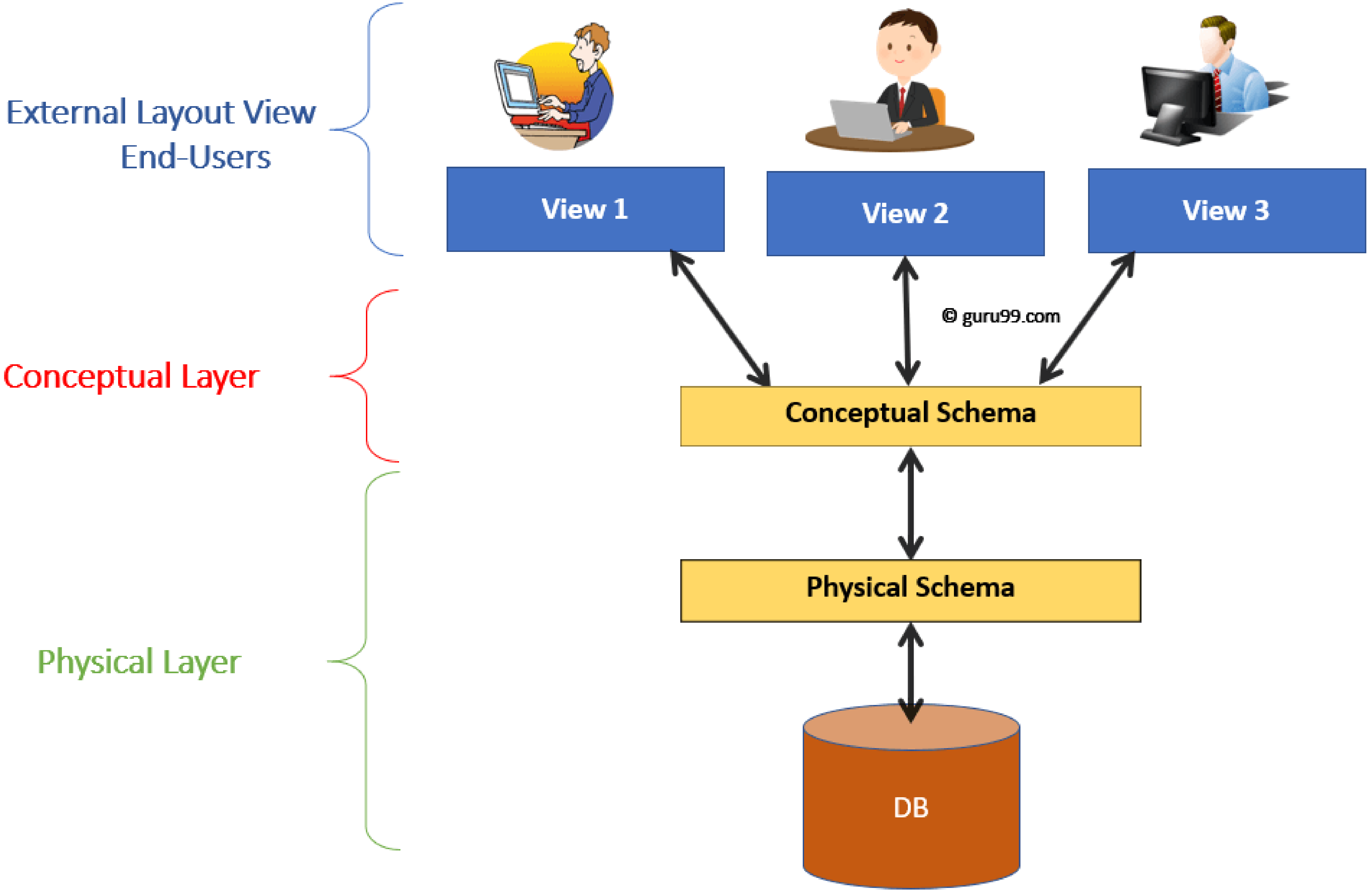

Fig: Levels of DBMS Architecture Diagram

Types of Data Independence

1. Logical Data Independence

- Logical data independence refers characteristic of being able to change the conceptual schema without having to change the external schema.
- Logical data independence is used to separate the external level from the conceptual view.
- If we do any changes in the conceptual view of the data, then the user view of the data would not be affected.
- Logical data independence occurs at the user interface level.

2. Physical Data Independence

- Physical data independence can be defined as the capacity to change the internal schema without having to change the conceptual schema.
- If we do any changes in the storage size of the database system server, then the Conceptual structure of the database will not be affected.
- Physical data independence is used to separate conceptual levels from the internal levels.
- Physical data independence occurs at the logical interface level.

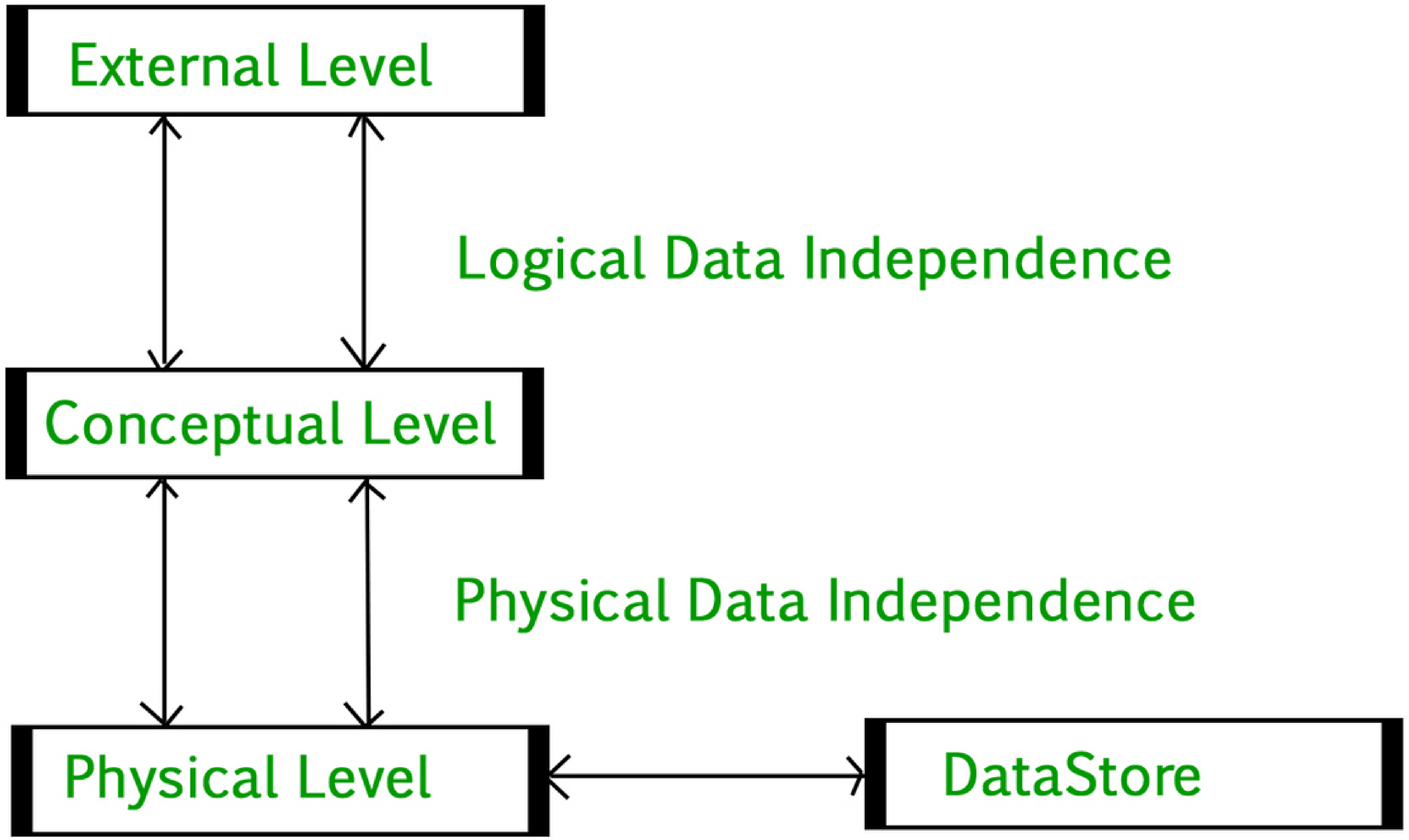

Fig:Types of Data Independence