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About Database (Db)

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A B S T R A C T

This article discusses the stage of development of the database, its types and future plans. A database is a collection of information that is organized so that it can be easily accessed, managed and updated. Computer databases typically contain aggregations of data records or files, containing information about sales transactions or interactions with specific customers. In a relational database, digital information about a specific customer is organized into rows, columns and tables which are indexed to make it easier to find relevant information through SQL or NoSQL queries.

A R T I C L E I N F O

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Introduction

In contrast, a graph database uses nodes and edges to define relationships between data entries and queries require a special semantic search syntax. As of this writing, SPARQL is the only semantic query language that is approved by the World Wide Web Consortium (W3C).

The database management system (DBMS) is the software that interacts with end users, applications, and the database itself to capture and analyze the data. The DBMS software additionally encompasses the core facilities provided to administer the database. The sum total of the database, the DBMS and the associated applications can be referred to as a "database system". Often the term

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"database" is also used to loosely refer to any of the DBMS, the database system or an application associated with the database.

Computer scientists may classify database-management systems according to the database models that they support. Relational databases became dominant in the 1980s. These model data as rows and columns in a series of tables, and the vast majority use SQL for writing and querying data. In the 2000s, non-relational databases became popular, referred to as NoSQL because they use different query languages.

Formally, a "database" refers to a set of related data and the way it is organized. Access to this data is usually provided by a "database management system" (DBMS) consisting of an integrated set of computer software that allows users to interact with one or more databases and provides access to all of the data contained in the database (although restrictions may exist that limit access to particular data). The DBMS provides various functions that allow entry, storage and retrieval of large quantities of information and provides ways to manage how that information is organized.

Because of the close relationship between them, the term "database" is often used casually to refer to both a database and the DBMS used to manipulate it.

Outside the world of professional information technology, the term database is often used to refer to any collection of related data (such as a spreadsheet or a card index) as size and usage requirements typically necessitate use of a database management system.

Existing DBMSs provide various functions that allow management of a database and its data which can be classified into four main functional groups:

Data definition – Creation, modification and removal of definitions that define the organization of the data.

Update – Insertion, modification, and deletion of the actual data.

Retrieval – Providing information in a form directly usable or for further processing by other applications. The retrieved data may be made available in a form basically the same as it is stored in the database or in a new form obtained by altering or combining existing data from the database.

Administration – Registering and monitoring users, enforcing data security, monitoring performance, maintaining data integrity, dealing with concurrency control, and recovering information that has been corrupted by some event such as an unexpected system failure.

History

The sizes, capabilities, and performance of databases and their respective DBMSs have grown in orders of magnitude. These performance increases were enabled by the technology progress in the areas of processors, computer memory, computer storage, and computer networks. The concept of a database was made possible by the emergence of direct access storage media such as magnetic disks, which became widely available in the mid 1960s; earlier systems relied on sequential storage of data on magnetic tape. The subsequent development of database technology can be divided into three eras based on data model or structure: navigational, SQL/relational, and post-relational.

The two main early navigational data models were the hierarchical model and the CODASYL model (network model). These were characterized by the use of pointers (often physical disk addresses) to follow relationships from one record to another. The relational model, first proposed in 1970 by

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Edgar F. Codd, departed from this tradition by insisting that applications should search for data by content, rather than by following links. The relational model employs sets of ledger-style tables, each used for a different type of entity. Only in the mid-1980s did computing hardware become powerful enough to allow the wide deployment of relational systems (DBMSs plus applications). By the early 1990s, however, relational systems dominated in all large-scale data processing applications, and as of 2018 they remain dominant: IBM DB2, Oracle, MySQL, and Microsoft SQL Server are the most searched DBMS. The dominant database language, standardised SQL for the relational model, has influenced database languages for other data models

Typically, the database manager provides users with the ability to control read/write access, specify report generation and analyze usage. Some databases offer ACID (atomicity, consistency, isolation and durability) compliance to guarantee that data is consistent and that transactions are complete.

Types of databases

Databases have evolved since their inception in the 1960s, beginning with hierarchical and network databases, through the 1980s with object-oriented databases, and today with SQL and NoSQL databases and cloud databases. In one view, databases can be classified according to content type: bibliographic, full text, numeric and images. In computing, databases are sometimes classified according to their organizational approach. There are many different kinds of databases, ranging from the most prevalent approach, the relational database, to a distributed database, cloud database, graph database or NoSQL database.

Relational database

A relational database, invented by E.F. Codd at IBM in 1970, is a tabular database in which data is defined so that it can be reorganized and accessed in a number of different ways. Relational databases are made up of a set of tables with data that fits into a predefined category. Each table has at least one data category in a column, and each row has a certain data instance for the categories which are defined in the columns. The Structured Query Language (SQL) is the standard user and application program interface for a relational database. Relational databases are easy to extend, and a new data category can be added after the original database creation without requiring that you modify all the existing applications.

Distributed database

A distributed database is a database in which portions of the database are stored in multiple physical locations, and in which processing is dispersed or replicated among different points in a network. Distributed databases can be homogeneous or heterogeneous. All the physical locations in a homogeneous distributed database system have the same underlying hardware and run the same operating systems and database applications. The hardware, operating systems or database applications in a heterogeneous distributed database may be different at each of the locations.

Cloud database

A cloud database is a database that has been optimized or built for a virtualized environment, either in a hybrid cloud, public cloud or private cloud. Cloud databases provide benefits such as the ability to pay for storage capacity and bandwidth on a per-use basis, and they provide scalability on

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demand, along with high availability. A cloud database also gives enterprises the opportunity to support business applications in a software-as-a-service deployment.

NoSQL database

NoSQL databases are useful for large sets of distributed data. NoSQL databases are effective for big data performance issues that relational databases aren't built to solve. They are most effective when an organization must analyze large chunks of unstructured data or data that's stored across multiple virtual servers in the cloud.

Graph database

A graph-oriented database, or graph database, is a type of NoSQL database that uses graph theory to store, map and query relationships. Graph databases are basically collections of nodes and edges, where each node represents an entity, and each edge represents a connection between nodes. Graph databases are growing in popularity for analyzing interconnections. For example, companies might use a graph database to mine data about customers from social media. Graph databases often employ SPARQL, a declarative programming language and protocol for graph database analytics. SPARQL has the capability to perform all the analytics that SQL can perform, plus it can be used for semantic analysis, the examination of relationships. This makes it useful for performing analytics on data sets that have both structured and unstructured data. SPARQL allows users to perform analytics on information stored in a relational database, as well as friend-of-a-friend (FOAF) relationships, PageRank and shortest path.

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