Introduction to SQL

In this chapter, as well as in Chapter 4 and Chapter 5, we study the most widely used database query language, SQL.

Although we refer to the SQL language as a "query language," it can do much more than just query a database. It can define the structure of the data, modify data in the database, and specify security constraints.

It is not our intention to provide a complete users' guide for SQL. Rather, we present SQL's fundamental constructs and concepts. Individual implementations of SQL may differ in details or may support only a subset of the full language.

We strongly encourage you to try out the SQL queries that we describe here on an actual database. See the Tools section at the end of this chapter for tips on what database systems you could use, and how to create the schema, populate sample data, and execute your queries

Bibliographical Notes

The original version of SQL, called Sequel 2, is described by [Chamberlin et al. (1976)]. Sequel 2 was derived from the language Square ([Boyce et al. (1975)] and [Chamberlin and Boyce (1974)]). The American National Standard SQL-86 is described in [ANSI (1986)]. The IBM Systems Application Architecture definition of SQL is defined by [IBM (1987)]. The official standards for SQL-89 and SQL-92 are available as [ANSI (1989)] and [ANSI (1992)], respectively.

Textbook descriptions of the SQL-92 language include [Date and Darwen (1997)], [Melton and Simon (1993)], and [Cannan and Otten (1993)]. [Date and Darwen (1997)] and [Date (1993)] include a critique of SQL-92 from a programming-languages perspective.

Textbooks on SQL:1999 include [Melton and Simon (2001)] and [Melton (2002)]. [Eisenberg and Melton (1999)] provide an overview of SQL:1999. [Donahoo and Speegle (2005)] covers SQL from a developers' perspective. [Eisenberg et al. (2004)] provides an overview of SQL:2003. [Bryla and Loney (2013)] cover Oracle 12c, including its SQL features.

The SQL:1999, SQL:2003, SQL:2006, SQL:2008, SQL:2011, and SQL:2016 standards are published as a collection of ISO IEC standards documents, which are described in more detail in Section 25.4. The standards documents are densely packed with information and hard to read, and of use primarily for database system implementers. The standards documents are available from the web site webstore.ansi.org, but only for purchase.

Many database products support SQL features beyond those specified in the standard, and may not support some features of the standard. More information on these features may be found in the SQL user manuals of the respective products.

The processing of SQL queries, including algorithms and performance issues, is discussed in Chapter 15 and Chapter 16.

The most important SQL reference is likely to be the online documentation provided by the vendor or the particular database system you are using. That documentation will identify any features that deviate from the SQL standard features presented in this chapter. Here are links to the SQL reference manuals for the current (as of 2018) versions of some of the popular databases.

- MySQL 8.0: dev.mysql.com/doc/refman/8.0/en/

- Oracle 12c: docs.oracle.com/database/121/SQLRF/

- PostgreSQL: www.postgresql.org/docs/current/static/sql.html

- SQLite: www.sqlite.org/lang.html

- SQL Server: docs.microsoft.com/en-us/sql/t-sql

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