Microsoft®
BackOffice™
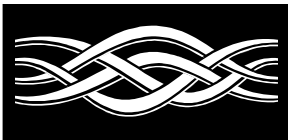
Microsoft®

Microsoft®
SQL Server™

Client/Server Database Management System

Product Strategy
Backgrounder

Microsoft® SQL Server™
in the Active Internet

March 14, 1996

Microsoft®
SQL Server™

Abstract

As thousands of companies rush to establish a presence on the Internet, many are discovering its potential as an internal corporate network as well as an external publication platform. One industry analyst calls the Internet "the greatest catalyst for change and growth in the IT industry since the PC and LAN 15 years ago."

This paper examines how Microsoft SQL Server enables organizations of all sizes to exploit the power of the Internet. Integrating SQL Server with your Internet or Intranet allows organizations to build active Web sites which publish real-time information and provide interaction and customization, conduct business on the Internet securely and reliably, and develop corporate Intranets giving users new tools to access business information, without compromising security and data integrity.

INTRODUCTION

The Internet represents the dawn of a new era of global communications and wide-area public networks. It is a technological revolution at least as important as the development of the personal computer. Microsoft believes that business people, consumers, students and users of all types can benefit from a *full integration* of these two revolutions--the Internet and the PC. Microsoft's strategy is to work openly with customers, other companies, and industry groups to realize the full potential of the Active Internet. The next generation of powerful Internet applications promises to make the Internet more exciting and useful by seamlessly integrating audio, video, 3D animation and more.
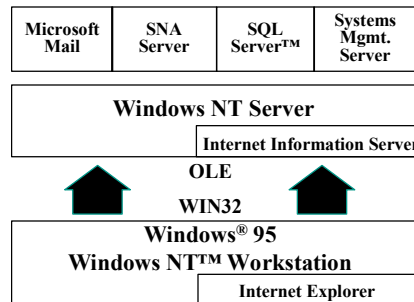
Microsoft Mail	SNA Server	SQL Server™	Systems Mgmt. Server

Windows NT Server

Internet Information Server

OLE

WIN32

Windows® 95
Windows NT™ Workstation

Internet Explorer

Microsoft's strategy to support business on the Active Internet is exactly the same as its overall distributed-computing strategy--to provide the network foundation for distributed computing (Windows NT Server); a family of integrated server applications (BackOffice); distributed object and systems technology (Win32 and OLE) ;   a complete set of development and authoring tools (Visual Basic, Java, Java Script, Front Page, Internet Studio) and a set of desktop applications (Office) and systems (Windows 95 and Windows NT Workstation) that take advantage of all these features for an integrated view of the world.

WHY DO I NEED A DATABASE ON THE ACTIVE INTERNET

Many organizations have already realized the benefits of the Internet as a means to rapidly publish information. . Companies today are using the World Wide Web primarily as an electronic store front, billboard, or Yellow Pages ad. Many have applied these same principles to *internal* communication, establishing *intra*nets, or private web-based networks---to exchange mission-critical information across local, regional, even global enterprises. Until now, this information has been predominantly static, pre-formatted HTML documents, not interactive, user-centric applications.

The same forces which have driven the evolution of client/server technology are now at work driving the Internet towards a more dynamic and interactive environment. Whether in traditional distributed computing or on the Internet, businesses and users need to access and manage an ever-expanding amount of information, from anywhere, at anytime.

By connecting Internet or Intranet web servers to relational databases

like Microsoft SQL Server, many organizations have moved beyond static document publication to an Active Internet, where content is generated dynamically from a database, automatically or in response to a user request. An Active Internet application may use electronic forms to collect orders, customer information and other transactions, then store them in a relational database. The database, in turn, allows processing, retrieval, and analysis with a variety of off the shelf tools. An Active Internet can store information in a single, secure place - without duplication - regardless whether that information is accessed internally or over the World Wide Web.

Progressive companies are driving the Web in a new and even more interesting direction, where business can be conducted over the Internet. These companies are building a new class of Active Internet business applications, based on products like Microsoft Internet Information Server, Microsoft SQL Server, and BackOffice family of products.

SQL SERVER AND THE ACTIVE INTERNET

The Active Internet is a new type of distributed client/server environment, which extends beyond traditional corporate IT boundaries. A major requirement for an Active Internet is a secure, reliable and scalable place to store information. Microsoft SQL Server is built from the ground up as a scalable, high-performance database management system designed specifically for the unique requirements of distributed client-server computing. SQL Server has been fulfilling this role in business-critical environments for several years.

As Internets and Intranets become more complex and more heavily trafficked, managing incoming and outgoing information becomes even more difficult. By applying basic distributed computing and client/server principles to this new frontier, companies can reduce the risk and the complexity of doing business on the Internet. Integrating Microsoft SQL Server with an Internet or Intranet allows organizations to:

- ◆ **Build Active Web sites,** capturing the user's interest by publishing real-time information and providing user interaction and customization.
- ◆ **Conduct Business on the Internet,** securely and reliably.
- ◆ **Develop corporate Intranets,** giving users new tools to access business information, without compromising security and data integrity.

Build Active Web sites

As businesses explore new ways to leverage the Internet for business operations, they have been quick to recognize that the most of the business content they would like to publish is already being managed by a relational database management system. These businesses also realize that today's Web sites are measured not just on content, but on presentation and the level of interaction. The more popular sites capture the Web user's interest by publishing real-time information and building customized pages. These sites put the user in control, allowing them to browse large volumes of data and provide input. It takes a client/server database like Microsoft SQL Server to accomplish this.

Ethos Corporation, for example, is an interactive service provider delivering up-to-the-minute financial news and research information to more than 300,000 online investors weekly. Their Web site InvestorsEdge http://www.investorsedge.com, is among the most active financial services on the Internet, offering on-line stock quotes, corporate summaries, financial news and personal portfolio analysis. Microsoft SQL Server drives this site, collecting, managing and publishing the real-time financial data—averaging 3.4 million transactions per day.

Personal portfolio analysis brings a new level of customization to the Investors Edge Web site, allowing each user to build an individual portfolio of 15 stocks to be tracked over time. Once established, a portfolio can be accessed only with a unique user id and password combination, where the user views a completely personalized web page displaying the performance history of their stocks. This sensitive information is protected by Windows NT Server's and SQL Server's integrated C-2 security.

Conduct business on the Internet

Many organizations are already realizing the benefits of *extending the enterprise,* i.e. connecting existing business systems to the Internet. By automating the communication and processes between customers and suppliers, businesses become more efficient. But electronic commerce is progressing more slowly than expected. Fewer than 10% of Internet users make regular online purchases. The biggest deterrents for conducting business on the Internet are data integrity and security.

Security on the Internet is critical to both extending the enterprise

Ethos Corporation

Industry: Financial Services

Ethos Corp a Mill Valley, Calif., an Internet and database software development company is already gaining business benefits combining Microsoft Internet Information Server and SQL Server.

"With Microsoft SQL Server, we have a powerful content-management engine that allows us to provide a richer, more dynamic Web site for our customers," said Patrick Connolly, president of Ethos Corp. "Microsoft SQL Server lets us handle millions of Internet transactions daily while protecting customers' need for reliability and privacy." "We've switched to Microsoft Internet Information Server because of its tight integration with Microsoft SQL Server."

and conducting electronic commerce. The industry has focused on defining technologies and industry standards to secure the communications between Web Servers and Browsers. Technologies and standards include encryption, secure transaction, user authentication, and signed-code or digital signatures. Microsoft and its partners have participated in the development of several important new technology standards, including Secure Sockets Layer (SSL)--a secure protocol providing data encryption, server authentication, and message integrity for a TCP/IP connection--and Secure Electronic Transactions (SET), a technical standard for safeguarding payment card purchases made over open networks like the Internet.

While these are critical components in providing a secure environment for conducting business on the Internet, they only address part of the security problem. Looking at traditional client/server environments gives insight into other security issues. Controlling user or application access to information is a fundamental security requirement of any business application. Data and transaction integrity are also critical in any multiuser business environment, ensuring that all transactions are either fully completed or are rolled back so that every user views of data are consistent and reliable.

These security and integrity issues were solved for traditional business applications years ago by Microsoft SQL Server technologies like user and application security, data integrity and concurrency controls, data

Data Track Systems Inc.

Industry: Real Estate

Data Track is a real estate industry Value Added Network (VAN) provider specializing state-of-the-art Windows and Internet solutions for lenders, relocation services and real estate brokerage firms.

The DTS system facilitates online ordering and receipt of Title , Tax, Escrow, Property Valuation, Credit, and other settlement services. DTS open and secure Internet connections between agents and vendors to process real estate transactions.

Microsoft SQL Server lives at the core of the application, collecting, processing and archiving real estate transactions from the Internet and automates the billing process.

stream encryption, data replication and transparent distributed transactions. Solving these issues for the Internet doesn't require new technology. Applying SQL Server technology to the Internet gives you proven solutions to the challenges of data security and integrity.

Data Track Systems Inc. http://www.datatrac.com, a Value Added Network provider specializing in the electronic ordering and receipt real estate settlement services is using Microsoft SQL Server to solve the challenges

of conducting business transactions on the Internet. Data Track is deploying an Internet application built on Microsoft SQL Server, allowing real estate agents to easily order and track title, credit, property valuation, escrow and home inspection services. By providing open and secure Internet access between requesters and vendors along with integrated billing services, Data Track creates efficiencies in ordering, processing, and delivery of settlement documents resulting in cost reductions and faster turnaround.

Control user and application security

Both Internet and Intranet servers need to augment anonymous user control with specific per-user and per-group access control. Both Microsoft Internet Information Server and Microsoft SQL Server build on the Windows NT Server security model to deliver Internet-specific security features like control over anonymous access, network- or host-based access, and secure Internet authentication.

Consider a group of Intranet users who have been given access to a particular Web site. With client authentication, users can identify themselves to Internet Information Server and gain access to those directories and files marked as readable only by the group. Because of the full-featured Windows NT Server user accounts database, any number of overlapping groups can be created and granted differing access to resources on the server. Taking this a step further - if they're authenticated by NT, they are also authenticated to SQL Server so you don't have to maintain multiple security databases.

Replicate rich text and graphical content

Microsoft SQL Server replication solves the traditional client/server challenge of distributing and synchronizing information throughout an organization, while guaranteeing integrity and reliability. Replication solves a similar set of problems for Internet and Intranet sites—allowing webmasters to manage and synchronize multiple copies of published information. Replication also allows an organization to avoid exposing sensitive database information on an Intranet by selectively replicating data from production SQL Servers to a Web-connected SQL Server. SQL Server 6.5 can replicate complex text and image data popular on Web sites.

Integrate legacy systems

Most medium-to-large companies today have significant investments in their information systems infrastructure. Information is stored in a variety of different and often incompatible database management systems. The vast majority of these legacy systems provide no integration with the Internet. With Microsoft SQL Server-compatible middleware solutions like Microsoft TransAccess or Information Builders Inc.'s EDA/ Open Database Gateway, customers can integrate data across the enterprise onto the Internet.

Develop Corporate Intranets

   Business use of internal Internets – so-called "Intranets" – will grow as corporations find them the best foundation for wide-area networks. Intranets let colleagues work together whether they're around the corner

> **George Weston Ltd.**
>
> *Industry: Food Processing & Distribution*
>
> *George Weston Ltd. Is a Toronto based food processing and distribution company and one of the ten largest companies in Canada. The company operates three diverse businesses through Weston Foods, Loblaw Companies and Weston Resources, employing more than 60,000 people.*
>
> *To enhance communication and manage growth across its businesses, Weston is in the processes of deploying Internet and Intranet sites using Microsoft Internet Information Server and SQL Server. The Intranet site which went live in February, provides online benefit services, employee guides, policy and procedures manuals.*
>
> *Weston selected the combination because the tight integration between the two products delivers tremendous efficiencies development, maintenance and support. And integrated security allowing them to maintain a single content server, and tightly control access security.*

or around the globe. While exact figures are hard to come by, industry analysts estimate *Intra*net web sites outnumber Internet web sites ten-to-one--an amazing growth rate considering there were *no* Intranets three years ago!

   To support this shift, Microsoft is making internal business use of the Active Internet a key strategic focus. For example, on the desktop, Microsoft is making windows clients (Windows 95 and Windows NT Workstation) the best Active Internet clients by designing Internet capabilities into the operating systems themselves. Microsoft has enhanced Office--the leading choice in business productivity software--so that Office tools serve as Web creation tools. Microsoft has also offered free viewers, which let users read Office documents, even if they don't have Office installed on their local PCs. Microsoft has integrated Web protocols –TCP/IP and HTTP-- into its server platform (Windows NT Server),allowing Internet users to share, search and use Web pages and documents the same way they use files and applications on the LAN. With SQL Server 6.5, Microsoft is extending its industry leading distributed client-server database to be the best engine for corporate Intranet applications.

   Business applications on corporate Intranets have the same require-

ments for security and integrity as their Internet counterparts. Organizations developing and deploying Intranet applications are benefiting from the same proven technologies -- user and application security, data integrity and concurrency controls, data stream encryption, data replication and transparent distributed transactions -- which make Microsoft SQL Server the best platform for conducting business on the Internet.

George Weston, for example, went live in February with an Intranet employee benefits application supporting over 1500 users. With SQL Server as the content engine, Weston has a scalable and secure system, which easy to support and maintain. Also, since the information is being published from SQL Server, Weston employees responsible for keeping information up to date don't have to become an expert in HTML. They can continue to use familiar tools like Microsoft Access to make necessary changes.

OPTIMIZING SQL SERVER FOR THE ACTIVE INTERNET

From its foundation of superior performance, reliability, and scalability to its tight integration with Microsoft Internet Information Server and the other BackOffice products, SQL Server is unquestionably the best database platform for the new breed of Internet applications. Microsoft SQL Server 6.5 builds on this success by introducing a number of tools and technologies which provide significant advantages over alternative solutions:
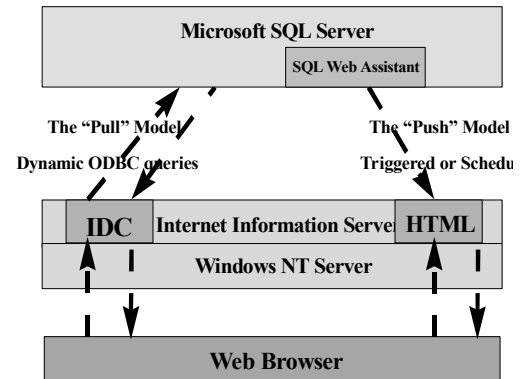
- ◆ Fast and easy programming interface
- ◆ Open Internet database connectivity
- ◆ Automated Web publishing of database information
- ◆ Cost effective licensing

Fast and easy programming interface

Traditionally, Common Gateway Interface (CGI) scripts have been used to add functionality to standard HTML forms, like linking forms with a SQL database. Each field on an HTML form may require 25 lines of CGI script to link it with a database. This model requires a high level of up-front programming. Any modifications are extremely labor intensive, given the one-to-one correspondence between the form field and the CGI script. The lack of quality database connectivity tools is partially responsible for the slow migration of commercial and business applications to the Internet.

Microsoft provides two powerful and complimentary tools for integrating SQL Server with the Web - the Internet Database Connector and SQL Server Web Assistant

Microsoft SQL Server
SQL Web Assistant

The "Pull" Model   The "Push" Model
Dynamic ODBC queries   Triggered or Schedu

| IDC	Internet Information Serve	HTML
Windows NT Server		

Web Browser

The adjacent diagram graphically demonstrates how the Internet Database Connector (IDC) and the SQL Server Web Assistant enable seamless connectivity with SQL Server data. The IDC, or *pull model,* allows a Web user to initiate dynamic user driven queries from within an HTML document to a SQL Server, which retrieve or update information in a database. The SQL Web Assistant, or *push model,* allows a database administrator or webmaster to define a set of data (a query or stored procedure) which is automatically merged into an HTML document either on a scheduled basis or when the actual data changes.

Open Internet database connectivity

Internet Database Connector (IDC) is an ISAPI application that uses Open Database Connectivity (ODBC) APIs to send and retrieve information between SQL Server and the Internet. The IDC provides the ability to create direct links between fields on HTML forms and SQL Server data without the need for complicated CGI scripts. Organizations are already using the Internet Database Connector to:

Internet Database Connector

Microsoft Internet Information Server
Internet Database Connector

ODBC		
SQL Server Driver	MS Access Driver	Other Drivers
SQL Server	MS Access	DBMS

• Publish real-time database information to the Active Internet

• Capture and store gigabytes of information directly into SQL Server

• Perform high-performance searches of on-line SQL Server data

• Build a new class of Active Internet commercial & business applications

Conceptually, database access is performed by Internet Information Server as shown in the diagram to the left:
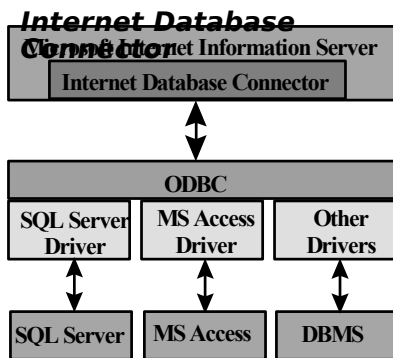
The Internet Database Connector uses two types of files to control how the database is accessed and how the output Web page is constructed. These files are Internet Database Connector (.idc) files and HTML extension (.htx) files.

The Internet Database Connector files contain the necessary information to connect to the desired ODBC data source and execute the SQL statement. A Internet Database Connector file also contains the name and location of the HTML extension file.

The HTML extension file is the template for the actual HTML document

that will be returned to the Web browser after the database information has been merged into it.. This allows static text, graphic images or even real time video to be combined with database information on the same Web page.

The Internet Database Connector is ideal for building a new class of Active Internet applications which allow the user to view and update information in a database. Applications like event registration, loan application processing, on-line banking and others can be created using this technology.

## Automated Web publishing of database information

SQL Server Web Assistant, one of the new Internet extensions available in SQL Server 6.5, provides the ability to easily and automatically generate Web pages formatted in hypertext markup language (HTML).Used in conjunction with an appropriate Web server product, the Web Assistant publishes Microsoft SQL Server-based information from anywhere in an organization.

THE WEB ASSISTANT USES A STEP BY STEP, WIZARD-LIKE INTERFACE THAT WALKS A DBA OR WEBMASTER THROUGH THE PROCESS OF CREATING A QUERY, FORMATTING OUTPUT, AND SCHEDULING THE QUERY EXECUTION--MAKING IT EASIER THAN EVER FOR CUSTOMERS TO CREATE INTERACTIVE, DATABASE-DRIVEN WEB SITES WITH AUTOMATED INFORMATION CONTENT. USING A DATA "PUSH" MODEL, THE WEB ASSISTANT AUTOMATICALLY PUBLISHES INFORMATION OUT OF A SQL SERVER DATABASE DIRECTLY TO THE WEB PAGE. THE DATA CAN BE UPDATED AUTOMATICALLY--ON A REGULAR SCHEDULED BASIS OR WHENEVER RELEVANT DATA CHANGES. THE DATA REMAINS ACCESSIBLE TO ANY EXISTING CLIENT/SERVER APPLICATION AS WELL AS THE WEB.

The Web Assistant is particularly valuable for publishing large amounts of database information that will be the same for all visitors to a Web site, such as price lists, inventory or on-line catalogs. The Web Assistant is helpful in publishing time-sensitive or dynamic data, where users need to view it in real-time-- like stock quote information. The Web Assistant is resource-efficient, executing the query only once, regardless of how many people visit the page.

Cost effective licensing

Traditional client/server RDBMS user-based licensing models, where customers are charged for the number of concurrent users accessing the database, have proven unworkable for the Internet. The Microsoft SQL Server Internet Connector, sold separately from Microsoft SQL Server, provides a simple, flexible and cost-effective way for customers to license their databases for use on the Internet or corporate Intranets.
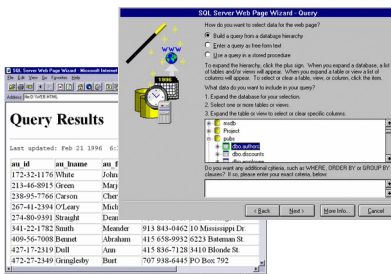
The Microsoft SQL Server Internet Connector license is an open solution, providing access to Microsoft SQL Server from the Microsoft Internet Information Server or from third-party Web servers. The SQL Server Internet Connector allows an unlimited number of Internet and Intranet connections to a single SQL Server.

The Microsoft SQL Server Internet Connector license will support customers using either Microsoft SQL Server version 6.0 or Microsoft SQL Server version 6.5. For more information, see "Microsoft SQL Server Internet Connector" at http://www.microsoft.com/SQL/netqa.htm.

For more than two years, Microsoft has been engaged in strategic development for the Active Internet, with the goals of making it easy for customers to get on the Internet, making it safe and reliable for significant business and consumer applications, and creating a viable business model that will support the industry and its consumers

As a result, Microsoft is well positioned to devise and implement a comprehensive Active Internet strategy to meet the needs of corporate users, consumers, content creators, software vendors, Web publishers and other information providers for a unified computing/Internet experience.

To deliver the full potential of the Active Internet, Microsoft recently introduced ActiveX™ Technologies – a robust framework for creating interactive content using software components, scripts and existing applications which can be embedded in HTML documents. Specifically, ActiveX Technologies enable developers to build Web content easily using ActiveX Controls (formerly OLE Controls), active scripts and active documents. Because Microsoft's object model is language independent, developers can take full advantage of their existing investments of time, money and work as they move to the Internet.

The ActiveX Server Framework allows developers to create the same rich, interactive applications for Microsoft BackOffice, leveraging their existing experience, knowledge and tools. ActiveX Server Controls and ActiveX Server Scripts ,written with a variety of scripting languages like Visual Basic Script, PERL and JavaScript, become the building blocks for the next generation of server-driven active content. Combined with the technologies discussed in this document, these ActiveX controls and scripts make it even easier for organizations to use Microsoft SQL Server and the other BackOffice products build active Web sites, conduct business on the Internet and develop corporate Intranets.

A LOOK AHEAD