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Alex Berson
George Anderson

Sybase and Client/Server Computing

Second Edition

Sybase 和客户机服务器计算

第 2 版

McGraw-Hill Book Co.
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To Irina, Vlad, and Michelle
ALEX BERSON

To Elvira Ranieri Anderson and my grandfather,
Walter H. Tantzen
GEORGE W. ANDERSON III

Preface

The last few years have seen the transformation of personal computers into programmable workstations organized into local area networks and integrated with mainframe computers. This transformation has been combined with the advances in microcomputer technology, graphical user interfaces, networking, and communications. As technology continues to evolve, users are able to interconnect various platforms efficiently and transparently, and to distribute data and applications across heterogeneous systems and networks. Users' desire to reduce hardware and software development and operational costs, to improve software quality, and to reduce time-to-market for new products can now be realized by moving application development and operational systems from mainframes to more efficient, cost-effective, and powerful workstations. These are the main developments that have given rise to new types of computing and, at the same time, have resulted in a new, often confusing, vocabulary of terms and in a number of new development methodologies. The picture has become even more complex with the advancement and acceptance of open systems and object-oriented technologies.

Prominent among these new computing models is the client/server computing model with its underlying architecture of cooperative and distributing processing. Almost every major business organization is considering a move toward distributed environment, cooperative processing, open systems, object-oriented technologies, and client/server architecture.

These large reengineering and system integration projects require significant investment in time, money, and resources. However, the lack of proper expertise and the confusion surrounding the issues of *open systems, distributed cooperative processing, distributed objects,* and client/server architecture often lead to project failures (actual or perceived) that affect business and computer vendors alike.

Thus, the need to clarify the concepts and architecture of the client/server computing model, coupled with an analysis of a popular and successful implementation of this model, becomes very pressing indeed. Understanding the client/server architecture and relevant issues is central to the success of open distributed systems and cooperative processing. The purpose of this book is twofold. First, the book aims to introduce readers to the power, advantages, and complex issues of the client/server architecture. Second, the greater portion of the book is intended to discuss in great detail the architecture, features, capabilities, installation, and administration of one of the most popular client/server product suites on the market today—SYBASE SQL Server and companion products.

This is the second edition of the book. While the purpose of this book has not changed from the first edition, the new edition is a reflection on several key events related to client/server computing and the Sybase suite of products. Among these events are the following:

- The evolution and wide acceptance of the multitiered client/server computing model.
- The proliferation and growing importance of technologies like data warehousing, the Internet and the World Wide Web, and mobile computing.
- The successful development and implementation of a new Sybase product and marketing strategy.
- The general availability of a significantly enhanced version of Sybase's suite of products—SYBASE System 11.

From that perspective, this book is very timely. It is intended to become the handbook and guide for SYBASE application developers, database administrators, and users alike. Sybase's architecture, advantages, features, and usage are discussed against a background of the evolution of the computing environment, client and server platform specialization, distributed database principles, and the analysis of middleware. Using these topics as a foundation, the book proceeds to analyze in great detail Sybase's suite of client/server products using its new product and marketing strategy, with the focus on the Sybase System 11.

All major issues of the client/server architecture, as well as SYBASE System 11 SQL Server implementations in such environments as UNIX and Windows/NT, are described in great detail. The book analyzes Sybase's data warehousing solutions, including SYBASE MPP and SYBASE IQ; middleware solutions, including Enterprise CONNECT, OmniCONNECT, and ObjectCONNECT; mass deployment products, including SQL Anywhere; Internet access strategy and prod-

ucts including *web.sql*; and application development toolset, including PowerBuilder and Optima++.

Why This Book Is Needed

The amount of information related to the subject of client/server applications is tremendous. Conversely, notwithstanding the popularity of Sybase, there are relatively few publications discussing its products, especially System 11. Some of the material covered in this book, especially references specific to SYBASE System 11 implementation, can be found mostly in various vendor publications, trade literature, and international standards materials.

To sort through all the available client/server-related information and to find a cohesive and complete description of SYBASE System 11 is extremely difficult. That is especially true because a significant portion of the available information is being changed on a regular basis. Various emerging standards and continuous product updates are examples of this dynamic nature. In addition, various client/server implementations and related issues, described in this book, require detailed knowledge of different hardware and software platforms. Specifically, hardware platforms described in this book include mainframes, midrange systems, workstations, servers, and personal computers. Operating systems include MVS, UNIX, Windows, and Windows/NT. Database management system discussions are focused on SYBASE SQL Server, SYBASE MPP, and SYBASE IQ, with a general overview and comparison that covers DB2/AIX, ORACLE, INFORMIX, and Microsoft SQL Server. Readers are also introduced to other extremely important client/server-related issues that deal with presentation management (e.g., X Window System and MS Windows), distributed data management, middleware, and various industry standards.

Unfortunately, even if one decides to read all available literature, it would be very difficult to obtain a clear picture of what client/server computing with Sybase is and how SYBASE works. That is why the authors' personal experience in developing client/server-based open-distributed environments and extended involvement with the Sybase suite of products proved to be invaluable in writing this book.

Who This Book Is For

This book has been written as a result of the authors' experiences in participating in several large-scale system integration projects implementing Sybase client/server architecture in open systems environments.

In discussing the architecture, advantages, and benefits of the client/server computing model, the authors met with many information tech-

nology (IT) managers, system integrators and system administrators, database and data communications specialists, and system programmers working with Customer Information Control System (CICS) and other transaction-management systems, all of whom may be potential readers of this book.

This book can be used as a guide for system integrators, designers of distributed systems, database administrators considering the issues of distributed databases and database management systems (DBMSs) for open systems, data warehouse developers, Internet/Intranet and general local area network (LAN) systems administrators, and network specialists looking for theoretical or practical knowledge of the distributed cooperative processing and client/server architecture.

Sybase-specific client/server implementations described in the book can help IT managers, system administrators, Sybase database administrators (DBAs), network and communications specialists, and application developers to make informed decisions when selecting platforms and products to implement client/server environments. The innovations that became available with SYBASE System 11, especially Omni-CONNECT, Backup Server, Replication Server, SYBASE MPP, and SYBASE IQ, are discussed in such detail that the book should be an invaluable tool for any professional developing distributed client/server applications, dealing with heterogeneous distributed databases, struggling with problems related to applications and database interoperability, data warehousing, and, in general, solving a whole spectrum of issues and concerns related to "downsizing" or "rightsizing." In fact, this book is a must for any system professional who deals with open systems and standards, client/server architecture, and distributed cooperative transaction processing.

Finally, those readers who are looking into such advanced topics as object orientation and high-performance commercial computing using massively parallel processors will find the implications of client/server computing on their favorite technologies.

Prerequisite

Readers with any data processing experience can understand this book. Those who deal only with COBOL batch programs will find this book useful. Those with CICS, SQL, DB2, or any other database expertise, including DBA experience, will benefit. UNIX, Windows/NT, OS/2, NetWare, and MS DOS application developers, system and network administrators, and LAN specialists should not have any problems reading this book. The authors assume readers have little or no previous knowledge about client/server architecture. The book is structured as a self-teaching guide, with the introduction to the client/server architecture

and general related issues placed in the first two parts and the rest of the book dedicated to the Sybase client/server architecture, products, implementation, administration, and application development. Given the level of attention Sybase is getting from users and the stock market alike, the book emphasizes the latest in Sybase—System 11.

Part 1 begins with the evolution of computing environments and an introduction to the open-systems phenomenon. Part 2 discusses Sybase's marketing and product strategy and methodically analyzes various aspects of the client/server architecture, concentrating on critical issues of SQL Server design and features and distributed systems management. An important and emerging issue of client/server computing—middleware—is discussed in Part 3. Part 4 focuses on data warehousing and Sybase's strategy and products for this important market. Part 5 discusses Sybase's approach to the mass deployment market, with its Windows/NT strategy and SQL Anywhere. Part 6 discusses SYBASE SQL Server administration, installation, and tuning, while Part 7 deals with the issue of application development in Sybase environments.

Style Used

This book includes a fair number of diagrams, figures, examples, and illustrations in an attempt to present a lot of rather complicated material in as simple a form as possible. Client/server architecture is a complex, involved, and often-misunderstood subject, so, whenever possible, theoretical issues are explained by practical examples. The same is true about SYBASE—its architecture is very advanced and complex, especially when it concerns System 11 OmniCONNECT, Replication server, SYBASE MPP, SYBASE IQ, and other products. Therefore, the authors have made a serious effort to illustrate Sybase's client/server architecture on the theoretical foundation of client/server computing presented in the first parts of the book.

For those readers interested in theory, the book provides sufficient theoretical overview of the client/server architecture and today's client/server technology. In fact, this book is a comprehensive guide to the client/server theory and architecture, as well as to popular Sybase client/server implementations.

This is a book about a very dynamic subject. All material included is current at the time of writing. But the authors realize that as the client/server computing model continues to evolve, and as vendors like Sybase continue to improve and expand on the quality and functionality of their products, changes will be necessary. The authors intend to revise the book again if a significant development in Sybase's suite of products or in the client/server arena make it necessary to add, delete, or change parts of the text.

What Is Included

Part 1 begins with an analysis of the evolution of computing environments, and introduces the changes in the way computing is done today. The discussion proceeds to describe the specialization of clients and servers in distributed environments. Advanced hardware features beneficial to the server components are explained with examples of several available products. Client specialization is illustrated with the example of presentation management, specifically MS Windows.

This part also introduces readers to a critical issue of client/server interoperability—middleware. Remote procedure calls, structured query language (SQL) interactions, messaging, and related data communications and networking issues in the client/server computing environment are described in sufficient detail.

Part 2 provides a detailed look into the Sybase client/server architecture. SYBASE SQL Server, Open Client, and new SYBASE System 11 components are introduced in this part. Sybase feature set examination includes an introduction to Sybase's version of SQL, Transact-SQL, with an explanation of stored procedures and triggers.

Part 3 deals with middleware and Sybase's suite of robust and feature-rich middleware products, including Open Server, Enterprise CONNECT, OmniCONNECT, ObjectCONNECT, and even Sybase's implementation of the OSF's Distributed Computing Environment (DCE). Part 4 deals with data warehousing and Sybase's strategy and products designed for that environment. SYBASE MPP and SYBASE IQ are discussed in great detail.

Part 5 looks at Sybase's strategy for mass deployment markets, with the focus on the Windows/NT version of the SQL Server and SYBASE SQL Anywhere.

Part 6 deals with the issues of SYBASE installation, administration, and management. This part is especially invaluable for SYBASE DBAs and SYBASE and UNIX system administrators. Practical rules, hints, and guidelines are presented together with essential utilities and commands. Issues like troubleshooting and performance tuning are also covered. An in-depth look at SYBASE SQL Server architecture helps illustrate how involved SYBASE DBAs' and system administrators' jobs could be.

Part 7 introduces readers to application development issues in the SYBASE environment. Previously weak in this area, Sybase has emerged with an excellent suite of application development tools from its PowerSoft division—PowerBuilder and Optima++. This chapter also discusses another popular development tool—Forte.

Acknowledgments

First and foremost, I must thank Jerry Papke and Jennifer Di Giovanna for encouraging us to write this book. I would like to thank George Anderson for his persistence, perseverance, and dedication in working on this book. Very special thanks to my many friends and colleges at Merrill Lynch and Dun & Bradstreet for providing a creative and challenging atmosphere, and giving me an opportunity to learn and work in a very stimulating and challenging environment on the leading edge of computer technology. Specifically, I would like to thank George Lieberman, Steve Wolfe, Jim Heinz, Guy Pujol, Janet Roche, Joe Hollander, John Ginelli, Tom Musmanno, Peter Meekin, Peter Bakalor, and Eric Kim.

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Finally, the key reason for this book's existence is my family. My very special thanks to Irina, Vlad, Michelle, and the rest of my family for giving me time to complete the book, understanding its importance, and giving me never-ending optimism, support, and love. I am especially grateful to my son Vlad for his help in designing the illustration material.

Alex Berson

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Last, because SYBASE is a complex and continually evolving product, it is possible that there are low-level discrepancies between this text and the product as it exists. The text has been repeatedly reviewed and checked by technical personnel at Sybase and several user organizations, so any inaccuracies will hopefully be minor.

George W. Anderson

Contents