

SQL Database Environment

2.5

- 1.) It needs to be able to allow multiple users being able to access the database at once.
- 2.) It needs to have concurrency control to address conflicts when multiple users are trying to access or change the same data at the same time to ensure data integrity.
- 3.) It needs a way to store data from multiple users.
- 4.) It needs to make sure that there are security measures, so each user only has access and can only manipulate data they are allowed to.
- 5.) It needs a reliable way of authenticating users.
- 6.) It needs a way to backup and recover lost or changed data, in case something goes wrong or needs to be reversed.

2.6

A standalone PC DBMS won't need a way to allow multiple user access or concurrency control, since only one instance of the database is running at a time anyways.

2.7

A system catalog is crucial to the function of a DBMS. It stores metadata like names, attributes, data types, relations between different databases / database entries and so on. It therefore fulfills the role of a centralized source dictionary. A system catalog furthermore simplifies communication by defining the specific meaning of what is stored, allows to apply security measures, guarantees data integrity and can record and identify user access / changes.

2.8

DML preprocessor: The DML preprocessor is responsible for transforming DML commands from the application programs into object code.

Program object code: No data found within script

Query processor: The query processor is responsible for executing database queries. It receives instructions from the user for example in form of a SQL statement.

Database manager: The database manager consists of a set of user-submitted application programs and queries, that provide basic functionalities to create and maintain a database. Its components are an authorization control, integrity checker, command processor, query optimizer, transaction manager, scheduler, buffer manager and recovery manager.

DDL compiler: The DDL compiler is responsible for processing DDL commands and breaks it down into machine code. Also accountable of storing metadata.

Dictionary manager: Controls and manages the system catalog

The database manager its component data manager are directly or indirectly (by interacting with the file manager) responsible for fulfilling all of the in 2.5 described facilities. Assumptions:

- 1.) Scheduler and buffer manager
- 2.) Integrity checker
- 3.) Scheduler and buffer manager
- 4.) Authorization control
- 5.) Authorization control
- 6.) Recovery manager

2.9

Client-server architecture: Client-server architecture means that a computer (client) is directly connected to a server (database). Most tasks like displaying information and processing power are done by client computer, the server serves the purpose of server-side validating and grants access to the database and its data. The benefits are that the system is less reliant on a functional network infrastructure, requires little bandwidth and only requires to be defined and validated in one place.

Other architectures are the three-tier architecture, which outsources most of the processing power of the client to a centralized application server. In comparison, this makes it a cheaper because it requires less powerful hardware and therefor cheaper hardware on the client's side. The client needs only to be able to establish a connection and display the dedicated content, like a web browser.

Another approach of database architecture is a file-server environment. This in general is a local area network, where the data is stored on a centralized server, although its nevertheless necessary to run the DMBS on each workstation independently. This leads to high bandwidth and requires more complex concurrency, recovery and integrity control, due to it being possible that multiple DMBSs are accessing the same file.

Teleprocessing architecture, that uses a central processing unit like a mainframe and terminals, that itself are unable to function on their own, are outdated and see fewer and fewer use nowadays.

2.10

The two-tier client-server approach compared to the three-tier client-server approach requires a much more potent hardware on the client's side, whereas the latter centralizes this hardware to an application server. This makes the three-tier client-server approach cheaper, easier to maintain and replace, due to modularity, but also requires a more complex network infrastructure.

The three-tier client-server model is very similar to a web browser, because web browser serves as an interface only, whereas the web server is performing most of the actual processing.