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Database Management and Optimizing

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Abstract: Cloud database management system is a distributed database that delivers computing as a service instead of a product. It is the sharing of resources, software, and information between multiple devices over a network which is mostly the internet. It is expected that this number will grow significantly in the future. As a result, there is a growing interest in outsourcing database management tasks to third parties that can provide these tasks for much lower cost due to the economy of scale just like putting it into the cloud. In this paper, we discuss the recent trend in database management system and the possibilities of making it as one of the services offered in the cloud. We also proposed an architecture of database management system in the cloud.

Keywords: ER Model, Database Design, Data Model a Schema, Entities Relationship, Attributes, Cardinality.

INTRODUCTION

In recent years, database outsourcing has become an important component of cloud computing. Due to the rapid advancements in a network technology, the cost of transmitting a terabyte of data over long distances has decreased significantly in the past decade. In addition, the total cost of data management is five to ten times higher than the initial acquisition cost. As a result, there is a growing interest in outsourcing database management tasks to third parties that can provide these tasks for much lower cost due to the economy of scale. This new outsourcing model has the benefits of reducing the cost for running Database Management System (DBMS) independently [1]. Cloud computing economics leveraging the power of multi tenancy delivers extremely fast shared storage at a dramatically reduced cost.

Virtualization then compounds these advantages by enabling users to scale elastically and to pay only for the resources they use. The cost/performance advantages have decisively shifted in favor of the shared-disk DBMS. It is just a matter of time before the shared-disk DBMS establishes dominance in the cloud. A Cloud database management system (CDBMS) is a distributed database that delivers computing as a service instead of a product. It is the sharing of resources, software, and information between multiply devices over a network which is mostly the internet. It is expected that this number will grow significantly in the future. An example of this is Software as a Service, or SaaS, which is an application that is delivered through the browser to customers. Cloud applications connect to a database that is being run on the cloud and have varying degrees of efficiency. Some are manually configured, some are preconfigured, and some are native. Native cloud databases are traditionally better equipped and more stable that those that are modified to adapt to the cloud.

The purpose of the document is to present representative notions about basic optimizing for databases, using mathematical estimation for costs in different types of queries, a review of the level of attained performances, and the effects of different physical access structures in specific query examples. The target group should be familiar with SQL and basic concepts in relational databases.

This way, execution strategies for complex queries can be made, allowing the use of knowledge for obtaining information at a lower cost. A database goes through a series of transformations until its final use, starting with data modeling, database designing and development, and ending with its maintenance and optimization.

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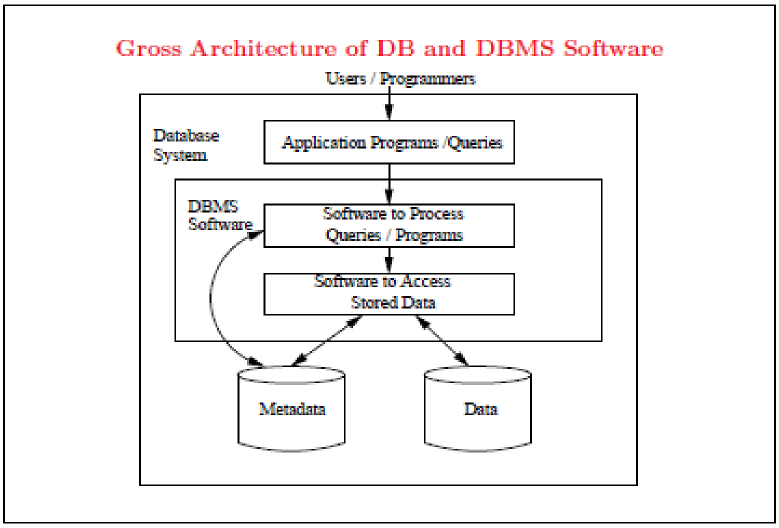
DATABASE MANAGEMENT SYSTEM (DBMS)

A database management system (DBMS) is a software package with computer programs that control the creation, maintenance, and use of a database. It allows organizations to conveniently develop databases for various applications by database administrators (DBAs) and other specialists. A database is an integrated collection of data records, files, and other objects. ADBMS allows different user application programs to concurrently access the same database. DBMSs may use a variety of database models, such as the relational model or object model, to conveniently describe and support applications. It typically supports query languages, which are in fact high-level programming languages, dedicated database languages that considerably simplify writing database application programs.

- Collection of interrelated data
- Set of programs to access the data
- DBMS contains information about a particular enterprise
- DBMS provides an environment that is both *convenient* and efficient to use.
- Database Applications:
- Banking: all transactions
- Airlines: reservations, schedules
- Universities: registration, grades
- Sales: customers, products, purchases
- Manufacturing: production, inventory, orders, supply chain
- Human resources: employee records, salaries, tax deductions
- Databases touch all aspects of our lives
- In the early days, database applications were built on top of file systems
- Drawbacks of using file systems to store data:
- Data redundancy and inconsistency
- Multiple file formats, duplication of information in different files
- Difficulty in accessing data
- Need to write a new program to carry out each new task
- Data isolation — multiple files and formats
- Integrity problems
- Integrity constraints (e.g. account balance > 0) become part of program code
- Hard to add new constraints or change existing ones



- Real-world entity: A modern DBMS is more realistic and uses real-world entities to design its architecture. It uses the behavior and attributes too. For example, a school database may use students as an entity and their age as
- Relation-based tables: DBMS allows entities and relations among them to form tables. A user can understand the architecture of a database just by looking at the table names.

- Isolation of data and application: A database system is entirely different than its data. A database is an active entity, whereas data is said to be passive, on which the database works and organizes. DBMS also stores metadata, which is data about data, to ease its own process.
- Less redundancy: DBMS follows the rules of normalization, which splits a relation when any of its attributes is having redundancy in values. Normalization is a mathematically rich and scientific process that reduces data redundancy.
- Consistency: Consistency is a state where every relation in a database remains consistent. There exist methods and techniques, which can detect attempt of leaving database in inconsistent state. A DBMS can provide greater consistency as compared to earlier forms of data storing applications like file-processing systems.
- Query Language: DBMS is equipped with query language, which makes it more efficient to retrieve and manipulate data. A user can apply as many and as different filtering options as required to retrieve a set of data. Traditionally it was not possible where file-processing system was used.
- ACID Properties: DBMS follows the concepts of Atomicity, Consistency, Isolation, and Durability (normally shortened as ACID). These concepts are applied on transactions, which manipulate data in a database. ACID properties help the database stay healthy in multi-transactional environments and in case of failure.

Database Schema

- Multiuser and Concurrent Access: DBMS supports multi-user environment and allows them to access and manipulate data in parallel. Though there are restrictions on transactions when users attempt to handle the same data item, but users are always unaware of them.
- Multiple views: DBMS offers multiple views for different users. A user who is in the Sales department will have a different view of database than a person working in the Production department. This feature enables the users to have a concentrate view of the database according to their requirements.
- Security: Features like multiple views offer security to some extent where users are unable to access data of other users and departments. DBMS offers methods to impose constraints while entering data into the database and retrieving the same at a later stage.

Access Control Policies

Access control policies dene the rules according to which access to the database objects is regulated. The most popular class of access control policies is represented by discretionary access control (DAC) policies, where the word discretionary characterizes the fact that users can be given the ability of passing their privileges to others.

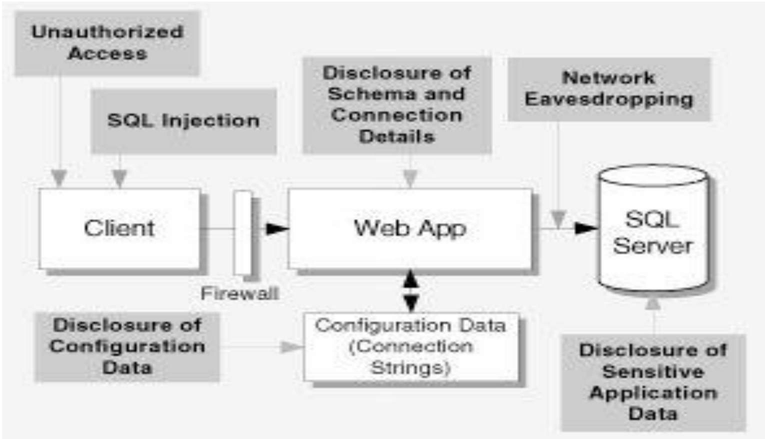
Discretionary access control policies are based on authorizations rules. An authorization rule states that a subject has the privilege to exercise a given action on a given object. The kind (and granularity) of subjects, objects, and actions that can be referenced in authorizations.

Subjects are the entities to which authorizations can be granted. Typically, subjects are users (i.e., deniers corresponding to human entities). User groups can also be denied to which authorizations can be granted; authorizations granted to a group can be enjoyed by all its members. Discretionary access control can be extended with role-based capabilities allowing the dentition of roles to which privileges can be granted. Roles are granted to users, and users can dynamically.

Database system security is more than securing the database; to achieve a secure database system, we need a:

- Secure database
- Secure DBMS

- Secure applications / application development
- Secure operating system in relation to
- database system
- Secure web server in relation to database
- system
- Secure network environment in relation to
- database system



Secrecy, Integrity and Availability The objective of data security can be divided into three separate, but interrelated, areas as follows.

- Secrecy is concerned with improper disclosure of information. The terms congeniality or non-disclosure are synonyms for secrecy.
- Integrity is concerned with improper modification of information or processes.
- Availability is concerned with improper denial of access to information. The term denial of service is also used as a synonym for availability.

These three objectives arise in practically every information system. For example, in a payroll system secrecy is concerned with preventing an employee from out the boss's salary; integrity is concerned with preventing an employee from changing his or her salary; and availability is concerned with ensuring that the paychecks are printed on time as required by law.

Similarly, in a military command and control system secrecy is concerned with preventing the enemy from determining the target coordinates of a missile; integrity is concerned with preventing the enemy from altering the target coordinates; and availability is concerned with ensuring that the missile does get launched when the order is given. Any system will have these three requirements co-existing to some degree. There are of course deference's regarding the relative importance of these objectives in a given system.

Prevention, Detection and Tolerance

The objective of data security can be approached in two distinct, and mutually supportive, ways.

- Prevention. Prevention ensures that security breaches cannot occur. The basic technique is that the system examines every action and checks its conformance with the security policy before allowing it to occur. This technique is called access control.
- Detection. Detection ensures that history of the activity in the system is recorded in an audit trail, so that a security breach can be detected after the fact. This technique is called auditing.
- Every system employs some mix of these two techniques. Sometimes the distinction between these two techniques gets blurred. For example, consider a system which monitors the audit trail in real time looking for imminent security violations so as to prevent them.

Tolerance

Moreover, detection is ultimately useful only to the extent that it prevents improper activity by threatening punitive action. Finally, there is the third \technique" of tolerance in which the potential for some security breaches is tolerated; because either these breaches are too expensive 3 to prevent or detect, or the likelihood of their occurrence is considered sufficiently low, or security measures are acceptable to users only up to some reasonable point.

Every practical system tolerates some degree of risk with respect to potential security breaches. It is, however, important to understand what risk is being tolerated and what is being covered by preventive/detective mechanisms.

Assurance Security mechanisms, whether preventive or detective in nature, can be implemented with various degrees of assurance. Assurance is directly related to the port required to subvert the mechanism. Low assurance mechanisms are easy to implement but also relatively easy to subvert. Subtle bugs in system and/or application software have led to numerous security breaches. On the other hand, high assurance mechanisms are notoriously cult to implement. They also tend to super from degraded performance. Fortunately, rapid advances in hardware performance are making the performance penalty acceptable.

CONCLUSION

Database system security is more than securing the database; to achieve a secure database system, we need a:

- Secure database
- Secure DBMS
- Secure applications / application development
- Secure operating system in relation to database system
- Secure web server in relation to database system
- Secure network environment in relation to database system

We use algorithms and technique which lower the complexity of the centralized Databases. This document has as purpose a better perception of the database systems.

Optimizations for the developer, as well as the way in which a database (ex. DBMS) formulates executional strategies different types of queries, even though the presented examples are limited in scope. It should also be noted that a well-created database should contain indexes and criteria for the selection of the columns for indexes.

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