Databases

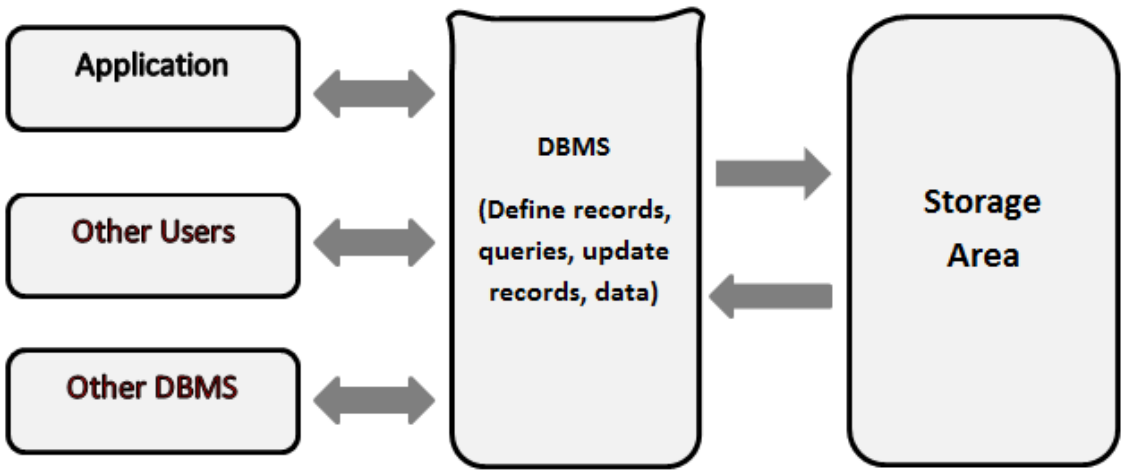
Introduction

A database, in the most general sense, is an organized collection of data. More specifically, a database is an electronic system that allows data to be easily accessed, manipulated and updated.

What are Databases?

A database is an organized collection of data, generally stored and accessed electronically from a computer system. It supports the storage and manipulation of data.

In other words, databases are used by an organization as a method of storing, managing and retrieving information.



What is RDBMS?

Introduction

RDBMS is the collection of programs and capabilities that enables the user to interact with a relational database. A relational database management system (RDBMS) is a type of DBMS with a row-based table structure. Most commercial RDBMSes use SQL. The most basic RDBMS functions are related to create, read, update and delete operations, collectively known as the CRUD cycle.

Features of RDBMS:

- An RDBMS is easily accessible using SQL commands.
- An RDBMS provides full data independence.
- The basic unit of data storage in a relational database is called a table.
- A table consists of tuples/rows/records and each record has one or more columns used to store values.
- In RDBMS, we can use conditional operations such as joins and restrictions.
- An RDBMS enables data sharing between users.
- Also at the same time, you can ensure consistency of data across multiple tables by using integrity constraints.
- An RDBMS minimizes the redundancy of data.

DBMS Functions:

DBMS performs several important functions that guarantee the integrity and consistency of the data in the database. The most important functions of Database Management System are:

- Data Dictionary Management,
- Data Storage Management,
- Data Transformation and Presentation,
- Security Management,
- Multi user Access Control,

- Backup and Recovery Management,
- Data Integrity Management,
- Database Access Languages andApplication Programming Interfaces and
- Database Communication interfaces.

MySQL :

MySQL is a very powerful program in its own right. It handles a large subset of the functionality of the most expensive and powerful database packages. MySQL uses a standard form of the well-known SQL data language. MySQL works on many operating systems and with many languages including PHP, PERL, C, C++, JAVA, etc.

Advantages:

1. Data Security

MySQL is globally renowned for being the most secure and reliable database management system used in popular web applications including WordPress, Drupal, Joomla, Facebook and Twitter. The data security and support for transactional processing that accompany the recent version of MySQL can greatly benefit any business, especially if it is an eCommerce business that involves frequent money transfers.

2. On-Demand Scalability

MySQL offers unmatched scalability to facilitate the management of deeply embedded apps using a smaller footprint, even in massive warehouses that stack terabytes of data. On-demand flexibility is the star feature of MySQL. This open-source solution allows complete customization to eCommerce businesses with unique database server requirements.

3. High Performance

MySQL features a distinct storage-engine framework that facilitates system administrators to configure the MySQL database server for a flawless performance. Whether it is an eCommerce website that receives a million queries every single day or a high-speed transactional processing system, MySQL is designed to meet even the most demanding applications while ensuring optimum speed, full-text indexes and unique memory caches for enhanced performance.

4. Round-the-Clock Uptime

MySQL comes with the assurance of 24×7 uptime and offers a wide range of high-availability solutions, including specialized cluster servers and master/slave replication configurations.

5. Comprehensive Transactional Support

MySQL tops the list of robust transactional database engines available on the market. With features such as complete atomic, consistent, isolated, durable transaction support; multi-version transaction support; and unrestricted row-level locking, it is the go-to solution for full data integrity. It guarantees instant deadlock identification through server-enforced referential integrity.

6. Complete Workflow Control

With an average download and installation time of less than 30 minutes, MySQL means usability from day one. Whether your platform is Linux, Microsoft, Macintosh or UNIX, MySQL is a

comprehensive solution with self-management features that automate everything from space expansion and configuration to data design and database administration.

7. Reduced Total Cost of Ownership

By migrating current database apps to MySQL, enterprises enjoy significant cost savings on new projects. The dependability and ease of management can save troubleshooting time that is otherwise wasted in fixing downtime issues and performance problems.

8. The Flexibility of Open Source

All the fears and worries that arise in an open-source solution can be brought to an end with MySQL's round-the-clock support and enterprise indemnification. The secure processing and trusted software of MySQL combine to provide effective transactions for large-volume projects. It makes maintenance, debugging and upgrades fast and easy while enhancing the end-user experience.

Microsoft SQL Server :

Is a Relational Database Management System (RDBMS) developed by Microsoft. It is a highly scalable product that can be run on anything from a single laptop, to a network of high-powered cloud servers, and anything in between.

Advantages:

- Easy to Install
- Enhanced Performance
- Several SQL Server Editions
- Highly Secure
- Excellent Data Restoration and Recovery Mechanism
- Lower Cost Of Ownership

1. Easy to Install

Microsoft SQL is easy to use and can be installed via setup wizard. Unlike other database servers requiring extensive command-line configurations, SQL server offers a user-friendly installation interface. Besides the one-click installation process, it comes with a readable GUI along with lots of instructions. The prerequisite updates are downloaded by the installation wizard automatically, which reduces manual workloads. Automatic updates not only reduces the maintenance cost but also helps to maintain the database with the current trend. Analytical and database services can be installed separately later.

2. Enhanced Performance

With built-in transparent data compression and encryption features, SQL server offers enhanced performance. To secure and encrypt the data, users need not modify programs. SQL Server provides efficient permission management tools with access controls designed to help users secure sensitive business information.

3. Several SQL Server Editions

MS SQL Server comes in several editions to cater to the needs of corporate enterprises and domestic and remote users. Different editions vary in features and price range. Therefore, organizations can choose the version suitable for their operational needs. The editions include:

- **Enterprise –** This edition is usually for larger enterprises with greater data storage requirements. It provides data warehousing and web-enabled databases. Enterprise-grade SQL server offers the essential features an organization expects.
- **Standard –** Standard SQL Server edition is best for small- and medium-scale businesses. Moreover, it can be used for branch

offices and small web servers as a back-end database. The standard version has no user limits.

- **Express –** Express SQL server edition is free of cost, has limited user capacity, and includes fewer features compared to standard and enterprise SQL server edition.
- **Developer –** The developer SQL server edition works and functions exactly like an enterprise SQL edition. The only difference is the license is used for testing and development purposes. This edition is generally used by developers to build and test applications on top of the SQL server.

4. Highly Secure

The SQL Server database is highly secure and uses sophisticated encryption algorithms making it virtually impossible to break the security layers. SQL Server is a commercial relational database with additional security features to reduce the risk of attacks.

5. Excellent Data Restoration and Recovery Mechanism

SQL Server consists of several sophisticated features to help restore and recover lost or damaged data. With the help of advanced recovery tools, it's possible to recover the complete database. The core component of SQL Server, Database Engine, controls data storage and helps to execute demands and queries of the users, including transactions, files, and indexes. Large organizations commonly use these facilities of SQL Server.

6. Lower Cost Of Ownership

The effective data mining, disk partitioning, and data management tools of SQL server help to maintain the crucial data and make the storage space available for highly sensitive information.

PostgreSQL :

PostgreSQL is a powerful, open source object-relational database system. It has more than 15 years of active development phase and a proven architecture that has earned it a strong reputation for reliability, data integrity, and correctness.

Advantages:

1. Overview
2. Robust feature set
3. Object-oriented database features
4. SQL standards conformance
5. ACID compliance
6. Open-source development and community
7. Conclusion
8. FAQ

System Properties Comparison Microsoft SQL Server vs. MySQL vs. PostgreSQL :

Name	**Microsoft SQL Server** X	**MySQL** X	**PostgreSQL** X
Description	Microsofts flagship relational DBMS	Widely used open source RDBMS	Widely used open source RDBMS
Primary database model	Relational DBMS	Relational DBMS	Relational DBMS
Secondary database models	Document store Graph DBMS Spatial DBMS	Document store Spatial DBMS	Document store Spatial DBMS
DB-Engines Ranking Trend Chart	Score 942.13 Rank #3 Overall #3 Relational DBMS	Score 1194.87 Rank #2 Overall #2 Relational DBMS	Score 615.87 Rank #4 Overall #4 Relational DBMS
Website	www.microsoft.com/en-us/sql-server	www.mysql.com	www.postgresql.org
Technical documentation	docs.microsoft.com/en-US/sql/-sql-server	dev.mysql.com/doc	www.postgresql.org/docs
Developer	Microsoft	Oracle	PostgreSQL Global Development Group

Initial release	1989	1995	1989
Current release	SQL Server 2019, November 2019	8.0.29, April 2022	14.4, June 2022
License	commercial	Open Source	Open Source
Cloud-based only	no	no	no
DBaaS offerings (sponsored links)		ScaleGrid for MySQL: Fully managed MySQL hosting on AWS, Azure and DigitalOcean with high availability and SSH access on the #1 multi-cloud DBaaS.	• Aiven for PostgreSQL: Fully managed and hosted PostgreSQL® with 70+ extensions and orchestration tooling included. • ScaleGrid for PostgreSQL: Fully managed PostgreSQL hosting on AWS, Azure and DigitalOcean with high availability and SSH access on the #1 multi-cloud DBaaS.
Implementation language	C++	C and C++	C

Server operating systems	Linux Windows	FreeBSD Linux OS X Solaris Windows	FreeBSD HP-UX Linux NetBSD OpenBSD OS X Solaris Unix Windows
Data scheme	yes	yes	yes
Typing	yes	yes	yes
XML support	yes	yes	yes
Secondary indexes	yes	yes	yes
SQL	yes	yes	yes
APIs and other access methods	ADO.NET JDBC ODBC OLE DB Tabular Data Stream (TDS)	ADO.NET JDBC ODBC Proprietary native API	ADO.NET JDBC native C library ODBC streaming API for large objects