

1) A database schema is similar to the layout or plan of the database, while the state is composed of the actual data of the database. The schema doesn't change much, and the state changes all the time as the DB is used and the data is changed

2) There are multiple types of schema: Internal, Conceptual, and External. The mapping between each of these are needed in order to process requests and information between the levels. For example, a client might want to upload data. They would contact the server and the server would access the database to fulfill the request.

3) Logical data independence is being able to change the conceptual schema without needing to change the external schema, while physical data independence is being able to change the internal schema without changing the conceptual schema. Physical data independence is more difficult because if you change where and what data is stored, the conceptual schema is more likely to have to change.

4) Amazon Shopping DB

- A. Distributed, concurrent.
- B. Add item to cart
- C. User can only buy an item if it is available.

5) There are **High level languages** which can be used in a stand alone way. There are also **Low level languages** that are embedded in other languages. High level languages can do bulk operations while low level language have to manually loop through the entries or data.

6) Amazon DB example

USERS

U_name	U_id	Cur_balance	Is_admin
Joe Smith	12-5C-84-A8	0.00	1
Nick Tanner	37-A5-8B-6C	12.56	0
Alice Grace	2C-B7-02-30	25.00	0

ITEMS

I_name	ASIN	Price	Num_vailable	Seller_id
USB Charger	B19TNBFHJR	7.45	105	37-A5-8B-6C
Fidget Spinner	A094NJCHLO	9.99	56	2C-60-9B-58
Office chair	JGUR84Y3I9	119.99	26	58-48-00-AF

ORDERS

U_id	ASIN	Destination	Cur_locaiton
12-5C-84-A8	B19TNBFHJR	155 Main st	USA, Alabama, huntsville
37-A5-8B-6C	A094NJCHLO	1001 Long dr	USA, Colorado, Denver
2C-B7-02-30	JGUR84Y3I9	258 UTA blvd	Japan, Kanto, Tokyo

Some more information that could be added would be the category of the item, more exact location data for orders, and the current contents of a users cart. Some constraints that could be added would be that ASIN, and U_id are unique for each item and user respectively. Because amazon handles concurrent requests, the Num_available in ITEMS could and should be constrained to not be less than 0.

In this sample database, both users who buy items and sell items are the same. Each item has a seller id that matches with a user. Sellers would be able to view the items that they are selling and would be able to change the information of the item. Buyers would not have access to change this data because they do not own the entry for the item.

If the Is_admin field is true then the user would have the ability to change other users, and items data. This access would probably be constrained so that the DB doesn't go into an invalid state.

7)

STUDENT: Student_number is unique

COURSE: Course_number is unique (possibly Course_name as well)

SECTION: Section_identifier is unique