RELATIONAL DATABASE MANAGEMENT SYSTEMS

RDBMS

Introduction

- Stands for "Relational Database Management System." An RDBMS is a DBMS designed specifically for relational databases. Therefore, RDBMSes are a subset of DBMSes.

- A relational database refers to a database that stores data in a structured format, using rows and columns. This makes it easy to locate and access specific values within the database. It is "relational" because the values within each table are related to each other. Tables may also be related to other tables. The relational structure makes it possible to run queries across multiple tables at once.

- While a relational database describes the type of database an RDMBS manages, the RDBMS refers to the database program itself. It is the software that executes queries on the data, including adding, updating, and searching for values. An RDBMS may also provide a visual representation of the data. For example, it may display data in a tables like a spreadsheet, allowing you to view and even edit individual values in the table. Some RDMBS programs allow you to create forms that can streamline entering, editing, and deleting data.

- Most well known DBMS applications fall into the RDBMS category. Examples include Oracle Database, MySQL, Microsoft SQL Server, and IBM DB2. Some of these programs support non-relational databases, but they are primarily used for relational database management.

- Examples of non-relational databases include Apache HBase, IBM Domino, and Oracle NoSQL Database. These type of databases are managed by other DMBS programs that support NoSQL, which do not fall into the RDBMS category.

MySQL

- MySQL, pronounced either "My S-Q-L" or "My Sequel," is an open source relational database management system. It is based on the structure query language (SQL), which is used for adding, removing, and modifying information in the database. Standard SQL commands, such as ADD, DROP, INSERT, and UPDATE can be used with MySQL.

- MySQL can be used for a variety of applications, but is most commonly found on Web servers. A website that uses MySQL may include Web pages that access information from a database. These pages are often referred to as "dynamic," meaning the content of each page is generated from a database as the page loads. Websites that use dynamic Web pages are often referred to as database-driven websites.

- Many database-driven websites that use MySQL also use a Web scripting language like PHP to access information from the database. MySQL commands can be incorporated into the PHP code, allowing part or all of a Web page to be generated from database information. Because both MySQL and PHP are both open source (meaning they are free to download and use), the PHP/MySQL combination has become a popular choice for database-driven websites.

MySQL / Some Of Features

- Easy to use
  - MySQL is easy to use. We have to get only the basic knowledge of SQL. We can build and interact with MySQL by using only a few simple SQL statements.

- It is secure
  - MySQL consists of a solid data security layer that protects sensitive data from intruders. Also, passwords are encrypted in MySQL.

- Client/ Server Architecture
  - MySQL follows the working of a client/server architecture. There is a database server (MySQL) and arbitrarily many clients (application programs), which communicate with the server; that is, they can query data, save changes, etc.

- Free to download
  - MySQL is free to use so that we can download it from MySQL official website without any cost.

- It is scalable
  - MySQL supports multi-threading that makes it easily scalable. It can handle almost any amount of data, up to as much as 50 million rows or more. The default file size limit is about 4 GB. However, we can increase this number to a theoretical limit of 8 TB of data.

- Speed
  - MySQL is considered one of the very fast database languages, backed by a large number of the benchmark test.

- High Flexibility
  - MySQL supports a large number of embedded applications, which makes MySQL very flexible.

- Compatible on many operating systems
  - MySQL is compatible to run on many operating systems, like Novell NetWare, Windows* Linux*, many varieties of UNIX* (such as Sun* Solaris*, AIX, and DEC* UNIX), OS/2, FreeBSD*, and others. MySQL also provides a facility that the clients can run on the same computer as the server or on another computer (communication via a local network or the Internet).

PostgreSQL

- PostgreSQL (pronounced "post-gress-Q-L") is an open source relational database management system (DBMS) developed by a worldwide team of volunteers. PostgreSQL is not controlled by any corporation or other private entity and the source code is available free of charge.

- PostgreSQL supports transaction s, subselects, trigger s, view s, foreign key referential integrity, and sophisticated locking. It runs on numerous platforms including Linux , most flavors of UNIX , Mac OS X , Solaris , Tru64, and Windows . It supports text, images, sounds, and video, and includes programming interfaces for C / C++ , Java , Perl , Python , Ruby, Tcl and Open Database Connectivity (ODBC).

PostgreSQL / Some Of Features

- PostgreSQL has many advanced features that other enterprise-class database management systems offer, such as:
- • User-defined types
- • Table inheritance
- • Sophisticated locking mechanism
- • Foreign key referential integrity
- • Views, rules, subquery
- • Nested transactions (savepoints)
- • Multi-version concurrency control (MVCC)
- • Asynchronous replication
- The recent versions of PostgreSQL support the following features:
- • Native Microsoft Windows Server version
- • Tablespaces
- • Point-in-time recovery
- And more new features are added in each new release.
- PostgreSQL is designed to be extensible. PostgreSQL allows you to define your own data types, index types, functional languages, etc.
- If you don't like any part of the system, you can always develop a custom plugin to enhance it to meet your requirements e.g., adding a new optimizer.

SQL Server

- SQL Server is a relational database management system, or RDBMS, developed and marketed by Microsoft.

- Similar to other RDBMS software, SQL Server is built on top of SQL, a standard programming language for interacting with the relational databases. SQL server is tied to Transact-SQL, or T-SQL, the Microsoft's implementation of SQL that adds a set of proprietary programming constructs.

- SQL Server works exclusively on Windows environment for more than 20 years. In 2016, Microsoft made it available on Linux. SQL Server 2017 became generally available in October 2016 that ran on both Windows and Linux.

Microsoft®
SQL Server®

SQL Server / Some Of Features

- INTELLIGENT QUERY PROCESSING ENHANCEMENTS
- ACCELERATED DATABASE RECOVERY (ADR)
- ALWAYSENCRYPTED WITH SECURE ENCLAVES
- MEMORY-OPTIMIZED TEMPDB METADATA
- QUERY STORE CUSTOM CAPTURE POLICIES
- VERBOSE TRUNCATION WARNINGS
- RESUMABLE INDEX BUILD
- DATA VIRTUALIZATION WITH POLYBASE
- LAST ACTUAL EXECUTION PLAN DMF
- MULTIPLE INTERNAL PERFORMANCE IMPROVEMENTS

Difference between SQL Server, MySQL and PostgreSQL

Name	Microsoft SQL Server X	MySQL X	PostgreSQL X
Description	Microsofts 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	Document store	Document store
Website	www.microsoft.com/en-us/sql-server	www.mysql.com	www.postgresql.org
Technical documentation	docs.microsoft.com/en-ie/sql/sql-server/sql-server-technical-documentation	dev.mysql.com/doc	www.postgresql.org/docs/-manuals
Developer	Microsoft	Oracle	PostgreSQL Global Development Group
Initial release	1989	1995	1989
Current release	SQL Server 2019, November 2019	8.0.21, 2020	12.4, August 2020
License	commercial	Open Source	Open Source
Cloud-based only	no	no	no

Difference between SQL Server, MySQL and PostgreSQL

DBaaS offerings (sponsored links)		• **Azure Database for MySQL**: A fully managed, scalable MySQL relational database with high availability and security built in at no extra cost **ScaleGrid for MySQL**: Fully managed MySQL hosting on AWS, Azure and DigitalOcean with high availability and SSH access on the #1 multi-cloud DBaaS.	• **ScaleGrid for PostgreSQL**: Fully managed PostgreSQL hosting on AWS, Azure and DigitalOcean with high availability and SSH access on the #1 multi-cloud DBaaS. **Azure Database for PostgreSQL**: A fully managed, scalable PostgreSQL relational database with high availability and security built in at no extra cost
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

Difference between SQL Server, MySQL and PostgreSQL

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
Supported programming languages	C# C++ Delphi Go Java JavaScript (Node.js) PHP Python R Ruby Visual Basic	Ada C C# C++ D Delphi Eiffel Erlang Haskell Java JavaScript (Node.js) Objective-C OCaml Perl PHP Python Ruby Scheme Tcl	.Net C C++ Delphi Java JavaScript (Node.js) Perl PHP Python Tcl

Difference between SQL Server, MySQL and PostgreSQL

Server-side scripts	Transact SQL, .NET languages, R, Python and (with SQL Server 2019) Java	yes	user defined functions
Triggers	yes	yes	yes
Partitioning methods	tables can be distributed across several files (horizontal partitioning); sharding through federation	horizontal partitioning, sharding with MySQL Cluster or MySQL Fabric	partitioning by range, list and (since PostgreSQL 11) by hash
Replication methods	yes, but depending on the SQL-Server Edition	Multi-source replication Source-replica replication	Source-replica replication
MapReduce	no	no	no
Consistency concepts	Immediate Consistency	Immediate Consistency	Immediate Consistency
Foreign keys	yes	yes	yes
Transaction concepts	ACID	ACID	ACID
Concurrency	yes	yes	yes
Durability	yes	yes	yes
In-memory capabilities	yes	yes	no
User concepts	fine grained access rights according to SQL-standard	Users with fine-grained authorization concept	fine grained access rights according to SQL-standard