Desirable database features

Part 2

Desirable database features. Easy error connection

Even a perfectly designed database cannot ensure perfect validity. How can the database know that a customer's name is supposed to be spelled Pheidaux not Fido as typed by the user?

Correcting a single error in a notebook is fairly easy. Just cross out the wrong value and write in the new one.

Desirable database features. Easy error connection

Correcting systematic errors in a notebook is a lot harder. Suppose you hire a summer intern to go door-to-door selling household products and he writes up a lot of orders for ''Duck Tape'' not realizing that the actual product is ''Duct Tape.'' Fixing all of the mistakes could be tedious and time-consuming.

Desirable database features. Easy error connection

In a computerized database, this sort of correction is trivial. A simple database command can update every occurrence of the product name ''Duck Tape'' throughout the whole system.

Desirable database features. Speed

An important aspect of all of the CRUD components is speed. A well-designed database can create, read, update, and delete records quickly.

Desirable database features. Speed

There's no denying that a computerized database is a lot faster than a notebook or a filing cabinet. Instead of processing dozens of records per hour, a computerized database can process dozens or hundreds per second.

Desirable database features. Speed

Good design plays a critical role in database efficiency. A poorly organized database may still be faster than the paper equivalent but it will be a lot slower than a well-designed database.

Desirable database features. Atomic transactions

Recall that an atomic transaction is a possibly complex series of actions that is considered as a single operation by those not involved directly in performing the transaction. If you transfer $100 from Alice's account to Bob's account, ...

Desirable database features. Atomic transactions

no one else can see the database while it is in an intermediate state where the money has been removed from Alice's account and not yet added to Bob's.

The transaction either happens completely or none of its pieces happen — it cannot happen halfway.

Desirable database features. Atomic transactions

Atomic transactions are important for maintaining consistency and validity, and are thus important for the R and U parts of CRUD.

Physical data containers such as notebooks support atomic transactions because typically only one person at a time can use them.

Desirable database features. Atomic transactions

These databases also automatically rollback any transaction that is open if the database halts unexpectedly.

Desirable database features. ACID

This section provides some more detail about the transactions described in the previous section rather than discussing a new feature of physical data containers and computerized databases.

Desirable database features. ACID

ACID is an acronym describing four features that an effective transaction system should provide. ACID stands for Atomicity, Consistency, Isolation, and Durability.

Atomicity means transactions are atomic. The operations in a transaction either all happen or none of them happen.

Desirable database features. ACID

Consistency means the transaction ensures that the database is in a consistent state before and after the transaction. In other words, if the operations within the transaction would violate the database's rules, the transaction is rolled back.

Desirable database features. ACID

Isolation means the transaction isolates the details of the transaction from everyone except the person making the transaction.

Desirable database features. ACID

Durability means that once a transaction is committed, it will not disappear later. If the power fails, when the database restarts, the effects of this transaction will still be there.

Desirable database features. Persistence backups

The data must be persistent. It shouldn't change or disappear by itself. If you can't trust the database to keep the data safe, the database is pretty much worthless.

Desirable database features. Persistence backups

Database products do their best to keep the data safe, and in normal operation you don't need to do much to get the benefit of data persistence.

Desirable database features. Low cost & extensibility

Ideally the database should be easy to obtain and install, inexpensive, and easily extensible. If you discover that you need to process a lot more data per day than you had expected, you should be able to somehow increase the database's capacity.

Desirable database features. Low cost & extensibility

Although some database products are quite expensive, most of them have reasonable upgrade paths so you can buy the least expensive license that will handle your needs, at least in the beginning

Desirable database features. Easy of use

Notebooks and filing cabinets have simple user interfaces so almost anyone can use them effectively.

Desirable database features. Easy of use

A computer application's user interface determines how usable it is by average users. User interface design is not part of database design, so you may wonder why ease of use is mentioned here.

Desirable database features. Portability

A computerized database allows for a portability that is even more powerful than the portability of a notebook. It allows you to access the data from anywhere you have access to the Web without actually moving the physical database.

Desirable database features. Portability

You can access the database from just about anywhere while the data itself remains safely at home, far from the dangers of pickpockets, being dropped in a puddle, and getting forgotten on the bus.

Desirable database features. Security

A notebook is relatively easy to lose or steal but a highly portable database can be even easier to compromise. If you can access your database from all over the world, then so can cyber-banditos and other ne'er-do-wells.

Desirable database features. Security

Locking down your database is mostly a security issue that you should address by using your network's and database's security tools. However, there are some design techniques that you can use to make securing the database easier.

Desirable database features. Security

If you separate the data into categories that different types of users need to manipulate, you can grant different levels of permission to the different kinds of users.

Desirable database features. Security

Yet another novel aspect to database security is the fact that users can access the database remotely without actually holding a copy of the database locally.

Desirable database features. Security

This is more an application architecture issue than a database design issue (don't store the data locally on laptops) but using a database design that restricts users' access to what they really need to know can help.

Desirable database features. Sharing

It's not easy to share a notebook or envelope full of business cards among a lot of people. No two people can really use a notebook at the same time and there's some overhead in shipping the notebook back and forth among users.

Desirable database features. Sharing

Taking time to walk across the room a dozen times a day would be annoying; express mailing a notebook across the country every day would be just plain silly.

Desirable database features. Sharing

Modern networks can let hundreds or even thousands of users access the same database at the same time from locations scattered across the globe. Though this is largely an exercise in networking and the tools provided by a particular database product, some design issues come into play.

Desirable database features. Ability to Perform Complex Calculations

Compared to the human brain, computers are idiots. It takes seriously powerful hardware and frighteningly sophisticated algorithms to perform tasks that you take for granted such as recognizing faces, speaker-independent speech recognition, and handwriting recognition

Desirable database features. Ability to Perform Complex Calculations

The human brain is also self-programming, so it can learn new tasks flexibly and relatively quickly.

When it comes to balancing checkbooks, searching for accounts with balances less than zero, and performing a host of other number-crunching tasks, the computer is much faster and

Desirable database features. Ability to Perform Complex Calculations

The computer is naturally faster at these sorts of calculations, but even its blazing speed won't help you if your database is poorly designed. A good design can make the difference between finding the data you need in seconds rather than hours, days, or not at all.