

Borland's Golden Gate Architecture:

Bridging Client/Server and Internet Technologies for Corporate Developers

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I. Executive Summary

In today's world of increasing competition and accelerated change, IT developers need both high-productivity tools and a scalable architecture with which to build their applications. More importantly, the tools must enable developers to build applications that fit into their own corporate IT architecture fully integrated in with existing applications and infrastructure services to ensure reliability and manageability.

Millions of application developers world-wide rely on Borland tools to create high-performance, scalable client/server applications. As corporate developers expand their scope to include the Internet and internal corporate "Intranets", Borland's technological strengths in high-performance, reusable component technology will help organizations realize a larger return on investment with better use of information while ensuring that applications can fit into their corporate information architecture.

Although the corporate "Intranet" market is growing rapidly, the first generation of Internet development tools do not have the maturity of today's client/server tools. Corporate developers need Internet tools that build on cost-effective client/server technology and offer an open scalable architecture based on high-performance, reusable components, scalable database technology and application server capabilities.

Borland, with its heritage in object-oriented compiler technology together with Open Environment Corporation's scalable Entera technology, is in a unique position to fill the need for corporate client/server and Internet tools. Borland's Golden Gate initiative is a bridging strategy that focuses on helping IT developers combine the best of the client/server and Internet architectures for departmental and enterprise applications. The objective is to accelerate the creation of corporate Intranet applications without compromising the security and reliability of business-critical systems. Borland will provide a family of interoperable tools with an open, scalable architecture that reduces development and maintenance costs.

Borland is unique in offering a Scalable Architecture based on four key technologies:

- *World's fastest optimizing compiler technology:* Borland has developed the world's fastest optimizing native code compiler technology. This provides customers a competitive business advantage with the fastest applications and the best use of information in their organizations.
- *Reusable component technology:* Borland has delivered a highly reusable object component architecture that supports Rapid Application Development. This allows organizations to deliver applications more quickly and lower development and maintenance costs by reusing code.
- *Scalable database technology:* Borland has scalable high-performance relational database and connectivity technology for accessing corporate database servers and legacy systems. This ensures that organizations can take advantage of existing systems and integrate them across the enterprise.
- *Cross-platform application server technology:* Borland is developing cross-platform application server technology that allows customers to create scalable multi-tier applications. This allows customers to broadly deploy applications with the highest performance and at the lowest cost.

These technologies provide Borland with a Scalable Architecture that spans from desktop application development, to two-tier client/server as well as to multi-tier enterprise wide Intranet applications. Borland has also developed the marketing partnerships and support to deliver solutions to customers.

- *Strategic partnerships:* Borland has developed strategic partnerships with leading technology providers including licensing agreements with Microsoft, Sun, Netscape and others.
- *Marketing infrastructure:* Borland has expanded its marketing infrastructure by adding Open Environment's direct sales force, VAR partnerships and System Integrators to its own.
- *World-wide client/server support:* Borland offers a range of support products and services that offer a complete solution to corporate customers in both decentralized and centralized IT organizations.

Borland is uniquely able to combine these technological and market strengths to provide customers with breakthrough products that deliver high-performance, scalable application development for the enterprise.

II. An Evolutionary IT Architecture

Today's Information Technology (IT) departments face a dilemma: How do you create a competitive advantage for your company by developing, deploying and managing distributed applications that scale across the LAN, WAN and Intranet while preserving your investments in systems, applications, information and people? Simply put, IT organizations are asked to build the future without breaking systems that maintain the business today.

A multi-tier distributed computing architecture has the potential to provide better, more timely information across the enterprise at a lower cost than the current combination of PC LAN, two-tier client/server and mainframe applications that have been developed in most organizations. A key part of the improvement will be the development of an overall corporate computing architecture that enables IT to manage the integration of departmental applications into an overall enterprise system.

Given the rapid evolution of multi-tier architectures built around corporate Intranets, web servers and thin-client browser-based applications, it's difficult to predict which technologies will become standards and which will fall by the wayside. IT managers must evolve their current systems one piece at a time and ensure that each application brings them one step closer to the desired multi-tier architecture.

Borland's Golden Gate Architecture

Integrating Client/Server and the Internet into the Enterprise

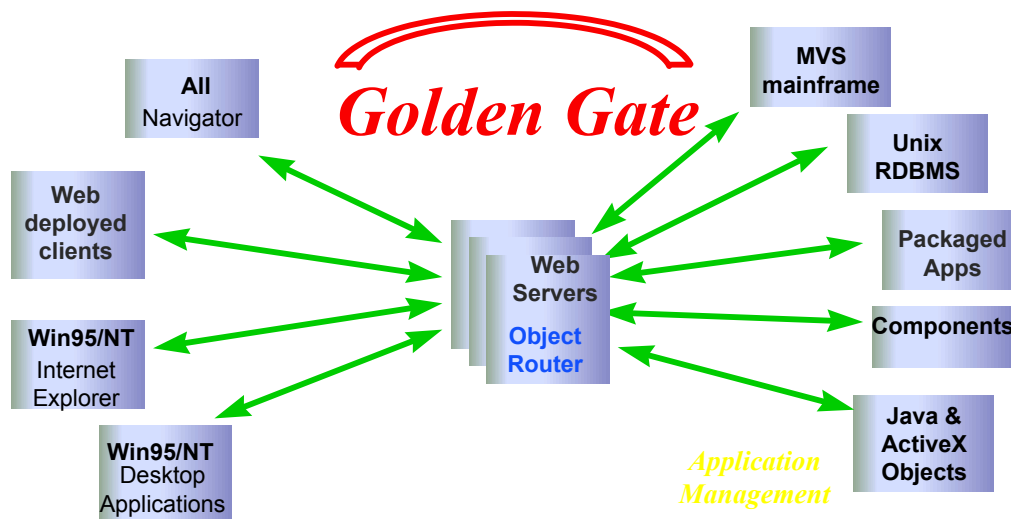


Figure 1 - Borland's Golden Gate architecture allows you to leverage existing systems

Corporate developers face a myriad of challenges along the way including:

- Integration: How do you integrate existing production applications, systems, skills and people?
- Development: How do you break through the application backlog to build applications more quickly?
- Scalability: How do you ensure that applications can deal with large volumes of data and users?
- Application Control: How do you combine the ease of Windows with the control of the mainframe?
- Management: How do you provide reliability and security over distributed data, objects and applications to ensure that systems are as robust, predictable and performant as existing mainframes?
- Standards: How do you reduce the risk of technology without getting caught in a standards war?

With over 12 years of technical leadership in development tools, Borland understands what it takes for developers to deliver robust applications on time. Borland understands the need for corporate IT departments to rapidly build highly scalable and reliable business-critical applications. Borland's development tools are based on the Golden Gate architecture which provides a bridging strategy between today's client/server computing architecture and the emerging multi-tier Intranet architecture. The goal of the Golden Gate architecture is to give corporate IT developers a competitive advantage in building applications that can be more easily managed and controlled while improving the integration of information across the enterprise.

Bridging to the Future

Borland's Golden Gate initiative is designed to provide a bridge between:

- *Client/Server and Internet architectures*: to allow developers to build applications today that fit into multi-tier architecture of the future thereby preserving current investments in skills and technology
- *Decentral IT and Central IT*: so that organizations can integrate departmental applications into an overall enterprise information system providing better information flow and management control
 - *Microsoft and Netscape platforms*: to provide interoperability between competing technology standards thereby reducing the risk of platform selection

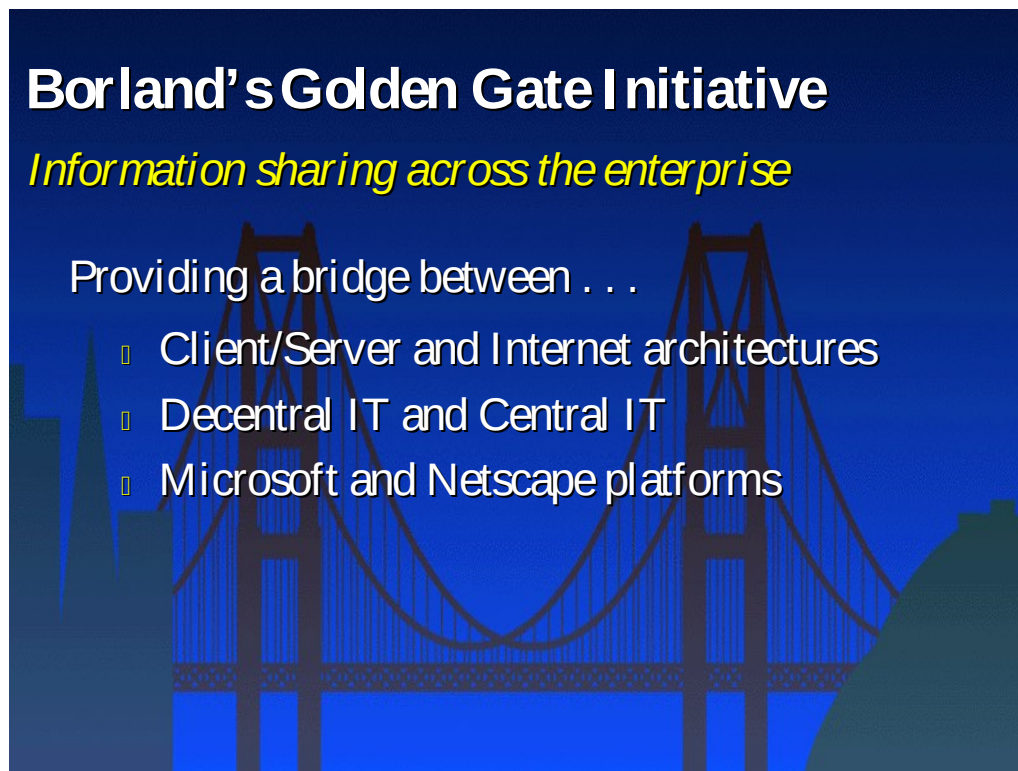


Figure 2 - Borland's Golden Gate initiative allows you to evolve your IT architecture

III. Borland's Golden Gate Initiative

Borland recognizes that IT departments need to have an evolutionary approach to building an enterprise computing architecture that combines the best of mainframe environments, two-tier client/server applications and PC LAN applications. The Golden Gate initiative is based on an enterprise computing architecture that allows IT developers to rapidly build scalable, manageable applications today that make the best use of their current investments in technology, systems and people and fit in with the evolving corporate Intranet infrastructure.

The Internet in general, and the corporate Intranet in particular, cut across many different application areas. As such, a variety of different tools are required to build these applications. In your development team's hands, Borland's tools enable your team to solve many of the application challenges facing your organization whether its the need for high performance enterprise Internet-enabled client/server applications, cross-platform web-delivered applications or departmental data-driven web-server applications. Borland is addressing developers needs to build a broad range of applications.

	Internet-enabled client/server applications	Web-delivered applications	Data-Driven web-server applications
<i>Target user</i>	Corporate and departmental client/server programmers	Corporate and departmental Internet programmers	Corporate and departmental database developers
<i>Needs</i>	Need to add Internet capabilities to traditional Windows client/server applications	Need to create secure, cross-platform Web-delivered applications, interactive Web pages and lightweight applets	Need to make databases accessible across corporate Intranets
<i>Key issues</i>	Scalability, performance, open integration with legacy systems	Productivity, cross-platform capabilities, adherence to emerging Internet standards	Ease of development, access to corporate data
<i>Examples</i>	Order entry systems, customer tracking, inventory management systems	On-line commerce, information kiosk, collaborative applications	Corporate phone lists, HR information systems, project tracking, financial reporting
<i>Borland solution</i>	Delphi Client/Server Suite, Borland C++, InterBase, OLEnterprise, Entera	Open JBuilder, InterBase, InterClient, OLEnterprise, Entera	IntraBuilder, InterBase, Entera

Borland is focused on meeting the needs of these different audiences with a family of interoperable development tools. This allows corporations to build more integrated solutions faster and at a lower cost.

Golden Gate Objectives

By providing development tools that fit into the overall Golden Gate architecture Borland will achieve the following objectives:

- *Accelerate the creation of Intranet applications:* Borland is applying its strengths in Rapid Application Development (RAD) and reusable component technology to simplify and accelerate the development of corporate Intranet applications. This provides businesses with a competitive advantage for better information management and closer relations with customers and suppliers.
- *Seamlessly combine the Internet into client/server development:* Borland will allow developers to take advantage of open, high-performance client/server technology in their Internet applications. This allows developers to get the "best of both worlds" as client/server and Internet technologies converge. Rather than having to choose between technologies, Borland will allow developers to use the skills they already have and build bridges to new technologies such as Java and JavaScript.
- *Provide a family of interoperable development tools:* Borland's development tools are fully interoperable so that developers can use the products and technologies together in their organization. Many of the Borland tools share common technologies including high-performance

- compiler technology, reusable component technologies, scalable database technology, and cross-platform application server technology.
- *Provide a scalable architecture for the Internet:* Borland's development tools can scale from departmental Intranets to secure large-scale public Internets. This allows organizations to reduce the expense of building large applications by eliminating unnecessary retraining and retooling expenses. Borland's cross-platform application server technology fully support the integration of existing legacy systems so that they can be combined into secure Internet applications.
 - *Support Internet standards:* Borland is committed to supporting existing and emerging Internet standards so that corporate developers will be able to take advantage of open standards. Borland fully supports Internet standards such as Java, JavaScript and JDBC, industry standards such as TCP/IP, DCE and CORBA, as well as Microsoft standards such as ActiveX, ISAPI, OLE, DCOM and ODBC. Borland is going beyond simply supporting Internet standards; through close technical partnerships with Sun, Netscape and Microsoft, Borland is helping to shape standards to ensure the open interoperability of tools.

Golden Gate Delivery Phases

Borland has already completed the first three phases in the delivery of the Golden Gate architecture:

- I. *Acquisition of Open Environment Corporation:* Borland entered into a definitive agreement to acquire Open Environment Corporation in May. Open Environment's Entera and OLEnterprise products allow Borland to deliver an open, scalable architecture for its enterprise development tools with complete scalability, reliability and manageability. Because of their open architecture, these products work with the Borland development tools today.
- II. *Internet-enablement of client/server tools:* Borland completed this phase during the summer of 1996 with Internet-enabled versions of its products including Delphi Client/Server Suite and Borland C++. This allows customers to add web client and server capabilities to their existing applications without having to learn new programming tools or techniques. These products are fully compatible with both the Netscape and Microsoft browsers and web servers.
- III. *New Data-driven web-server tools:* In September, Borland delivered a new product, IntraBuilder, which is a complete toolset for easily building and maintaining live data-driven Intranet application that run on the web server. IntraBuilder gives professional developers the full functionality of their corporate database on the web. IntraBuilder fully supports Netscape and Microsoft browsers and web servers and is based on the industry standard JavaScript language.
- IV. *New Java-based tools:* Borland will be releasing a new Java-based development tool, Open JBuilder (previously codenamed "Latté"), which provides developers a high productivity environment for creating cross-platform web-delivered applications for departmental and enterprise use. Open JBuilder is currently in beta test and incorporates the latest version of the Java Beans component specification that Borland has created with Sun.
- V. *Enterprise-enablement of client/server tools:* Once the acquisition of Open Environment is complete, expected in November 1996, Borland will begin announcing new versions of its client/server development tools based on Delphi and C++. These tools will provide more integrated support for Open Environment's multi-tier scalable architecture and will also serve as a "component foundry" allowing developers to create reusable ActiveX components that can be used across the enterprise.

III. Client/Server meets the Internet

The Growth of the Intranet

Until earlier this year, few people outside of academic research environments knew about the Internet. Today, the Internet provides the most efficient, cost-effective way to collect and disseminate information. Some startling statistics about the Internet:

- 6.7 Million host computers make up the Internet today
- 70,000 Networks connect the Internet
- Over 40 million users in more than 100 countries comprise the user base
- Every 2 minutes of every business day, a new business joins the Internet community
 - Over 100 million users expected by 1997

The most impressive growth, however, is in the area of internal corporate networks or "Intranets". In fact, according to IDC:

- 89% of large corporations this year are building corporate Intranets
- 43% say browser will be the primary interface to new application development
 - Intranet development represent 25% of US IT budgets

Furthermore, by the year 2000 the Intranet market is expected to be 10 times that of the public Internet representing:

- 4,500,000 annual Intranet servers shipments
 - Over \$12 billion world-wide

One big reason for the phenomenal growth of the Internet is that its flexibility allows companies to cut costs for distribution of information, increase productivity through better communications and enhance revenues through a better market presence. The Internet is quick, inexpensive and ubiquitous. Not surprisingly, the use of the Intranet is considered a strategic resource in most corporate IT organizations as a way to more easily distribute information in a cost effective manner.

The majority of Intranet applications today are constructed outside a company's existing network, for security reasons, and utilize the World Wide Web, which offers simple communications protocols, languages and user friendliness through graphical interfaces.

Internet development tools, and the Intranet in particular, are growing at an even greater pace than two-tier client/server tools. The Intranet is the fastest growing use of Internet technology. It allows corporate customers to take advantage of the cross-platform scalable Internet architecture to deal with both structured relational corporate data and unstructured information including rich formatted text, bitmap diagrams, multi-media content and discussion or workflow information.

The Range of Intranet Applications

Because of its widespread potential the Intranet cuts across many application areas ranging from informational applications to business critical transaction systems. Here are just a few examples of how the Intranet is being used:

- *Increased competitiveness through technology:* T. Rowe Price has built a web-based multi-tier application that gives individual investors access to existing 401K retirement planning portfolio management software in a secure, scalable environment. The application was built using Delphi Client/Server Suite and Entera.
- *The changing nature of commerce:* Via World Network created an on-line secure reservation system with a multi-tier architecture to support on-line transactions and data analysis. The system is built using Java.

- *Improved access to information:* Bank of America has built an information system to provide tighter ties and better data sharing with their suppliers. The application is built using IntraBuilder.

The Needs of Intranet Developers

By using the Intranet as an open, standards-based networking system, developers are able to eliminate some of the complexity of traditional network applications and deliver applications at lower cost. The resulting applications are easy to use and portable. However, the tools for creating Internet applications are still evolving from the first generation. Corporate developers need Internet tools that offer high performance, reusable components, scalable database technology and application server capabilities.

- *The need for high performance:* The first generation of Internet development tools fail to deliver performance advantages of native code compiler technology. Most Java tools use a p-code interpreter, similar to that used in Basic interpreters, and as a result application performance is slow. Performance degradation may be less noticeable for small-scale demonstration "applets" on web sites, but for corporate applications which need to retrieve and analyze large volumes of data to improve decision making, performance is critical.
- *The need for reusable component technology:* Internet developers need to be able to quickly bring products to market with high productivity Rapid Application Development tools. As with client/server tools, this means they need a reusable component architecture, a large library of reusable components and the ability to easily create new components specific to their business needs. The first generation of Internet development tools lacks a rich component library and architecture for easily creating reusable components.
- *The need for scalable database technology:* Corporate Internet applications will begin to have a return on investment when they leverage corporate databases. Currently there are low-level connectivity standards, such as JDBC, but many tools lack the high-performance native drivers for connectivity to relational and legacy database systems.
- *The need for application server technology:* Although the Internet has become popular because of its cross-platform Web-based client model, for corporate developers it is the application server which is even more important. The application server allows developers to unify their information systems and have business rules and application logic running on a portable middle tier.

The Internet as a Client/Server Computing Platform

The Internet is not a market but a platform that will play an important role in the computing environment for corporate application developers. The Internet is a multi-tier client/server architecture. The Internet has the potential to provide the reliability and performance of centralized host computing while leveraging the productivity of desktop PCs. Borland is focused on addressing the needs of corporate developers by building a complete solution for multi-tier client/server computing on the Internet using Delphi and Open JBuilder together with Open Environment's Entera application server.

Two distributed object models have emerged from the rapid evolution of the Internet: Microsoft's and Netscape's. Microsoft supports the Internet through its ActiveX component technology, its Internet Explorer and Internet Information Server and ISAPI interface. All of these tools are focused on Windows 95 and NT Workstation on the client and NT Server on the server.

Netscape's support includes their cross-platform browser, SuiteSpot server and NSAPI interface. In addition, Borland and Netscape have formed strong alliances with Sun to fully support the Java and JavaScript cross-platform programming languages.

Vision of the future

Internet = Multi-tier Client Server

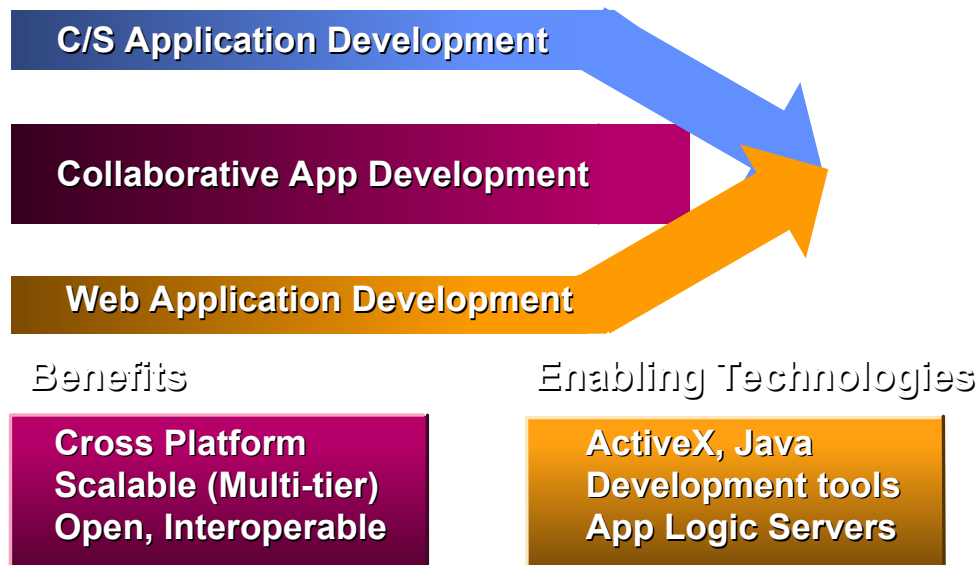


Figure 3 - Borland provides a complete solution for client/server development on the Internet

Borland is Platform-Neutral

Borland is supporting both the Microsoft and the Netscape distributed object models with high-performance, scalable development tools for corporate customers. Because Borland is platform neutral, our tools will be able to interoperate and support both Microsoft and Netscape's Internet strategies.

Borland has begun Internet enabling its Windows development tools to take advantage of Microsoft's open ActiveX-based Internet strategy. Borland has introduced a new Internet-enabled version of Delphi Client/Server Suite 2.0 that supports both the Internet client side with the Borland Internet Solutions Pack library of ActiveX components and server-side interfaces to Microsoft's Internet Information Server through ISAPI. Borland is equally committed to supporting the Netscape model through the creation of new Java and JavaScript tools. Borland will deliver RAD tools such as our Java-based environment, Open JBuilder, to allow customers to create cross-platform web-delivered applications.

A key strength of World Wide Web systems is the ability to create Web-server applications that only require a browser, without the need for installation of any extra software at the user's desktop. Borland's IntraBuilder product allows creation of Web applications that make it easy for users to get to data through their browser. IntraBuilder is ideal for departmental database developers who need to create these Web-server applications.

Because Borland is platform neutral, we can offer the best solutions to corporate customers and focus on adding value to the standards and making them work together rather than choosing sides. Customers can choose Borland development tools knowing that they work together no matter which platform is used.

Borland/Open Environment Synergy

A complete solution to enterprise scalability

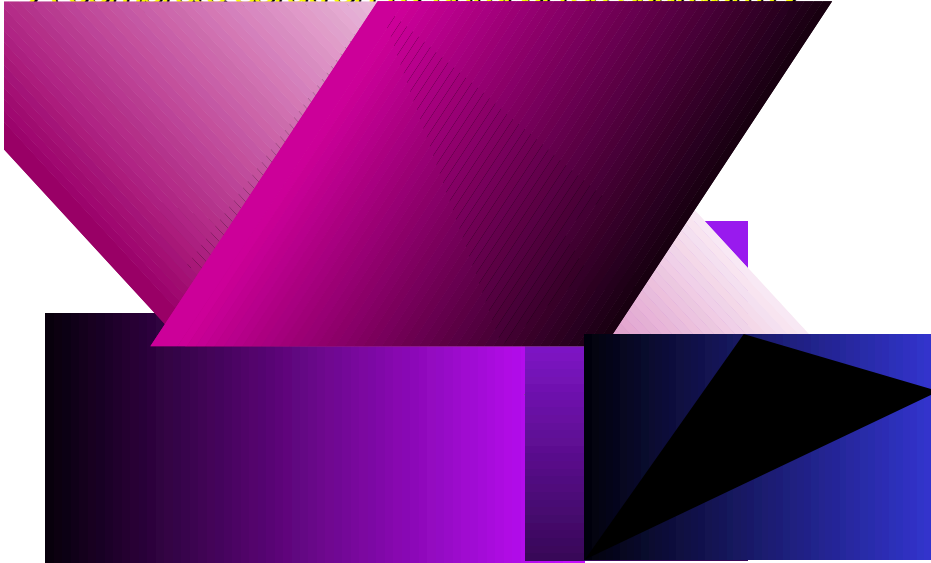


Figure 4 - Borland and OEC provide a scalable architecture from the desktop to the enterprise

Borland's Strength in Client/Server

The client/server development tools market continues to grow at approximately 45% per year according to IDC. Borland has established a strong penetration into the departmental decentralized IT segment and is expanding into the enterprise centralized IT market with the recent acquisition of Open Environment Corporation. Borland has shipped more than 450,000 units of Delphi in approximately 15 months giving it almost three times the market share of PowerBuilder, according to IDC.

The next stage of growth in client/server computing will come as development tools expand from the classic "two-tier" architecture of a client and a server to a more flexible multi-tier architecture (sometimes also called three-tier) to support more powerful distributed processing of applications. Today's predominant form of two-tier client/server computing works very well for applications that access corporate relational data that require efficient data access and support high volume of transactions.

For example, MCI used Delphi Client/Server Suite to develop a call tracking application that provides up-to-the-minute information to executives around the country. The application processes several megabytes of call volume information every minute and stores it in an Oracle database system. With Delphi Client/Server Suite, MCI has improved their information reporting and decision making tremendously. The next step of their project is to take this application and Internet-enable it to allow users to view and analyze this information over the corporate Intranet.

There are many client/server applications like this that can increase their scalability by using a multi-tier Internet architectures. These applications are ideally suited to a combination of Borland technologies including Delphi Client/Server Suite, Open JBuilder and Borland's recently acquired Entera application server.

Borland offers these advantages:

- *World's fastest optimizing compiler technology:* Borland has developed the world's fastest optimizing native code compiler technology. This compiler technology is used today in Delphi Client/Server Suite and in Borland C++ and provides a unique performance advantage to customers. For example, Delphi Client/Server Suite delivers application performance that is 15-50 times faster

- than p-code interpreters such as Visual Basic 4.0 or partially compiled tools such as PowerBuilder 5.0. Borland has also developed a high-performance just-in-time Java compiler, known as AppAccelerator, that similarly speeds up Java applications.
- *Reusable component technology:* Borland has delivered an object-oriented component architecture in Delphi Client/Server Suite that makes it easy to reuse code and reduce development costs. Borland has developed a Visual Component Library (VCL) of over 100 reusable components in an open, object-oriented architecture. The Visual Component Library is fully compatible with industry standards including Microsoft's ActiveX and DCOM technologies. In addition, Borland has demonstrated support for Sun's component model known as the Java Beans Initiative.
 - *Scalable database technology:* Borland has scalable high-performance InterBase relational database technology and SQL Links native drivers for accessing corporate databases and legacy systems. This ensures that organizations can integrate existing systems across the enterprise.
 - *Cross-platform application server technology:* Borland is developing cross-platform application server technology based on its recent acquisition of Open Environment Corporation's Entera product line. The Entera application server technology provides the linchpin in Borland's technical vision for a high-performance, scalable architecture that allows customers to use any client tool, any server tool and access any relational database on any platform. Entera technologies provide broad platform support and connectivity (IBM 3270, Open Edition MVS, AIX/6000, OS/2, Digital OSF/1, HP-UX, Unisys SVr4, Sun Solaris, Macintosh and Microsoft Windows 95, NT).

Borland Offers an Open, Scalable Architecture

Borland's open, scalable architecture can provide a business advantage in combining client/server and Internet technologies. A scalable architecture is a critical necessity for a development tool to adapt to both technological and business changes. Technology shifts, such as the Internet, open up new possibilities for gaining a business advantage. By providing timely access to information, leveraging applications across the enterprise and integrating customers and suppliers, Borland tools create that advantage.

Customer Example - **Scaleable Architecture**

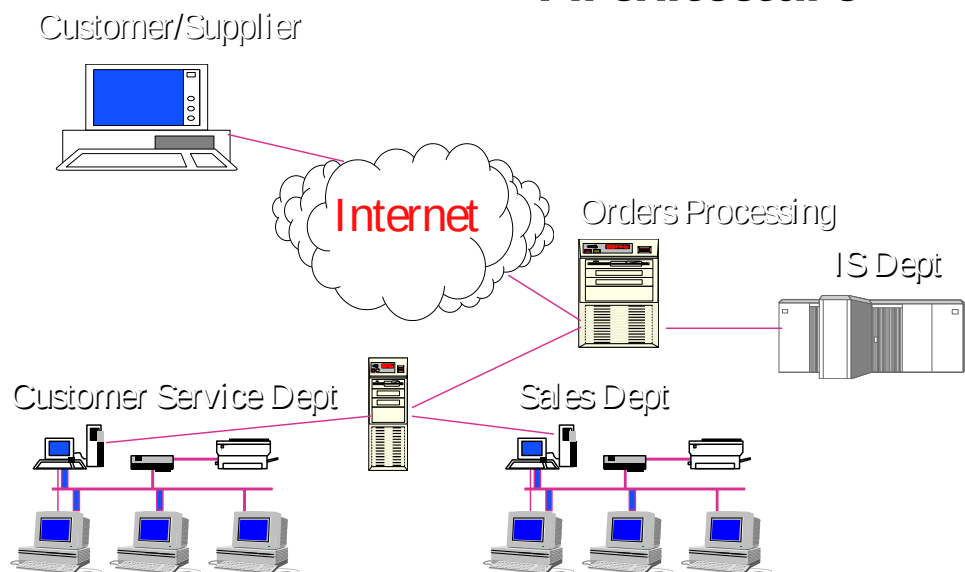


Figure 5 - Borland offers an open, scalable architecture from the desktop to the enterprise

An open, scalable architecture reduces an organizations requirement to predict shifts in technology. By relying on well insulated components, a scalable architecture minimizes the risk of technology changes by allowing adaptability of applications. Openness gives the flexibility to integrate existing systems to maximize investments. Integration and reuse of standard components reduces cycle time and thereby improves time to market. Being able to chose a toolset for any job minimizes re-training and re-tooling. And scalable applications can be broadly deployed across the organization without limits offering a greater return on investment than other tools.

For example, Company XYZ sells merchandise through direct mail and retail. The customer service department writes a LAN database application in Delphi to process customer information requests. Later, the sales manager wants to share the application services to address all the customer issues in a single sales call to deliver better service. Because the application is scalable it can easily handle the additional load of more users by scaling to a client/server architecture.

After analyzing the situation further, the centralized IS group uses Delphi with OLEnterprise to access the existing UNIX-based order processing system. Then IS uses Entera to tie that application together with access to the mainframe based manufacturing system. Finally IS combines Open JBuilder with Delphi's interface to Microsoft's Internet Information Server to make a secure, multi-tier, inventory information and customer service system available to XYZ's customers and suppliers over the World-wide Web. XYZ increases its sales productivity, reduces its manufacturing delays and enjoys greater profitability as a result. The essential component is a scalable architecture that enables a customers to start with low-risk prototyping of applications and then increasing the scope and complexity while preserving their investments.

IV. Borland's Competitive Advantage

Borland delivers a scalable architecture for client/server and the Internet that has a competitive advantage against Forte, PowerBuilder and Visual Basic. Only Borland offers:

- *Scalable Architecture from the desktop to the enterprise:* Borland provides the broadest range of scalability for client/server and Internet development. Developers can create solutions that range from the desktop to two-tier client/server to multi-tier enterprise applications. Borland is able to achieve broad scalability from the combination of object-oriented development tools, SQL Link native drivers and cross-platform InterBase RDBMS in conjunction with the multi-tier capabilities of Entera. By providing a scalable architecture, corporate developers are ensured of application success.
- *High Performance:* Borland has established a premier position in the client/server development tools market by delivering the highest performing applications. This performance comes from the use of high-speed optimizing compiler technology developed over 12 years. Borland has used this technology to create Delphi Client/Server Suite, Borland C++ and the first Java just-in-time compiler. Borland has also developed SQL Link native drivers for connecting to servers such as Oracle, Sybase, DB2, Informix and InterBase, instead of slower ODBC drivers. OEC's Entera technology optimizes multi-tier applications by reducing network traffic in high-volume client/server applications.
- *High Productivity:* Just as Borland has dramatically simplified departmental client/server application programming through the use of object-oriented Rapid Application Development tools, OEC has simplified the creation of multi-tier enterprise applications. The result is that developers can now more quickly create and deploy highly-scalable client/server and Internet applications.
- *Application Reliability:* The object-oriented architecture of Borland's development tools as well as OEC's Entera technology results in applications which are reliable, robust and secure. Applications can be widely deployed at departmental and enterprise level with complete confidence. OEC's application management tools provide additional means of monitoring and tuning applications.
- *Open Solutions:* Borland and OEC's technologies are based on open, interoperable standards. Corporate developers can combine any client tool with any database on any platform. This supports efficient use of corporate IT resources without replacing systems or requiring costly retraining.

Competitive Summary

	Borland	Forte	PowerBuilder	Visual Basic
Scalable Architecture				
Standalone desktop applications	Y			Y
Departmental Client/Server	Y		Y	Y
Cross-platform multi-tier	Y	Y		
High Performance				
Native SQL drivers	Y	Y	Y	Y
Fully compiled applications	Y			
High Productivity				
Rapid Application Development	Y		Y	Y
Fully object-oriented language	Y			
Reusable component technology	Y			
Application Reliability				
Automatic Fail-Over	Y	Y		
Performance Monitoring	Y	Y		
Integrated Security	Y			
Internet Capabilities				
Internet-enabled client/server	Y			
Web-delivered applications	Y			

Web-server applications	Y			
Open Solutions	Y			

V. Borland Technology Roadmap

Borland is leveraging the strengths of its optimizing native code compiler technology, reusable component technology and cross-platform application server technology to provide a family of products that support an open, scalable architecture for Internet development.

Borland has the most complete solution for open, scalable Internet development. Borland's family of products supports:

- Internet-enabled client/server development with Delphi Client/Server Suite and Internet Launcher
- Cross-platform Rapid Application Development of Web-delivered applications with Open JBuilder
- Open connectivity with InterBase and InterClient
 - Web-server data driven applications with IntraBuilder

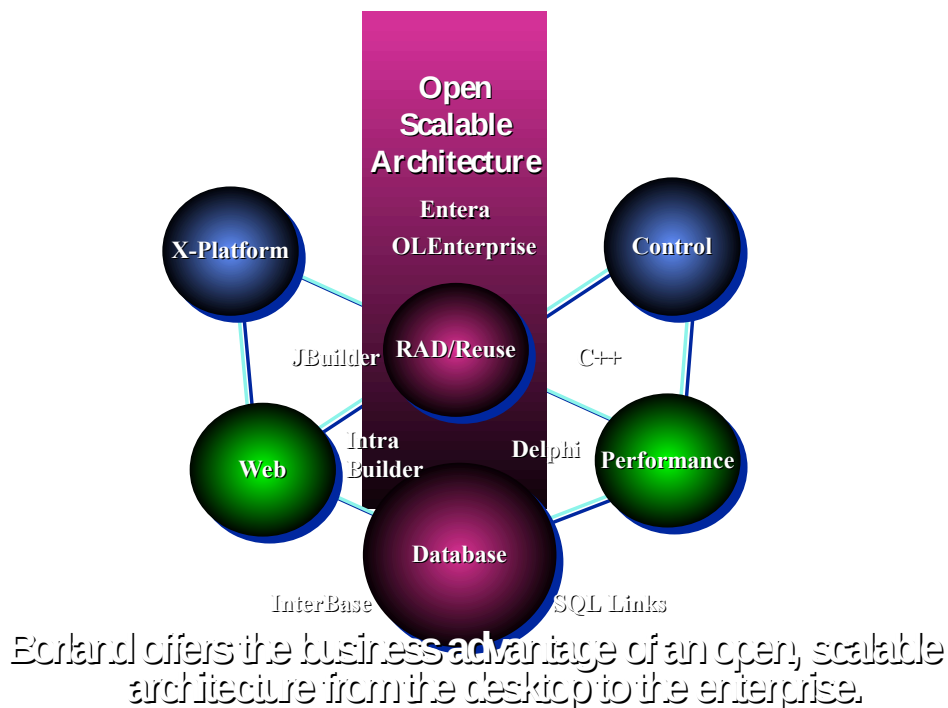


Figure 6 - Borland provides a complete solution for client/server development on the Internet

Technological Synergy

Borland Internet solutions are a unique combination of high performance, object-oriented development tools, including Delphi Client/Server Suite, Open JBuilder, IntraBuilder and Borland C++, and Open Environment's Entera technology. As a result, Borland offers a scalable architecture for client/server and Internet development. Because of the open architectures and robustness of both Borland's development tools and OEC's second-generation Entera product line, these technologies work together today.

Borland and OEC Architecture

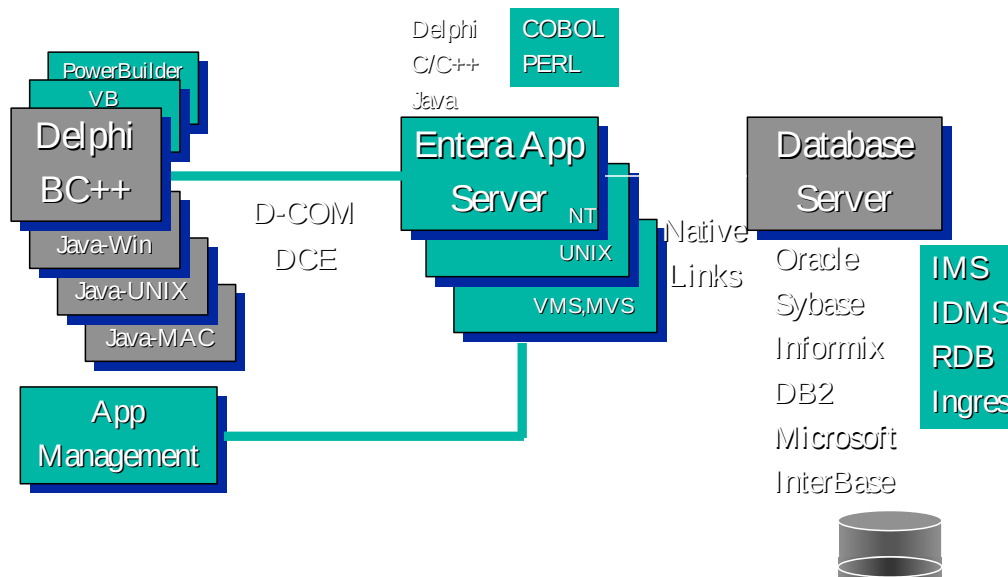


Figure 7 - The combination of Borland and OEC provides an open, scalable multi-tier architecture

Internet Enabling Client/Server with Delphi Client/Server Suite

Borland has recently released an update to Delphi Client/Server Suite 2.0 that includes the Borland Internet Solutions Pack, a library of eight ActiveX components that add to the Visual Component Library. This enables Delphi customers to easily add Internet client support to their applications while using the same high productivity drag-and-drop component programming techniques they are used to. Developers do not need to learn a new tool or a new language in order to add such capabilities as Web browsing, Internet mail, FTP file transfer, network news support to their client/server applications. In addition, because Delphi Client/Server uses a native code compiler, and not a p-code interpreter or partial compiler, it can interface directly to Microsoft's Internet Information Server through the ISAPI interface or Netscape's server using NSAPI. This enables Delphi developers to support both Internet client and server development in their applications. This is not possible using tools such as Visual Basic 4.0 or PowerBuilder 5.0 which lack the ability to compile native code into Dynamic Link Libraries (DLLs) necessary to interface to the Internet server.

Borland's recent acquisition of Open Environment Corporation further strengthen our integration of Internet and client/server technologies. Borland has developed a number of new technologies that will become available with the forthcoming Delphi97 that use COM and ActiveX technology to support a richer set of Internet and Intranet application development and delivery.

For example, Delphi97 will enable client/server developers to automatically distribute multi-tier application clients and enable them to communicate over the Internet to application servers running securely at the corporate site. By using the Internet as a wide-area network, corporate applications can now be extended to span the globe, without additional investment in networking infrastructure.

Delphi97 will offers these benefits for client/server developers who want to Internet enable their applications:

- Existing applications, legacy data, corporate functionality can be accessed securely over the Internet.
- Extend the scope of existing multi-tier applications across the Internet network.
- Conduct Intranet commerce (Intra-company commerce over the Internet) effectively and securely.
- Integrate suppliers, distributors, business partners and customers over the Internet saving additional networking infrastructure costs.
- Allows the use of current World Wide Web architecture (browser/server) to deploy applications, without need for additional development or software.
 - Distribution of any client applications enables use of existing multi-tier Entera systems.

An Example of Internet Enablement using Entera

Many companies have Web pages, but few provide customers real-time information about the products and services they have ordered. Yet they have corporate information systems that track exactly that.

Entera creates “application objects” which interoperate with existing applications and databases. These objects have a defined interface that can be called from client programming languages like Delphi Client/Server Suite, Visual Basic or PowerBuilder. With Delphi97's Internet technologies, it is easy to link these clients to existing Web pages, allowing users to request information from back-end systems.

Web-delivered Applications with Open JBuilder

Customers are quickly recognizing the full potential of the Inter/Intranet and Java as a low cost, ubiquitous platform for delivering new types of applications that run unchanged on a variety of hardware platforms. With the announcements from major operating systems vendors that Java will come standard as part of future versions of their OS's and similar announcements from numerous hardware vendors that the Java OS will be in equipment ranging from phones to network computers, it is clear that Java will play an important role in the corporate computing infrastructure.

By developing and deploying Inter/Intranet applications built on top of Java, corporations gain the advantage of being able to deliver these applications on multiple platforms today. And, with the dynamic and unpredictable nature of business to consider corporations also gain the security of knowing that they will be able to dynamically and easily re-deploy these applications to other platforms in the future. For Java to be adopted as a mainstream, mission critical technology, however, there is a critical need for the robust tools, libraries and components that customers have come to expect in development environments available today. Borland is delivering these capabilities for Java with Open JBuilder, (previously codenamed "Latté"), the visual, Rapid Application Development environment for building web-delivered, cross platform applications.

Open JBuilder is a highly productive RAD environment, similar to Delphi Client/Server Suite, used for building Java-based applications that are deployed on Netscape, Sun or Microsoft Internet platforms. As with Delphi, customers use a highly intuitive visual component-based metaphor for developing applications. To build these applications, customers drag and drop from an extensive set of pre-defined or user-developed components onto a form, set properties on these components through an object inspector and program in Java to common events such as a mouse click. In addition, Open JBuilder provides high performance compilers and robust debugging, browsing and management tools. These features allow developers to build and maintain many types of applications including: interactive applets for web pages, easy front ends that connect to existing systems and scalable web-delivered, cross-platform multi-tier applications.

To give programmers a more productive way to develop applications, Borland is incorporating the JavaBeans reusable component technology from JavaSoft into Open JBuilder. Open JBuilder offers over many pre-defined JavaBeans components that offer solutions to common programming needs as well as delivering on the promise of reusable code by allowing customers to package up their own solutions as fully self-contained, pre-tested components. New components can easily be developed in-house or purchased from third party vendors thereby significantly speeding up the development process.

Because multiple clients and powerful servers are interconnected, the Inter/Intranet and Open JBuilder is an ideal platform for deploying applications that are partitioned across multiple tiers. Applications developed for this multi-tiered architecture are immensely scaleable because many powerful clients and servers can be working together to support large numbers of users. Open JBuilder will be tightly integrated with Entera, the application server and middleware technology recently acquired from Open Environment Corporation to provide an end-to-end multi-tiered application development environment. With Open JBuilder and Entera, applications will be distributable across multiple tiers and will also have access to corporate databases and legacy data. The combination of Open JBuilder's RAD tools, Entera and the Internet provides a highly productive and powerful toolset for web-delivered scaleable applications in a cross-platform web environment.

For developers seeking to build web applications that access client/server SQL databases, Open JBuilder provides the DataDirector architecture. DataDirector is a complete solution with a suite of capabilities that includes data-aware controls, experts, an extensible architecture and database management tools. Open JBuilder supports the JDBC standard with drivers for common databases providing a common, high-speed way to access Oracle, Sybase, Informix, IBM or Borland databases from any Java platform.

Open JBuilder also includes Borland's InterClient JDBC/Net driver for building all-Java applications that access Borland's SQL-92 compliant InterBase relational database management system. Applications that use InterClient do not require the presence of drivers on the client making application deployment substantially easier to manage and therefore less costly. In addition, Open JBuilder/InterClient provides an ideal solution for transaction oriented database connectivity by establishing a high-speed persistent TCP/IP connection with the server. Borland will offer all-Java, JDBC/Net drivers for all popular databases coupled with multi-tiered database access for a complete, cost effective solution for corporate Intranets.

To ensure complete flexibility, the Open JBuilder environment is open and extensible so that it can accommodate add-ins and components. Add-ins can take several forms including version control systems, reporting tools or data modeling tools and are available from many independent software vendors. The Open JBuilder architecture allows for add-ins to take advantage of its easy-to-use Experts capabilities to make interacting with the add-ins as easy as possible. In addition to add-ins, Open JBuilder allows for new JavaBeans components to be added to the environment and used in the creation of applications.

Open Connectivity with InterClient and InterBase

Borland's InterBase is a platform independent SQL database server, which scales from the PC desktop to advanced UNIX servers, for building multi-tier client/server and Web-enabled applications for decentralized IT organizations. InterBase is easy to use, yet provides the high performance and availability required of mission critical client/server applications.

InterClient for InterBase, the premier implementation of JDBC for Java client/server development, is written in Java and provides JDBC connectivity for InterBase. InterClient with InterBase delivers:

- *Performance:* A common complaint about Web-based client/server applications is a lack of performance because the Web is a stateless client/server connection paradigm, which means that every time you connect to the Web database to look for information, you have to login to the database all over again, wasting time and diminishing performance. With InterClient and InterBase you get a sustained connection over TCP/IP for the duration of your session, delivering much higher performance and far less network traffic.
- *Open Standards:* InterClient is compliant with JavaSoft's JDBC specification, which means that all new tools developed to JDBC will automatically be compatible with InterBase.
- *Portability:* Everywhere Java runs (Macs, Windows, UNIX, etc.), InterClient will run.
 - *Lower Life-cycle Costs:* InterClient eliminates the need to install and configure each client machine with platform specific client libraries. A client is automatically configured as the Java client/server application downloads InterClient. You do not have to worry about software upgrades making your client configuration out of date, because of InterClient's automatic client configuration.

When integrated into Open JBuilder, InterClient extends your data access options by enabling Java applications to:

- Open a high-performance direct connection to Web-based data
- Maintain a direct connection to the server
- Bypass resource-intensive stateless Web server access methods
 - Allow higher throughput speeds and reduced Web-server traffic

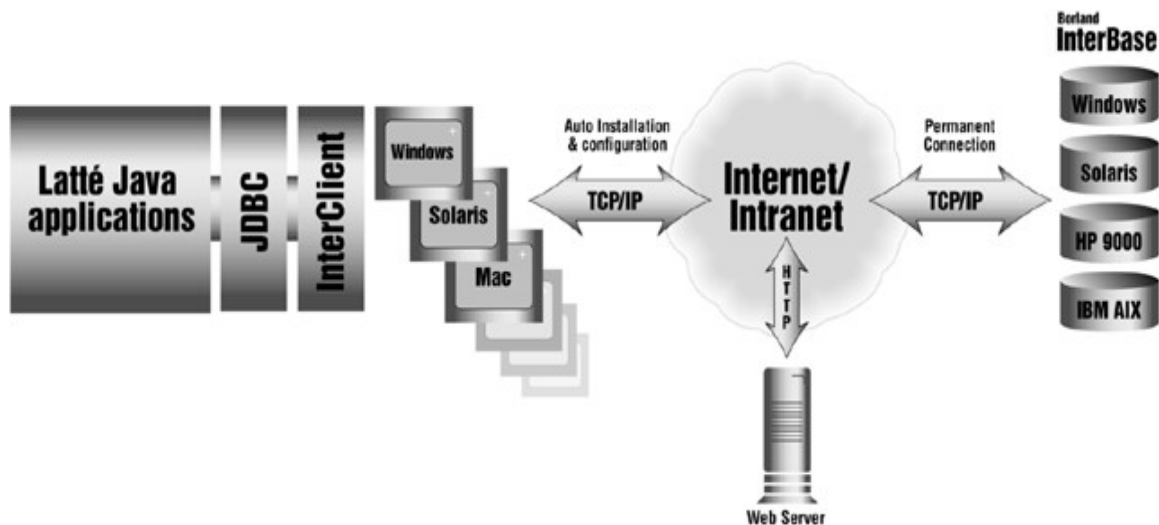


Figure 8 - InterClient with InterBase provides high-performance scalable Java connectivity

Intranet Solutions using Open JBuilder, InterClient and InterBase

Integrated with Open JBuilder, InterClient and InterBase provides the ideal solution for enabling state-of-the-art client/server applications on corporate intranets and the World Wide Web.

InterClient and InterBase are one aspect of Borland's Internet and Intranet initiatives and combined with Open JBuilder, a rapid application development (RAD) environment for Java, will allow developers to build Web applications that access client/server SQL databases. Open JBuilder provides a complete solution with a suite of capabilities that includes data-aware controls, wizards, and database management tools. Open JBuilder supports the JDBC standard providing a common way to access the most popular databases including InterBase, Oracle, Sybase, Informix, IBM, or any vendor that provides JDBC or ODBC drivers.

Data-Driven Web-Server Applications with IntraBuilder

In addition to offering tools targeted to corporate client/server and Internet developers such as Delphi Client/Server Suite and Open JBuilder, Borland is also making it easy for developers to easily create data-driven web server applications. IntraBuilder significantly lowers the bar on web server scripting to allow "Point and click" web database servers. IntraBuilder is the first product that combines Rapid Application Development, reusable component technology and automatic access to corporate databases with standard JavaScript to deliver the easiest way to create data-driven Web server applications.

With IntraBuilder, developers can quickly build and maintain applications that deliver and manage data from industry standard databases through a web server. Complete control of business logic and application flow is made possible by the use of client side and server side JavaScript.

JavaScript is an important aspect of Internet programming. JavaScript is complementary to Java and will support a much broader constituency because of its greater ease of use. JavaScript is a compact, object based scripting language for developing client and server Internet applications. Netscape Navigator, and

Microsoft Internet Explorer execute JavaScript statements embedded directly in HTML pages. By the end of 1996, there will be over 20 million JavaScript enabled browsers in use.

IntraBuilder is the easiest way to develop live, web-server, data driven applications. Pre-built and custom applications provide access to popular local databases, BackOffice and other Windows NT databases, as well as corporate relational databases and legacy systems. By using the Web browser as the “client” software, IntraBuilder applications can be “deployed” effortlessly to end users on any platform. IntraBuilder is based on several key Internet standards including HTTP, NSAPI, ISAPI, CGI, HTML and JavaScript. By basing IntraBuilder on JavaScript, Borland is delivering a powerful, standards-based toolset that complements Open JBuilder.

With IntraBuilder, web-server application development is now practical *and* maintainable. IntraBuilder includes a rich set of server-side data aware controls that utilize direct connections to a wide variety of corporate databases via native SQL Links drivers and ODBC. To make true database integration with the Web a reality, IntraBuilder includes a powerful, built in, automatic “state” manager that handles multiple users, sessions, transactions and row concurrency. In addition, IntraBuilder provides server-side JavaScript compilation, point and click Experts and various productivity features.

Borland IntraBuilder

Open multi-tier live data solutions on the Web

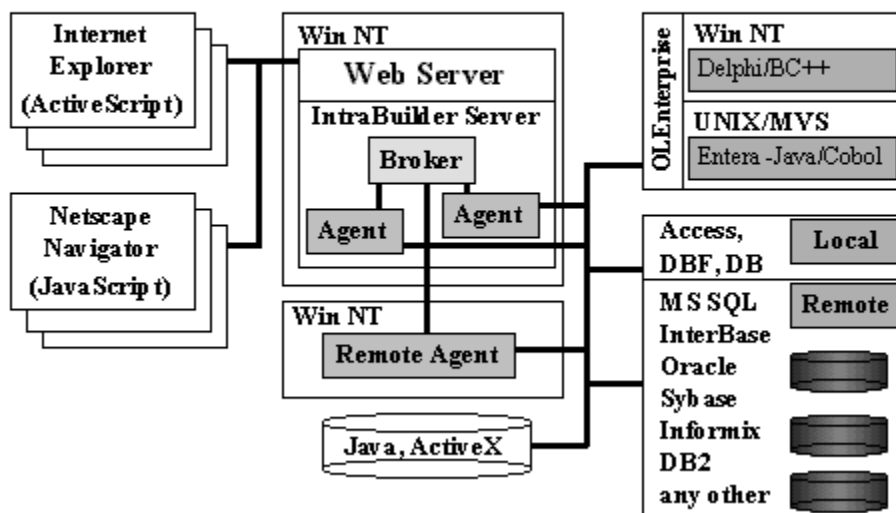


Figure 9 - IntraBuilder complements Open JBuilder to provide easy, data-driven Web server applications

IntraBuilder allows rich database connectivity to multi-platform databases like Sybase, Oracle, Microsoft SQL Server and Borland InterBase. IntraBuilder servers are multi-threaded and use named pipes to communicate to the web server. This allows corporations to “scale” their IntraBuilder applications by adding extra IntraBuilder servers as required to serve either one or more web servers. Using OLEEnterprise, IntraBuilder applications can integrate with Delphi Client/Server Suite applications deployed as remote OLE automation servers. IntraBuilder allows corporations to turn web servers into intelligent gateways to multiple tiers, corporate databases and legacy data. The combination of IntraBuilder and JavaScript with OLEEnterprise, provides a highly productive and powerful platform for scaleable, data-driven, web-server applications.

Developers can now build and maintain many types of web applications including: corporate phone lists, HR information systems, financial reporting and project tracking, that are based on “live” data, are easy to create, and easy to maintain.

A Commitment to Technological Leadership

Borland's client/server and Internet technologies work today to provide developers with a rich set of open, scalable tools. In the future, Borland will continue to offer greater integration of these products as well as announce new products that will provide even greater productivity and advanced capabilities. Borland is committed to filling the need for high-performance, scalable technology for client/server and Internet development.

VI. Conclusion

Borland has a comprehensive family of client/server and Internet development tools that offer developers a competitive advantage of an open, scalable architecture with high-performance and high-productivity. Borland is also committed to supporting all emerging Internet standards whether they are for the Microsoft or the Netscape platform.

Because of Borland's experience in optimizing compiler technology, reusable component technologies, scalable database technology and cross-platform application servers, it is uniquely able to address the broad needs of traditional client/server developers seeking to add Internet capabilities to their applications as well as the needs of Internet developers and webmasters. In the coming months Borland will continue to provide additional information on its client/server and Internet technologies.