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21st-Century Computing

Client/Server Market Study

Pepsi and Paramount Case Studies

■ FROM THE EDITOR ■

Welcome to *DBMS*'s Database World & Client/Server World Supplement! On the occasion of this colossal conference and exposition, we've assembled this special booklet to guide you through the exhibit aisles, while informing and entertaining you in what little free time you have. In these pages you'll find a handy conference guide and exposition map (see page 12), along with articles about the client/server technology of today and tomorrow. If you can't attend Database World & Client/Server World (this supplement ships to *every* DBMS reader), we hope you enjoy the articles nonetheless.

Unlike the main *DBMS* section, which focuses primarily on client/server implementation details, this supplement offers a birds-eye view of the technology (sorry, no C++ program listings here). It includes a market study from database technology analysts David McGoveran and Victor Lewis, a client/server management primer from enterprise-computing consultant John K. Piraino, and case studies of client/server systems in action at Pepsi-Cola and Paramount Pictures, by computer industry analyst and consultant Lance B. Eliot.

If you received this supplement at Database World & Client/Server World, don't miss the December 1993 issue of *DBMS*. You can find it on newsstands, or for subscription information you can call 800-334-8152 from the U.S. and Canada, or 619-745-0685 from all other countries.

From the *DBMS* magazine staff, thanks for reading and enjoy the show!

Dave Kalman
Editor in Chief

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It takes client/server technology specialists to analyze the client/server market, or so claim McGoveran and Lewis. Unlike other studies that count "seats" or "sites," this one counts the enabling components of client/server systems, with surprising results.

Enterprise-wide technology consultant Piraino demonstrates that client/server is more than a technology — it's a management philosophy that flattens the organization and empowers individuals. In this article, he describes strategies for moving your enterprise into the 21st Century.

Pepsi-Cola and Paramount Pictures have committed to client/server, yet both are moving cautiously to the new technology. These case studies relate the first-hand experiences of front-line IS professionals in two industry giants.

A New View of the
CLIENT/SERVER MARKET

THIS MARKET ANALYSIS ASSUMES THAT SEVERAL

TECHNOLOGIES, ARCHITECTURES, AND STANDARDS MAKE

CLIENT/SERVER COMPUTING POSSIBLE, AND THAT THEIR

COMPONENTS COMPRISE "THE CLIENT/SERVER MARKET."

BY DAVID MCGOVERAN
AND VICTOR LEWIS
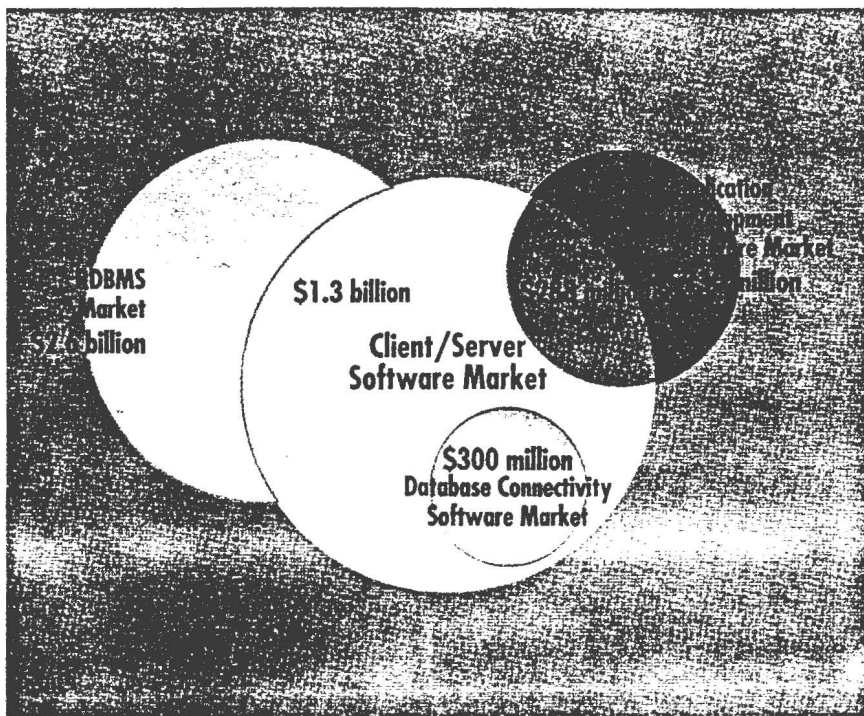
Figure 1. Total client/server software market: $1.888 billion.

E veryone knows that client/server is all the rage, but how does one quantify this observation? What exactly is the size of the client/server software market? Many market research firms have addressed this question. The published answers, generally phrased in terms of dollars or shipments, vary by as much as an order of magnitude. How can all of these studies be right when they apparently disagree so much?

David McGoveran is a frequent DBMS *contributor. He has been president of the database consulting firm Alternative Technologies (Boulder Creek, Calif.) since 1976. He is author (with Chris Date) of* A Guide to Sybase and SQL Server *and publisher of in-depth technical studies of major DBMSs.*

Victor Lewis is president of Information Technology Solutions (Morgan Hill, Calif.), a marketing research and information systems consulting firm. He was formerly director of Research Systems at Dataquest.

Part of the problem is that each market research firm has its own (a) definition of client/server, and (b) method of attempting to quantify the market. Where those methods depend on surveying users or vendors in an attempt to gauge client/server acceptance and adoption, the lack of consistency among user and vendor terminology further confuses the results. When it comes to assessing the size of the market in dollars or shipments based on vendor information, the results don't mean very much because the numbers mean different things to different vendors. Some vendors, for example, count shipments by the number of service contracts (without regard to the number of licensed products in a given category); others count shipments by the number of users permitted by the product license.

Another aspect of the problem is the difficulty in obtaining vendor information regarding shipments or revenues for a particular product category. The data obtained is impure in the sense that few vendors maintain good records, often change the bundling of product components, and may require the purchase of multiple products to implement a particular function. For example, it is not unusual for a vendor to package the essential elements of its database connectivity software along with other products, requiring two or more purchases to implement database connectivity. In particular, the client portion of the database connectivity software often comes bundled with an application development tool, whereas the server portion often comes bundled with the database product. This leads to nonsensical survey results. Researchers' lack of understanding of the technical purpose and functionality of product components further compounds the difficulty in assessing the market.

Earlier this year, Alternative Technologies and Information Technology Solutions jointly introduced a new assessment of the size of the client/server software market using a methodology and a model of client/server technology developed by Alternative Technologies. This analysis assumed that several technologies, architectures, and standards make client/server computing possible, and that their components comprise "the client/server market." In our opinion, the methodology has produced more realistic predictions and new conclusions by eliminating areas we've identified as flawed in other research.

Unlike studies that attempt to answer the more ambiguous question of whether products are being used for client/server applications, this study measured the client/server products being purchased.

We based the study on a conservative definition of the client/server model. In particular, we defined a client/server system as one in which a client-based application accesses a relational database management system (RDBMS), and uses database connectivity software, typically incorporating some form of SQL. The solution incorporates application development software that coexists with the RDBMS and uses database connectivity "middleware."

Not all application development software or RDBMS products can support client/server computing. Therefore, we can define the client/server market using vendor-supplied data on software licenses for products that are "client/server enabled." We assume that purchasers of client/server-enabled product licenses intend to develop client/server applications.

We surveyed the leading companies in the RDBMS, application development tools, and database connectivity software markets to obtain base data directly. For companies that would not provide data, we used the best available estimates based on publicly available company data and market research publications. Table 1 (page 9) shows the list of companies and products the survey covered. Note that some products and companies have merged and new products have shipped since we did our research. This task required: (a) identification of how products were used with client/server applications, (b) an understanding of the relationship between products, and (c) a way to correlate data on related products. We were able to meet requirements (a) and (b) because of our unusual position as technical industry analysts, providing technical and marketing consulting to vendors and strategic, design, and development consulting to end users. We met requirement (c) using our new model of the functionality required for client/server applications, and the interrelationships between functional components.

After extensive analysis, we determined the percentage of software being used in client/server-enabled applications, which serves as the primary indicator of

the growth and acceptance of client/server technology. Our survey was product-oriented, in contrast to either financial analysts' company-oriented surveys or market researchers' user-oriented surveys. We divided the base data we obtained into product classes. This study provides, for the first time, a set of internally consistent, derived data about the product class (and client/server). It also differentiates uniquely between products that are designed for client/server use and those that are not.

Using information about what the survey numbers meant to different vendors, we first normalized the survey data. We used these numbers to derive counts of equivalent licenses of an abstract standard product. This step was necessary because of the many ways in which vendors bundle and sell database connectivity software. Also, because of our interest in characterizing opportunity, we had to consider shipments and the installed base of those products that are designed for use with database connectivity software. In most cases, such products cost more than those that you cannot use with database connectivity software.

In the study, we made every effort to state our assumptions clearly and openly. One such assumption concerns our definition of "RDBMS product." This assumption is so important that we state it here:

Critical Assumption: We take a conservative view about the definition of a relational DBMS; thus, we did not include many products such as dBASE or Paradox in our sizing of the (RDBMS) market. (We did count client/server-enabled versions of Paradox for its application-development capabilities.)
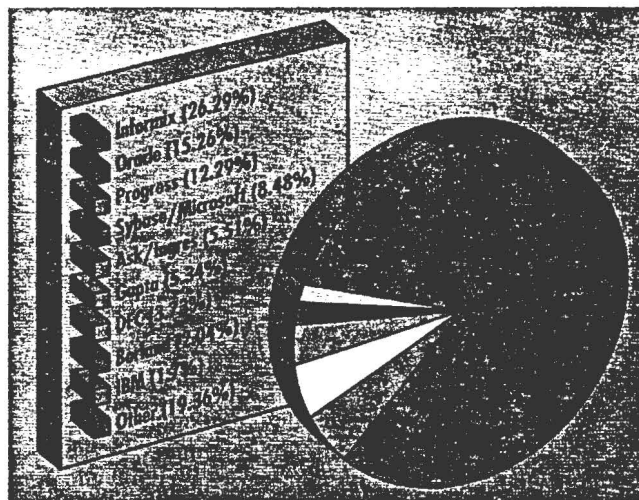

FIGURE 2 The market shares, by licenses, of installed client/server-enabled RDBMSs.

Definitions

The following are the key terms we used in the study. These definitions are important for understanding the results of this study. Other studies may differ in their use of these terms. We've taken care to make these definitions precise.

Server. A server is a logical process that provides services to requesting processes. A server may be quite complicated in its implementation; however, this complexity remains hidden from other parts of the system. The logical process may consist of a single physical process, or of numerous communicating processes and distributed processes. In fact, a server may depend on other servers from which it requests services. Ideally, the server has responsibility for managing all the requests it receives from other processes, including request queue management, buffer management, execution of the service, results management, and notification of service completion. It generally does not send results to the requester until the requesting process tells it to do so. It is up to the server to manage synchronization of services and communications, once a request has been initiated. You should not confuse the term "server" in this article with a piece of hardware (such as a special-purpose processor dedicated to running server software). There are many kinds of servers, including network, file, communications, mail, terminal, and database servers. A database server processes database requests.

Client. Processes that request services from a server are called the clients of the server. There is no concept of a client without a server. We call a process a client only if it has a server — it is not a client by virtue of its own structure. One characteristic that distinguishes a client from its server is that the client may initiate a communications transaction (as distinct from a database transaction) with the server, but the server never initiates a communications transaction with the client. (This does not preclude "event notification," wherein the server notifies interested clients of some server-detectable event.) It is the client's task to initiate communications, request specific services, acknowledge service completion notifications, and accept results from its server. While the client may request either synchronous or asynchronous notification of service completion, it does not manage synchronization of services and communications. In a client/server architecture, many clients may "share" a single server and one client may access many servers.

Client/Server Communication. Client/server communication occurs between client and server. In a particular installation, it can involve a variety of mechanisms: LAN, WAN, wireless, or operating system task-to-task communication services through mailboxes, shared memory, and so on. However, a client/server architecture should be independent of these methods and the physical connection between them. A client/server architecture supports transparent reconfiguration or even replacement of the client/server communication interface, so that you don't have to change the applications and database processing when the communication medium changes. In particular, the client and the server need not reside on physically distinct processors or nodes. Whether you physically separate a client process and a server process, or install them on the same machine using shared memory for communications, the architecture should let you change their locations transparently.

Client/Server. For the purposes of this article, we use the term "client/server" in the restricted sense of database client/database server, a class of client/server in which the server manages a database. Other possibilities include file client/file server, mail client/mail server, communications client/communications server, and various hybrids. The server is a particular form of DBMS that can manage sessions with multiple clients. Typically, the database client makes requests to the server using the native database language. That database language may consist of DML (data manipulation language), DDL (data definition language), TML (transaction management language), and DCL (data-access control language) functionality; SQL is an example of such a database language.

Middleware. Middleware is software that resides between applications and services such as data, communications, processors, and user interfaces. Middleware is typically isolated from resources by APIs (application programming interfaces) that conform to emerging standards. Middleware can take the form of network operating systems, languages, drivers, remote procedure-call facilities, gateways, routers, or transaction monitors.

Application Development Software. Application development software provides the development and runtime environment for applications. For purposes of the present study, it does not include upper CASE (formal design) tools. In this study, we include only those application development products capable of supporting client/server applications. The shipment volume and installed base size of client/server-enabled application development software are important for estimating the size of the database connectivity market, because application development tools often include and/or require database connectivity functionality. For the connectivity software segment (as compared to the gateway segment), we correlated application development software licenses with connectivity licenses.

Database Connectivity Software. Database connectivity software consists of a broad range of middleware that enables clients to communicate with database servers; in other words, database
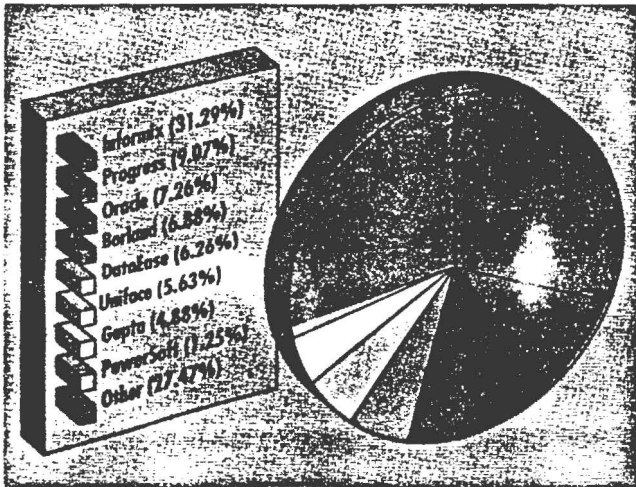
FIGURE 3 The market shares, by licenses, of client/server-enabled application development software.

Informix (31.29%)
Progress (9.07%)
Oracle (7.26%)
Borland (6.88%)
Datalase (6.26%)
Uniface (5.63%)
Gupta (4.83%)
PowerSoft (1.25%)
Other (27.47%)
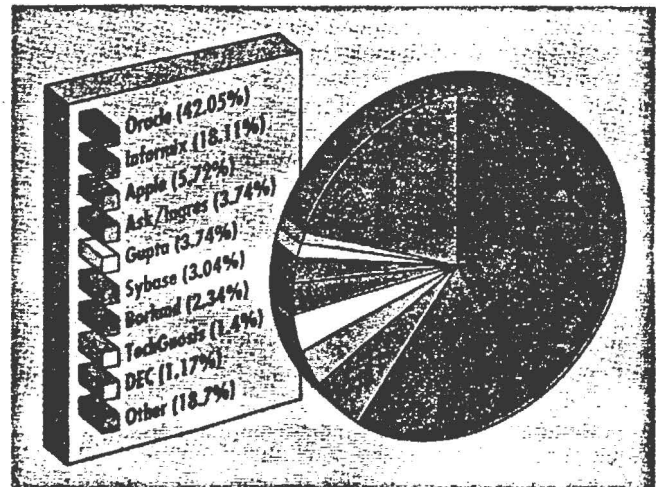
FIGURE 4 The market shares, by licenses, of client/server-enabled database connectivity software.

Oracle (42.05%)
Informix (18.11%)
Apple (5.72%)
Ask/Ingres (3.74%)
Gupta (3.74%)
Sybase (3.04%)
Borland (2.34%)
TechGnosis (1.4%)
DEC (1.17%)
Other (18.7%)

connectivity software enables client/server communications. It minimally includes a client API, transport support (network or communications link, formats, and protocols), and a server API. We divide the database connectivity software market into two segments: the connectivity software market segment and the gateway market segment. These are defined below.

Critical assumption: Today, RDBMS is the most important database category: Based on our research and published market analyses, 80 to 90 percent of production databases are expected to be relational by 1996 and will bring in twice the yearly revenues of nonrelational DBMS

shipments. Therefore, we restricted our study to RDBMS-supporting products.

Connectivity Software Market Segment. The connectivity software segment consists of those database connectivity products that do not run on a separate platform, as does a gateway. Vendors typically license database connectivity software on a per-client, per-client application, or per-user basis. Note that some database connectivity products function as both database connectivity interfaces and as gateways, at the user's discretion.

Gateway Market Segment. The gateway market segment consists of those database connectivity products that reside on a separate platform situated between

the client platform and database server platform. Note that some companies offer a bundled package of both the gateway software and the gateway platform.

Critical assumption: Some people in the industry sometimes refer to a bundled software/hardware package as a gateway, but we do not include gateway hardware costs in our assessment of the market.

Vendors typically license gateways on a per-host platform basis. The price depends on the type of database server (both RDBMS and platform); the gateway platform power and resources implicitly limit the number of users or client applications the RDBMS can support.

TABLE 1. A list of companies and their client/server-enabled products considered in this study

Application Development Software

Company	Product(s)
The Ask Group Inc.	Windows 4GL
Borland International Inc.	ObjectVision
	Paradox
Channel Computing*[1]	Forest & Trees
Cognos Corp.	Powerhouse 4GL
DataEase International Inc.*	DataEase
Gupta Corp.	SQL Windows
	Quest
Informix Software Inc.	4GL Family
	Wingz
Matesys[2]	ObjectView
Microsoft Corp.*	Visual Basic
Oracle Corp.	SQL*Forms
	Pro*C
Powersoft Inc.	PowerBuilder
Progress Software Corp.	Progress 4GL
Sybase Inc.	APT Workbench
Uniface Corp.	Uniface

Relational Database Management Systems

Company	Product(s)
The Ask Group Inc.	Ingres Intelligent Database
Borland International Inc.	InterBase
DEC	Rdb/VMS
Gupta Corp.	Gupta SQLBase
IBM*	DB2
	SQL/DS
	SQL/400
	OS/2 & AIX Data Manager
Informix Software Inc.	Informix SE
	Informix On-Line
Microsoft Corp.	SQL Server
Oracle Corp.*	Oracle
Progress Software Corp.	Progress RDBMS
Sybase Inc.	SQL Server
Tandem Computer Inc.	NonStop SQL
Unify Corp.*	Unify 2000
XDB Systems Inc.*	XDB

Database Connectivity Software

Company	Product(s)
Apple Computer Inc.*	DAL
The Ask Group Inc.	Ingres Net
	Embedded SQL precompiler
Borland International Inc.*	SQL Link
DEC	SQL Access
Gupta Corp.	Gupta SQL Network
	Gupta SQL Router
Informix Software Inc.	Informix-Net
	Informix-SQL precompilers
Micro Decisionware Inc.	PC/SQL-Link
Oracle Corp.	Oracle Call Interface
	SQL*Net
Sybase Inc.	DB-Library
	Net-Library
	Open Client

Gateways

Company	Product(s)
The Ask Group Inc.	Gateways
Gupta Corp.	Gupta SQL Gateways
	Gupta SQL Host
Information Builders Inc.	EDA/SQL
Micro Decisionware Inc.	Gateway for DB2
Oracle Corp.	SQL*Connect
	Gateways
Sybase Inc.	Open Server
	Gateway
TechGnosis Inc.	SequeLink

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* Data not acquired directly from vendor. [1] Channel Computing was recently acquired by Trinzic Corp. [2] Matesys was recently acquired by KnowledgeWare.

Note that some companies were acquired and new products were released after this study was completed.

the importance of developing systems that match the business: "We don't wait around for change, we stay ahead of it."

Pepsi-Cola, the flagship division of PepsiCo, has blossomed far beyond being a single carbonated soft-drink company. Today, they are a total beverage company, offering bottled water, Lipton iced teas, fruit drinks, their venerable Pepsi core products, and more.

With a highly distributed environment, including more than 270 LAN servers (primarily IBM PS/2 Model 95s) running Novell Netware, Panatera is involved in the rollout of applications for IBM-compatible PC desktop computers that use centralized HP 9000s as database servers.

On the desktop, the client/server applications use Microsoft Windows, while the database servers on the HP 9000s use Sybase SQL Server. Primarily using Powersoft's PowerBuilder as their main development tool, special lab teams work rapidly toward developing and implementing new systems. "Besides using our special lab teams for development," comments Panatera, "we also provide second- and third-level support for our help desk."

Many firms are just realizing that, as client/server applications enter the field, user-initiated questions about the applications and their associated technologies can flood their internal help desk. Panat-era and his crew have anticipated the potential need for assistance, and provide various escalation levels to make sure that questions get answered.

Also, the 270-plus nodes are interconnected via a WAN and allow the organization to roll out new applications quickly, using electronic software distribution. This helps the technology keep pace with the business. The distributed nature of their technology fits well with the recent company-wide reorganizations that have shifted resources to focus on front-line employees (salesmen, drivers, and so on).

When asked about important tips for other adopters of client/server systems, Panatera urges that organizations give training a top priority. "Training for the users is a key factor in success," he notes, "and you must do the training up front, before you place the systems out into the field, and then continue to do follow-on training as required."

Of the various applications fielded, Panatera is particularly pleased with one of the new customer information systems now being implemented. Under the new system, customers with multiple Pepsi products now receive a single invoice, rather than the old way of multiple invoices.

Pepsi-Cola's customer account specialists and office staff are experiencing improved communication with customers as a result of the system. According to Panatera: "Reengineering the business also means reengineering how you use information systems, and the focus must be on delighting the customer."

Every day, approximately $77 million of Pepsi beverages are bought and consumed. Though the sales number may seem staggering today, PepsiCo has a goal of reaching $100 billion in sales in the next decade (yearly revenues are currently $25 billion). With such high expectations of tremendous growth comes the need for tremendous computing.

Clearly, client/server and good management are playing a critical role in the fulfillment of the Pepsi challenge, and that's sure to delight any customer.

Conclusion

Sound management of client/server efforts is essential to its successful use. Information systems managers and staff must be willing to take risks, but as illustrated by both Paramount and Pepsi-Cola, the risks can be reduced by adopting an incremental strategy that rolls out new systems, step by step.

The next time you find yourself sipping a Pepsi in your local movie theater (watching a Paramount film), think about the role of client/server in bringing you all that enjoyment. You gotta have it. ■

C/S MARKET (continued from page 9)
Findings

We can consider the overall market for client/server software a portion of the markets for each of three product categories: RDBMS, application development, and database connectivity software. Figure 1 shows this relationship. (See page 6.) The client/server software market is conservatively $1.888 billion, divided among RDBMS licenses ($1.3 billion), application development software ($288 million), and database connectivity software ($300 million). We estimate that these numbers might have been two to four times higher, had we not taken such a conservative view and had we included all possible vendors.

These findings are three to ten times higher than estimates by market researchers such as Business Research Group, Dataquest, Forrester, Gartner, IDC, InfoCorp, and Sentry. We believe this is so because these market researchers use inadequate models of the client/server application development process. They do not adequately account for the subtleties of product and component functionality, nor for variations in vendor licensing and accounting practices. For example, some vendors report licenses in terms of "seats" while others report "sites." Market researchers sometimes fail to recognize these serious differences, let alone more subtle variations, in reported installed bases.

Relational Database Market

The total RDBMS software market has an installed base of about 1.15 million licenses, of which about 590,000 are client/server-enabled. Shipments for 1992 were about 236,000 licenses, valued at about $2.6 billion, of which about half ($1.3 billion) are client/server enabled. The RDBMS installed base is growing at a compound annual growth rate (CAGR) of about 37 percent, with revenue growth at about 24 percent. Figure 2 (page 7) shows the market shares, by licenses, of installed client/server-enabled RDBMSs.

Application Development Software Market

The application development software market has an installed base of about 1.2 million licenses, of which about 799,000 are client/server-enabled. Shipments for 1992 were about 565,000 licenses, valued at about $730 million, of which $288 million are client/server-enabled. The application development software installed base is growing at a CAGR of about 42 percent, with revenue growth at about 27 percent. Figure 3 (page 8) shows the market shares, by licenses, of client/server-enabled application development software.

Database Connectivity Software Market

The total database connectivity software market has an installed base of about 900,000 licenses, of which 856,000 are client/server-enabled. Shipments for 1992 were about 228,000 licenses, valued at about $300 million. The database connectivity software installed base is growing at a CAGR of about 40 percent, with revenue growth somewhat higher at 69 percent. Figure 4 (page 8) shows the market shares, by licenses, of client/server-enabled database connectivity software.

Conclusions

This study has produced a picture of the acceptance and growth of client/server computing technology that differs from previous estimates. Other mainstream financial and market analysts have seriously underestimated the opportunities for this important technology. The market remains somewhat ill-defined, making data for studies of this nature difficult to obtain and analyze. In particular, the market cannot be understood properly based on simplistic user surveys. We have taken an approach based on a detailed technical understanding of the market. The resulting data will lead to additional studies and conclusions. ■