SERVICE-ORIENTED ARCHITECTURE AND WEB SERVICES:

CREATING FLEXIBLE ENTERPRISES FOR A CHANGING WORLD

Managing consolidation and globalization. Dealing with growing customer and partner demands. Devising new ways to spur innovation and business growth. Aligning IT and business goals. Coping with inflexible technology infrastructures. These are just a few of the formidable challenges facing your business.

So where do you turn? To service-oriented architecture (SOA).

This distributed computing environment is poised at the intersection of business and technology, enabling enterprises to adapt quickly to a changing environment. Simply put, it takes standard business applications, such as order management, and breaks them down into individual business functions, such as "check customer credit."

The beauty of this is that the functions, or services, can be used and reused to support different business activities. For example, the finance, sales and marketing departments can all use the "check customer credit" function. This means that organizations don't have to constantly build new applications for various departments, saving time and money, and eliminating redundancies. And these services can be extended out to business partners as well.

"When alignment occurs within an organization and between companies, enormous productivity gains are possible." —Sophie Mayo, director for the Strategies Group at IDC

What does this mean to your organization? "People are able to work smarter and better," says Sophie Mayo, director, Web services and SOA implementation services research at IDC, a Framingham, Mass.-based research and consulting firm. "When alignment occurs within an organization and between companies, enormous productivity gains are possible."

BOTTOM-LINE BENEFITS

As with any technological advance, business executives are asking some tough questions about SOA: What's the bottom line? How will this help support and grow my business? What does SOA mean to my customers and business partners? How will it affect my internal operation? What's the return on investment?

These are fair questions. And the answers are straightforward. By implementing SOA, organizations can:

- **Respond** to changing business conditions in a fast, flexible manner, thanks to the ease with which services can be created, revised and reused. The ability to move quickly spurs business innovation and growth.
- **Adapt** functions and services to fit different business processes in an agile manner. As business requirements change, it's relatively easy for the IT environment to adapt quickly, which is not the case with traditional legacy systems. With SOA, enterprises can start with small projects and expand to enterprisewide implementations as needed.
- **Generate** new revenue and increase market share by enabling enterprises to offer advanced capabilities, such as greater Web personalization or more efficient order management. Such capabilities help attract new customers and strengthen loyalty among existing ones.
- **Share** data, information and knowledge more readily through open standards and common protocols. SOA supports more effective communication—both within an enterprise and between

Defining Enterprise Architectures: An IBM View

During the next few years, service-oriented architecture (SOA) and Web services will play a vital role in defining enterprise IT architectures. Already, IBM has emerged as an industry leader in developing comprehensive products and solutions for organizations looking to harness SOA.

SOA encompasses three primary aspects, according to Kerrie Holley, an IBM Distinguished Engineer and CTO at the IBM SOA and Web Services Center of Excellence:

1. **Business roles** that expose the services to customers and clients
2. **Architectural styles** that require a service provider, requestor and a service description
3. **Implementation methodologies** that include a programming model complete with standards, tools, methods and technologies such as Web services.

"When organizations put these pieces together, they're able to achieve a much higher level of flexibility and crush IT roadblocks," Holley says. He adds that organizations considering SOA and Web services can choose among four distinct entry points, based on their requirements:

- **Individual Web services:** Some companies focus on individual Web services, but most want these systems to operate in the larger universe of SOA. These organizations can streamline processes, integrate activities more tightly and achieve revenue gains. Most of these deployments occur within an enterprise, and they involve low-risk processes that are not mission-critical.
- **Service-oriented integration of business functions:** At this stage, the organization is seeking to provide a set of services based on SOA components. Typically, this is the entry point for alignment of business and IT. The organization may migrate legacy functionality into SOA modules and add new projects to the existing SOA base. These services can be mission-critical, but they often encompass low- to medium-risk deployments.
- **Enterprisewide IT transformation:** Here, the enterprise moves from niche applications to deploying SOA at the enterprise level, with common services used across organizations. These services are an integral part of business products, use standards-based measurement and monitoring systems, and are usually undertaken as integration projects.
- **On Demand Business Transformation:** At this phase, an organization moves into the highest strategic level of SOA. Deployment of services becomes ubiquitous, federated services collaborate and create complex products, and individual services come from many providers. In addition, the services provide support to consumers by veering away from company-specific systems or services. Oftentimes, deployed business services use pervasive standards.

"Today's underlying business problems haven't changed, but the solution has changed," observes Michael Liebow, vice president of Web services for IBM Global Services. "The more creative an organization is about leveraging SOA, the greater is the opportunity for success."

What makes SOA so powerful is that it encompasses Web services. These modular, self-contained components are built on open standards, so they work together without custom coding.

an organization and its supply chain—since communications are not hobbled by incompatible systems. This helps create a distinct competitive advantage for all parties involved.

- **Decrease** infrastructure and personnel costs, reduce testing, improve productivity, and lessen the time and effort required to maintain, support and manage an IT environment.
- **Simplify** the development, maintenance and integration of enterprise applications through standard, reusable components. This building-block approach means that an enterprise can add, remove and swap out components without the pain that typically results from reprogramming large applications.

  Since applications can be reconfigured without rewriting the underlying code, changes can be made to any function by simply plugging in a new component.

  What's more, when an organization has a less complex environment, it is better able to leverage existing systems.
- **Support** security-enhanced environment and identity management. SOA allows administrators to define security policies for Web or legacy applications, as well as for an entire organization. That way, employees gain access only to the data they're allowed to see, and any policy changes take effect almost immediately across the entire enterprise.

  SOA also automates the creation of identifications for trusted users. This greatly simplifies the management of portals, as well as enterprise resource planning (ERP), customer relationship management (CRM) and supply chain management (SCM) applications.
- **Reduce** the risk of problems and failures through the reuse of previously tested software components, rather than developing new, untested ones.

BUILT ON OPEN STANDARDS

The concept of reusing software components has been around for more than a decade. However, past attempts relied heavily on proprietary models, so the connections between various components had to be custom-coded. That approach was expensive, inefficient and time-consuming.

What makes SOA so powerful is that it encompasses Web services. These modular, self-contained components are built on open standards, so they work together without custom coding. Since the services share a common protocol, they can communicate with each other even though they don't share the same language or application platform. Web services make individual services available to other systems via a network.

"SOA is an evolutionary step in the progress of distributed computing," says Jason Bloomberg, a senior analyst at ZapThink, a Waltham, Mass., consulting firm.

By implementing a standards-based approach to distributed computing, an organization can provide services to employees, customers and business partners without the time and expense involved in past proprietary efforts. Because everyone follows the same set of standards, enterprises can be responsive, flexible and competitive, potentially realizing the dream of an on demand business.

SOA Success Story

Many organizations that have adopted service-oriented architecture (SOA) and Web services have already reaped significant rewards.

CREDIT CARD PROVIDER CASHES IN

A large consumer credit card provider was sinking under the weight of customer disputes. With more than 50,000 transactions per minute, the firm recognizes that disputes between consumers and merchants are an inevitable part of the card transaction process. However, every time a dispute arises, the merchant, issuing bank and credit card provider must wait for payment.

In the past, the card provider's call center fielded many of these disputes, and agents used a Web-based application to record the details. However, the standalone application did not interface with the various banks' systems, so staff members spent countless hours rekeying the data.

Using SOA and Web services, the credit card firm reengineered the process so that its form appears within each bank's own application. By making the data available almost immediately and creating a system that can resolve a dispute within the 30-day billing cycle, the credit card company generated more than $200 million in savings during the first three months alone. The firm is so pleased with the results that it plans to roll out the same capability to consumers in the future.

When designed effectively, SOA can function in a seamless and transparent way—offering capabilities that support business growth and success.

PUTTING SOA TO WORK

Service-oriented architecture and Web services work on a straightforward principle: Software components—usually in the form of Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL) or Java—interconnect applications, forms, services and more to any computer in any location.

"SOA knocks down the monolithic application building that surrounds ERP, CRM, SCM and other programs," explains Michael Liebow, vice president of Web services for IBM Global Services.

Too often, systems built by different operating divisions, business units or departments focus on their own tactical goals—without any regard to sharing information or coordinating business transactions to further the goals of the enterprise as a whole. SOA and Web services aim to end this silo mentality. Their containable, reusable objects are designed to interact seamlessly with various applications, regardless of the department, division or unit.

In addition, traditional IT systems typically involve so many business processes and transactions that making a change can unravel the entire infrastructure. With SOA and Web services, the components are building blocks that can be used to construct and recombine functions and processes in a seemingly endless array of combinations. That makes it easy to change a business process or the way a transaction occurs without ripping out an entire application interface or engaging in countless hours of reprogramming.

The results can be significant. For instance, an insurance company can change claims forms used by agents in the field without having to rewrite software. An aerospace firm can accept invoices and purchase orders in different formats from multiple suppliers, yet all the data will flow correctly into its ERP system. And an electronics manufacturer that's involved in an acquisition can combine two companies' technology systems instead of spending months revamping the entire IT infrastructure.

SOA and Web services can also handle more elaborate tasks. A retailer, for example, could reroute trucks automatically based on a weather report. If snow or flooding were forecast, getting shovels or sandbags to home-supply stores in affected areas could take place seamlessly—based on preexisting business rules. This would help eliminate the inevitable shortages that occur during severe weather conditions. Other applications range from managing third-party billing to overseeing outsourcing arrangements. All of these services can be handled automatically, without manual intervention.

Over time, the flexibility and scalability of SOA and Web services provide powerful tools for building an on demand enterprise. "It has implications and ramifications throughout the enterprise," IDC's Mayo points out.

GETTING ON TRACK

Like any complex IT initiative, SOA and Web services have their share of challenges. When designed effectively, SOA can function in a seamless and transparent way—offering capabilities

SOA Success Story

SOA DELIVERS FOR A MOVING COMPANY

A large delivery company achieves bottom-line benefits from SOA. The firm ships large and high-value items, such as sofas and exercise equipment, directly to consumers.

With more than 1,600 delivery agents scattered across the United States, assigning delivery jobs by phone was a complex and time-consuming process. In many cases, the company waited hours for individual responses before considering other agents. This led to shipping delays, incremental costs and allegations that the firm unfairly favored certain agents.

Missing critical shipping dates wasn't an acceptable option. So, the firm replaced the manual process with a Web services solution that distributes relevant order information simultaneously to available agents. The agents access the system through a Web portal or their own transportation management system. Agents then bid for jobs in real time.

The net effect? The company has slashed the cycle time for deliveries by 25 percent, while achieving its return on investment within 12 months. In addition, agent, business partner and customer satisfaction levels have spiked, which has resulted in increased volume. As a result, the company projects $75 million in additional annual revenue.

Of course, getting any major project off the ground requires solid governance. When implementing SOA and Web services, the paramount concern is aligning technology and business strategies.

that support business growth and success. However, if the underlying services do not function correctly, optimum benefits cannot be achieved.

"It's possible to achieve certain gains with a pilot or departmental SOA project," ZapThink's Bloomberg points out. "But the largest gains occur when an organization moves its enterprise architecture to SOA."

For any organization turning to SOA, it's essential to recognize that, in the most basic sense, it is a software architecture that encompasses business processes. Beneath all the programming, SOA is really a set of best practices for how to organize IT and how to help IT interact with the business in the most effective way.

In short, SOA is more than a technology. Instead, it defines how people use technology and sets up strict standards for the governance of technology.

Enterprises can use either a bottom-up or top-down approach to tap into the power of SOA. Within some organizations, it makes sense for individual departments to develop an SOA and create Web services applications. By building on the success and acceptance of those components, the enterprise can then expand the initiative and use SOA to address other issues and needs.

The disadvantage to the bottom-up method is that it can create a chaotic environment. Numerous groups and constituencies within an organization can develop their own components—thus duplicating time and effort. In addition, the lack of a cohesive strategy can undermine potential opportunities and gains.

On the other hand, a top-down approach—while unifying the strategy and effort throughout the enterprise— doesn't always take into account the realities of existing IT. Such an approach might yield an architectural plan that isn't practical to implement. That has led many organizations to turn to a hybrid approach that balances top-down and bottom-up methodologies. When executed effectively, that approach offers the best results and lowers risk, according to Bloomberg.

GOVERNANCE IS ESSENTIAL

Of course, getting any major project off the ground requires solid governance. When implementing SOA and Web services, the paramount concern is aligning technology and business strategies. If IT does not comply with the business needs of an organization, SOA can quickly become a repeat of the failures of the early ERP days.

A poorly designed or executed project can devour time, energy and money, while providing little or no payback. To avoid such an occurrence, many enterprises put together a cross-functional team that includes business analysts, line of business decision-makers, system architects and applications developers, security specialists, network operations experts, users and others. Such teams can play a crucial role in engineering an SOA environment that functions for the greater good of the enterprise.

A core responsibility of this team is to prioritize projects and maintain a global view of SOA and Web services. For instance, they should recognize that a component benefiting human resources might also provide dividends for the finance department.

And the same module that allows field agents to submit orders via the Web or a wireless connection also could be used for customers. That would help eliminate the need to engage the IT staff in additional programming and integration. In fact, economies of scale are a primary selling point supporting service-oriented architecture.

SOA Success Story

BANKING ON SOA

A full-service financial institution offers low-cost Internet banking. The service is accessible through in-store kiosks in conjunction with a leading grocery chain.

In the past, customers could complete basic deposits, withdrawals and transfers, but they could not process other routine tasks, such as ordering checks or stopping payment, online. As a result, customers used a call-center and endured long waits. Not surprisingly, customer satisfaction levels plummeted.

The bank turned to SOA and Web services to create Web portal and kiosk access to call-center functions. Today, when a customer makes a change or places an order, it is instantly updated across all channels.

Already, the solution has resulted in $3 million in operational cost savings annually. More important, it has helped customer satisfaction levels climb, leading to a 50 percent year-over-year growth in the bank's customer base.

While SOA and Web services have already made headway within large organizations, the technology will start filtering down to medium and small companies and will expand into supply chains.

According to IBM's Liebow, best-practice organizations focus on four factors for achieving success with SOA and Web services. They are:

- Take a formalized approach by creating rules and policies for the use of SOA and Web services across the enterprise.
- Ensure that IT and others in the organization have the skills to use SOA and Web services to optimum advantage.
- Take a disciplined approach to the architecture: Look for pain points and low-risk, high-reward opportunities.
- Develop an overall strategy for SOA and Web services, rather than putting components in place in a helter-skelter fashion. In many instances, organizations start small and continue to build on SOA over many months and years.

FUTURE TRENDS

Most organizations have just begun to tap into the power of SOA and Web services. The vast majority are piloting the technology or using it on a niche basis.

However, it is anticipated that in the coming years, this technology will achieve widespread acceptance and play a major role in defining enterprise computing. Thanks to the acceptance of key standards by virtually all major software vendors, service-oriented architecture is likely to emerge as a more important step in the evolution of computing than client-server or basic Web-based systems.

Early adopters of SOA and Web services include financial services, telecommunications, government and retail. In fact, as radio frequency identification (RFID) and other leading-edge tools take root in the retail industry, SOA promises to play a major support role.

"Keeping track of every item on every shelf requires an IT infrastructure that might be an order of magnitude more complex than that required for earlier technologies," ZapThink's Bloomberg observes. "The last thing an organization wants to do is to have its RFID project fail miserably because its existing IT infrastructure isn't up to the task."

During the next few years, service-oriented architecture will likely expand to all corners of the corporate universe: from auto manufacturers to pharmaceutical firms; from electronics companies to consumer goods. While SOA and Web services have already made headway within large organizations, the technology will start filtering down to medium and small companies and will expand into supply chains. This architecture will also play a significant role in streamlining mergers and acquisitions, by linking previously incompatible systems.

SOA and Web services provide a dynamically reconfigurable architecture that is designed to enable enterprises to respond quickly and flexibly to market changes, thereby supporting innovation and business growth. Ultimately, this increases the potential for an improved return on IT investments and a more robust bottom line. ■

Learn More at an IBM eSeminar

Interested in learning more about how service-oriented architecture (SOA) and Web services can help your enterprise drive growth and revenue, improve productivity and customer satisfaction, lower costs and provide a flexible IT architecture that speeds time to market?

On November 15, 2004, at 2:00 p.m. ET, IBM will present an eSeminar designed to help business and IT managers understand the value of SOA and Web services and learn how to get started. This eSeminar will define SOA, discuss potential applications and benefits, provide insight about challenges and offer a basic roadmap for navigating the technology. It will also include a Q&A session during which attendees can ask about specific issues and topics.

AGENDA TOPICS INCLUDE:

- **First Steps:** How to begin building a more flexible, responsive enterprise
- **Confronting the Hairball:** Streamlining and leveraging existing IT infrastructure to enable flexibility and growth
- **Why Standards Matter:** How Web services support and enhance SOA
- **Implementation:** What steps are needed to implement SOA and Web services
- **Q&A:** Specific issues addressed by attendees.

You can register for this eSeminar at http://go.eSeminarslive.com/ibm.
For more information about IBM's service-oriented architecture offerings, please visit www.ibm.com/services/SOA.