



## SQL Server Backgrounder

SQL Server provides a unique and flexible database server solution for multi-user PC applications, from simple decision support to large on-line, transaction processing systems. SQL Server is based on Sybase, Inc.'s field-proven relational database management system, enhanced with technology from Microsoft and database technology from Ashton-Tate. The result is a product uniquely positioned to address the needs of the evolving PC database market.

### Market Evolution

Today's PC hardware is capable of running applications previously limited to mini or mainframe systems. OS/2, the new PC operating system developed by Microsoft and IBM, provides multi-tasking support previously found only in the mini-mainframe world. Within a year, new systems running OS/2 with several megabytes of memory and disk drives in the hundreds of megabytes will be commonplace in PC networks.

PC databases provide tremendous productivity benefits including individual control, quick access, and the ability to quickly develop custom applications. However, most existing PC database software was developed for a generation of PC's that had limited memory, and a single user, single tasking operating system. Today's PC databases have generally operated separate from large corporate production-oriented information systems. In large corporations today's PC databases are used as decision support systems. In contrast, mini and mainframe relational database products, although powerful, for the most part lack a sophisticated user interface, and still use the older character-oriented terminal technology. While the mini-mainframe SQL-based relational databases have the power to support on-line production applications, they traditionally lack multi-user performance, the ability to enforce complex data integrity rules, and high database availability.

### Client/Server Model

In response to these trends, both PC and mini/mainframe databases are adopting the "client/server" model of computing (sometimes also called the workstation/server model). This approach splits the functions of a database management system cleanly into a "front-end" component where data is manipulated by end users or applications, and a "back-end", or server component where data is stored and retrieved. In PC networks, front-ends typically run on workstation PC's and back-ends on server PC's.

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A major advantage of the client/server model is that many clients can communicate over a network to single or multiple servers. This approach requires that the server be an intelligent database that has the ability to evaluate the client's request and reject unauthorized database actions. Unlike conventional database software that requires data integrity and transaction logic to be coded into each application, the intelligent server allows data integrity and transaction logic to be stored centrally in the database itself. This effectively brings mainframe level control to the PC environment. Rules governing an organization can be enforced centrally in a PC local area network, just as they would have been on a mainframe. From a programming and maintenance perspective, this translates into important user benefits. Once rules are established in the central database, changes can be made quickly and easily, while maintaining a high level of integrity and performance.

Separating workstations and servers also permits the server to act as a dedicated database machine that can be tuned to a particular application or set of applications and scaled in size. The server must be able to support not only increasing amounts of data, but also increasing numbers of workstations without significantly degrading response time. As application database requirements grow, a server that started out on a PC should be able to move to a larger PC or to a mini/mainframe if necessary, without requiring changes to the user interface.

### SQL Server

SQL Server meets the requirements of the client/server model by providing an intelligent server that runs in a local area network.

SQL Server is an open platform, offering any workstation application the ability to access high-performance, back-end database services. This gives users the ability to use a variety of PC applications and languages, against the same data at the same time for any DOS or OS/2 workstation in a local area network.

On the server side, SQL Server's distributed database capabilities extend this flexibility even further, allowing multiple workstations to talk with multiple servers.

SQL Server is based on the ANSI standard Structured Query Language (SQL), the industry-standard language by which applications communicate with databases. SQL gives programmers common tools across many different systems and ensures that application investments are preserved as systems grow and change over time. SQL can also serve as the common communications vehicle across relational databases on different systems. SQL Server is completely

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compatible with the SYBASE DataServer running on larger platforms such as the DEC VAX. For all of SQL's importance, many end-users may never want to use SQL directly. One of SQL Server's key benefits is that end-users can use their front-end application of choice, and still enjoy the power and flexibility of a SQL-based back-end.

#### **dBASE Support**

SQL Server in combination with a future version of Ashton-Tate's dBASE will provide transparent mapping of dBASE to SQL. This mapping is made possible through both the use of many of SQL Server features and through technology provided by Ashton-Tate that will be incorporated into SQL Server. Applications written in the dBASE language will be able to use the SQL server with no modification.

Through this transparency a mechanism is provided to the large installed base of dBASE customers to migrate to the Client-Server architecture.

#### **SQL Server Architecture**

SQL Server is a true database server, providing high-performance database services, integrity logic, data dictionary and administration facilities. In contrast to a file server, which relies on operating system file handling facilities, SQL Server talks directly to OS/2 at the physical disk level. Further, most SQL databases coming from the mini and mainframe world have an architecture that requires a process per user. While such an architecture may work on large systems, it is not suitable for PC's. SQL Server is designed so that a single process runs the whole database. A SQL kernel runs under OS/2, scheduling tasks from different users and the disk simultaneously, thereby making very efficient use of memory. Once SQL Server is loaded, a PC server machine can support more than 25 users in each additional megabyte of memory.

SQL Server's lower memory requirements leave more memory available for the disk cache, which in turn reduces disk I/O's and maximizes use of the CPU. This maximizes transaction throughput, so that SQL Server's performance, as seen by an individual user, stays virtually constant as users are added to the network.

SQL Server's architecture is further tailored to the on-line environment by providing high availability features such as on-line backup and recovery. Database updates, design changes, performance tuning, and integrity rule changes can all be done while the database is still running. The system can be administered from anywhere on the network, so there is no need for a separate administrator's console.



The client workstation communicates with SQL Server over PC networks using TRANSACT-SQL, a superset of ANSI standard SQL with a set of powerful Sybase-developed extensions. These extensions include control of flow, temporary variables, transaction management, and stored procedures, the latter being pre-compiled SQL queries.

Stored procedures dramatically minimize message and network traffic from the workstation to the server, and can result in performance that is 10 times greater than standard SQL queries. Stored procedures also allow SQL Server to centrally enforce data integrity, a far superior approach to requiring integrity rules in all the various front-end applications which access the database.

The SQL Server client is an OS/2 or DOS based workstation that consists of several pieces: OS/2 or DOS; networking software; DB-LIBRARY, the standard application interface to SQL Server; and the workstation application itself.

A five megabyte 386-based SQL Server can be expected to support more than 35 users accessing a 300 megabyte database with subsecond response time. Should the need arise, it is also possible to move SQL Server applications to mini computers and mainframe databases that are based on SQL.

#### SQL Server and Workgroup Computing

SQL Server has been designed to become the database cornerstone for PC workgroup computing.

For DOS and OS/2 based workstation applications, of which dBASE is the leading PC database example, SQL Server will be the powerful multi-user option that preserves current applications investments while broadening the accessibility and performance of those same applications.

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