SQL FOR STUDENTS

SQL injection

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In computing, SQL injection is a code injection technique used to attack data-driven applications, in which malicious SQL statements are inserted into an entry field for execution (e.g. to dump the database contents to the attacker). SQL injection must exploit a security vulnerability in an application's software, for example, when user input is either incorrectly filtered for string literal escape characters embedded in SQL statements or user input is not strongly typed and unexpectedly executed. SQL injection is mostly known as an attack vector for websites but can be used to attack any type of SQL database.

SQL injection attacks allow attackers to spoof identity, tamper with existing data, cause repudiation issues such as voiding transactions or changing balances, allow the complete disclosure of all data on the system, destroy the data or make it otherwise unavailable, and become administrators of the database server. Document-oriented NoSQL databases can also be affected by this security vulnerability.

SQL injection remains a widely recognized security risk due to its potential to compromise sensitive data. The Open Web Application Security Project (OWASP) describes it as a vulnerability that occurs when applications construct database queries using unvalidated user input. Exploiting this flaw, attackers can execute unintended database commands, potentially accessing, modifying, or deleting data. OWASP outlines several mitigation strategies, including prepared statements, stored procedures, and input validation, to prevent user input from being misinterpreted as executable SQL code.

PostgreSQL

1994, Berkeley graduate students Andrew Yu and Jolly Chen replaced the POSTQUEL query language interpreter with one for the SQL query language, creating

PostgreSQL (POHST-gres-kew-EL) also known as Postgres, is a free and open-source relational database management system (RDBMS) emphasizing extensibility and SQL compliance. PostgreSQL features transactions with atomicity, consistency, isolation, durability (ACID) properties, automatically updatable views, materialized views, triggers, foreign keys, and stored procedures.

It is supported on all major operating systems, including Windows, Linux, macOS, FreeBSD, and OpenBSD, and handles a range of workloads from single machines to data warehouses, data lakes, or web services with many concurrent users.

The PostgreSQL Global Development Group focuses only on developing a database engine and closely related components.

This core is, technically, what comprises PostgreSQL itself, but there is an extensive developer community and ecosystem that provides other important feature sets that might, traditionally, be provided by a proprietary software vendor. These include special-purpose database engine features, like those needed to support a geospatial or temporal database or features which emulate other database products.

Also available from third parties are a wide variety of user and machine interface features, such as graphical user interfaces or load balancing and high availability toolsets.

The large third-party PostgreSQL support network of people, companies, products, and projects, even though not part of The PostgreSQL Development Group, are essential to the PostgreSQL database engine's adoption and use and make up the PostgreSQL ecosystem writ large.

PostgreSQL was originally named POSTGRES, referring to its origins as a successor to the Ingres database developed at the University of California, Berkeley. In 1996, the project was renamed PostgreSQL to reflect its support for SQL. After a review in 2007, the development team decided to keep the name PostgreSQL and the alias Postgres.

Database

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In computing, a database is an organized collection of data or a type of data store based on the use of a database management system (DBMS), the software that interacts with end users, applications, and the database itself to capture and analyze the data. The DBMS 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 "database" is also used loosely to refer to any of the DBMS, the database system or an application associated with the database.

Before digital storage and retrieval of data have become widespread, index cards were used for data storage in a wide range of applications and environments: in the home to record and store recipes, shopping lists, contact information and other organizational data; in business to record presentation notes, project research and notes, and contact information; in schools as flash cards or other visual aids; and in academic research to hold data such as bibliographical citations or notes in a card file. Professional book indexers used index cards in the creation of book indexes until they were replaced by indexing software in the 1980s and 1990s.

Small databases can be stored on a file system, while large databases are hosted on computer clusters or cloud storage. The design of databases spans formal techniques and practical considerations, including data modeling, efficient data representation and storage, query languages, security and privacy of sensitive data, and distributed computing issues, including supporting concurrent access and fault tolerance.

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, collectively referred to as NoSQL, because they use different query languages.

QUEL query languages

language, based on tuple relational calculus, with some similarities to SQL. It was created as a part of the Ingres DBMS effort at University of California

QUEL is a relational database query language, based on tuple relational calculus, with some similarities to SQL. It was created as a part of the Ingres DBMS effort at University of California, Berkeley, based on Codd's earlier suggested but not implemented Data Sub-Language ALPHA. QUEL was used for a short time in most products based on the freely available Ingres source code, most notably in an implementation called POSTQUEL supported by POSTGRES.

Eugene Wong of Ingres was the creator of QUEL. As Oracle and IBM DB2 gained market share in the early 1980s, Ingres and other companies supporting QUEL moved to SQL. QUEL continues to be available as a part of the Ingres DBMS, although no QUEL-specific language enhancements have been added for many years.

Relational database

relational database systems are equipped with the option of using SQL (Structured Query Language) for querying and updating the database. The concept of relational

A relational database (RDB) is a database based on the relational model of data, as proposed by E. F. Codd in 1970.

A Relational Database Management System (RDBMS) is a type of database management system that stores data in a structured format using rows and columns.

Many relational database systems are equipped with the option of using SQL (Structured Query Language) for querying and updating the database.

Microsoft Query

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Microsoft Query is a visual method of creating database queries using examples based on a text string, the name of a document or a list of documents. The QBE system converts the user input into a formal database query using Structured Query Language (SQL) on the backend, allowing the user to perform powerful searches without having to explicitly compose them in SQL, and without even needing to know SQL. It is derived from Moshé M. Zloof's original Query by Example (QBE) implemented in the mid-1970s at IBM's Research Centre in Yorktown, New York.

In the context of Microsoft Access, QBE is used for introducing students to database querying, and as a user-friendly database management system for small businesses.

Microsoft Excel allows results of QBE queries to be embedded in spreadsheets.

Ingres (database)

Ingres Database (/????r?s/ ing-GRESS) is a proprietary SQL relational database management system intended to support large commercial and government applications

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Actian Corporation controls the development of Ingres and makes certified binaries available for download, as well as providing worldwide support. There was an open source release of Ingres but it is no longer available for download from Actian. However, there is a version of the source code still available on GitHub.

In its early years, Ingres was an important milestone in the history of database development. Ingres began as a research project at UC Berkeley, starting in the early 1970s and ending in 1985. During this time Ingres remained largely similar to IBM's seminal System R in concept; it differed in more permissive licensing of source code, in being based largely on DEC machines, both under

UNIX and VAX/VMS, and in providing QUEL as a query language instead of SQL. QUEL was considered at the time to run truer to Edgar F. Codd's relational algebra (especially concerning composability), but SQL was easier to parse and less intimidating for those without a formal background in mathematics.

When ANSI preferred SQL over QUEL as part of the 1986 SQL standard (SQL-86), Ingres became less competitive against rival products such as Oracle until future Ingres versions also provided SQL. Many companies spun off of the original Ingres technology, including Actian itself, originally known as Relational

Technology Inc., and the NonStop SQL database originally developed by Tandem Computers but now offered by Hewlett Packard Enterprise.

CS50

various verified certificates are available for a fee. As of 2024,[update] CS50x teaches the languages C, Python, SQL, HTML, CSS, and JavaScript. It also teaches

CS50 (Computer Science 50) is an introductory course on computer science taught at Harvard University by David J. Malan. The on-campus version of the course is Harvard's largest class with 800 students, 102 staff, and up to 2,200 participants in their regular hackathons. The course was first offered on campus in 1989, and Malan has been the course's instructor since 2007. Notable industry experts including Mark Zuckerberg and Steve Ballmer have given guest lectures.

An online version of the course, CS50x, is available through the platforms edX and OpenCourseWare and follows the same curriculum as the in-person format of the course. All CS50x course materials are free and there is no fee to complete the course, though various verified certificates are available for a fee. As of 2024, CS50x teaches the languages C, Python, SQL, HTML, CSS, and JavaScript. It also teaches fundamental computer science concepts including data structures and the Flask framework. New content is added to the course each year; additional lectures on cybersecurity and emoji were added for 2022. Another adapted version of the course, CS50 AP, is designed for high school students and completes the required curriculum of AP Computer Science Principles.

User-defined function

compiling a SQL statement. SQL-data access

tells the database management system whether the function contains no SQL statements (NO SQL), contains SQL statements - A user-defined function (UDF) is a function provided by the user of a program or environment, in a context where the usual assumption is that functions are built into the program or environment. UDFs are usually written for the requirement of its creator.

Larry Ellison

SQL/DS database products, it delayed entering the market for a relational database on Unix and Windows operating systems. This left the door open for

Lawrence Joseph Ellison (born August 17, 1944) is an American businessman and entrepreneur who co-founded software company Oracle Corporation. He was Oracle's chief executive officer from 1977 to 2014 and is now its chief technology officer and executive chairman.

As of July 2025, Ellison is the second-wealthiest person in the world, according to Bloomberg Billionaires Index, with an estimated net worth of US$257 billion, and the second-wealthiest person in the world according to Forbes, with an estimated net worth of US$286.8 billion. Ellison is also known for his ownership of 98 percent of L?na?i, the sixth-largest island in the Hawaiian Islands.

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