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DBMS See Database Management Systems.

DB2

DB2 is a **database management system** (DBMS) sold by **IBM**, whose market share in this segment of the software industry was about 30 percent in 2000. DB2 runs on a variety of **operating systems**, including OS/2, **Windows** and **Windows NT**, variations of **Unix**, and IBM's OS/390 and OS/400. There are currently more than 3 million DB2 installations.

DB2 is a relational database—that is, data are stored in tables (*relations*) that can be queried using a special language such as **SQL**. This language was developed by IBM and in the late 1970s was put into the public domain. The first relational database sold by IBM was SQL/DS, released in 1981, which was replaced two years later by DB2, a database for IBM mainframes. DB2 has continued to evolve since its introduction, adding new features every year and also new variations of SQL. Being an SQL-based language, DB2 provides data definition, data manipulation, and a data control language.

DB2 is one of the few examples of software that moved successfully from the **mainframe** to smaller computers. IBM added the suffix UDB to DB2 to indicate that it is now a universal database. The key objective of IBM has been to position DB2 at the center of "complete solutions," by offering many other software products that access the DB2 server software. To implement this strategy, all DB2 groups within IBM were fused into a single group that wrote unified code for all platforms.

To couple the database with applications, DB2 provides a functionality that makes programming with this system easier. An interface exists for most common programming languages, so that DB2 queries can be started from within a program. Also, it is now possible to access DB2 databases through the **World Wide Web**.

The latest release of DB2 added support for data warehouses and online analytical processing (OLAP). IBM's intention is to provide *scalability*—that is, the capability of greatly increasing the size of a database—and *extensibility*, which refers to interfacing future applications to DB2. This is the case of electronic commerce on the Web, for which no definite standards exist.

The largest producers of database systems are IBM, **Oracle**, **Microsoft**, Informix, and Sybase, in that order. Although IBM had lost market share in the 1990s, it became the leading database vendor after switching to its "universal" strategy. The database market is expected to grow to U.S$10 billion by 2003, and DB2 is expected to continue to be one of the principal DBMS products.

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Debugging

The word **bug** as a synonym for a computer programming error has been in use for more than 60 years. Debugging refers to the process of finding and removing errors in programs.

Usually, the programmer examines a program's source code, trying to identify the offending portion. In more complex situations, a debugging tool allows the user to go step-by-step through a program, setting breakpoints at specified statements and examining the values of variables. The first debuggers worked only with **assembler** language, but there are modern debugging tools for high-level programming languages which interpret a program line by line. The debugger for the language **Prolog**, for example,