



WebSphere software

Integrating zSeries applications and processes as Web services in an SOA environment.

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Introduction

In today's mainframe or core-systems environments, applications and processes built on traditional languages and runtimes continue to deliver a wealth of mission-critical benefits to large organizations. These applications and processes also represent significant investments in terms of development, maintenance, training and other factors.

Organizations want to leverage the value of these processes and applications as much as possible. However, much of this existing technology was not designed to address today's rapidly changing market and business conditions. To respond quickly and effectively to these changes while providing greater reuse and flexibility, the existing applications and processes should be integrated with other IT environments across enterprise networks and with other business entities over the Internet.

With a long history of successful implementations, service-oriented architectures (SOAs) offer a consistent, strategic way to integrate applications and processes as services. IBM WebSphere® software and the IBM zSeries® family of products support SOA strategies, with a full range of solutions for flexible, cross-platform integration. The result can be increased responsiveness, improved business agility and greater competitive advantage in an increasingly competitive business world.

Integration challenges for existing applications and processes

Business success depends on being able to address rapidly changing conditions with highly responsive, flexible, on demand solutions. Large organizations also know that an on demand infrastructure will require the integration of their existing applications with new platforms and environments — a requirement that presents a number of significant challenges.

Heterogeneous platforms and environments. The sheer size and diversity of today's large IT infrastructures can make integration a daunting task. Many organizations use a complex variety of business logic and user interfaces across multiple, heterogeneous platforms. These platforms include different hardware, networking protocols and operating systems. In addition, applications must often work with other business entities such as vendors, suppliers, customers and partners, all of which use processes implemented on disparate platforms outside the enterprise.

Diverse programming and development languages. Modern SOA frameworks in many cases enable customers to leverage processing and information through Web-based or Web service-based processing. As such, customers may need to integrate two disparate environments. On one side, there is Web-based processing delivered through application servers supporting Java™ 2 Enterprise Edition (J2EE) software and Java language. On the other side, there is mainframe-based processing delivered with the COBOL and PL/I language processing of IBM CICS® and IBM IMS. The Java language is the language of the Internet; COBOL and PL/I are the languages of business. Therefore, it can be assumed that modern applications will leverage the user-interface potential of Web and Java-based processing with the business potential of COBOL and PL/I processing, including self-documentation, ease of understanding, high performance and a simplified programming model.

IT professionals are finding that their expertise needs to extend to this new model through training, knowledge, skill sets and methodologies. The strategic goal is to understand, create, support and troubleshoot these modern applications.

Siloed applications. Horizontal integration across the enterprise must accommodate a number of functional areas such as supply chain management, enterprise resource management and customer relationship management. These areas are often supported by custom or pre-packaged applications, most of which were implemented years ago with point-to-point integration methods. As a result, these applications still contain “silos” of data. Replicating or reusing business logic across these siloed platforms by traditional means can be time consuming and error prone.

“Green screen” interfaces. Existing applications sometimes have thousands of character-based or “green screen” interfaces that were designed to support earlier generations of business processes. These applications do not provide native support for browser-based interfaces. Data must often be transferred by manual methods involving faxes, printing or retyping — a process that can be prohibitively expensive and even unworkable for large amounts of data.

To address these and other challenges, organizations must find a flexible, strategic and cost-effective solution for integrating existing applications and processes. IBM believes that SOAs can be a critical part of this solution.

“Given the heterogeneous computing environment at Schwab, the adoption of a standards-based SOA was an evolutionary step towards reducing the coupling between interacting software systems.”

– Tim Heier, technical director of Application, Infrastructure, Domains and Engineering (AIDE), Charles Schwab

SOAs: a brief overview

An SOA is a standards-based integration and development architecture that overcomes differences in platforms, software architecture, languages and network protocols. In an SOA environment, COBOL and J2EE applications — as well as PL/I software — work together easily and effectively. Major vendors like IBM and Microsoft® have agreed to SOA standards, which allow their hardware and software to share information and data.

With an SOA, different computers with different programs from different functional areas of the business (or externally to customers, partners, suppliers or vendors) can intelligently talk and exchange data with each other. Communication relies on open, cross-platform standards including Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL) and Universal Description, Discovery and Integration (UDDI).

SOAs are sometimes considered to be a recent development, perhaps because interest in SOAs has grown so rapidly in the past few years. However, SOA-based solutions have a long history of successful implementations in a number of vertical industries.

SOA implementations were once proprietary and limited in their ability to integrate across heterogeneous platforms. However, a new implementation mechanism for access and connectivity called Web services has now made SOAs much more flexible, cost-efficient and scalable. Web services are actions performed by an application in response to a request by another application. Applications work together by exchanging service messages back and forth. The communication can be either simple data passing or the coordination of two or more services. Service messages and services are exchanged using Web-based interfaces.

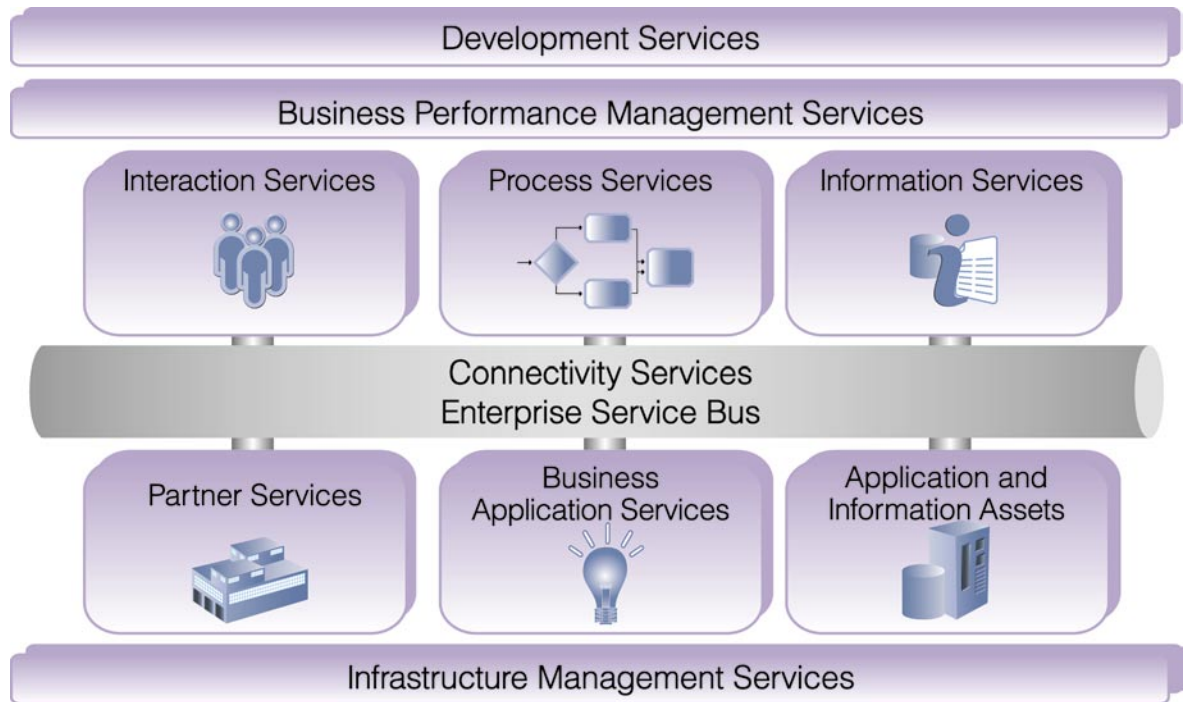
Existing applications and traditional runtimes and processes can fully participate in SOAs. Transaction-oriented applications can have one set of routines handling business processing and another set handling screen processing at the interface level. The business processing routines or services and their interfaces can be consumed and assembled by any number of business integration tools and made a part of larger business flows and applications.

IBM WebSphere family of products

The strongest proof of IBM's commitment to SOA strategies is the family of IBM WebSphere products. The IBM WebSphere Integration Reference Architecture — the overall architecture guiding WebSphere product development — represents a long-term commitment to SOAs, a commitment also reflected in the ongoing evolution and rapid enhancements of our SOA technology.

An ESB is the key enabler that allows the IBM WebSphere Integration Reference Architecture to provide a set of infrastructure capabilities, implemented by middleware that enables the integration of services in an SOA environment. An ESB supports communication among software applications with little or no disruption — even those applications that are written on different platforms, in different programming languages, or that use different programming models.

IBM WebSphere Integration Reference Architecture



The breadth of robust software capabilities from IBM WebSphere are delivered through a modular product portfolio, connected in a flexible, open reference architecture. The IBM WebSphere Integration Reference Architecture enables organizations to realize the value of a fully integrated service-oriented architecture (SOA) using IBM WebSphere's proven IT platform.

Within this framework, IBM WebSphere technology includes:

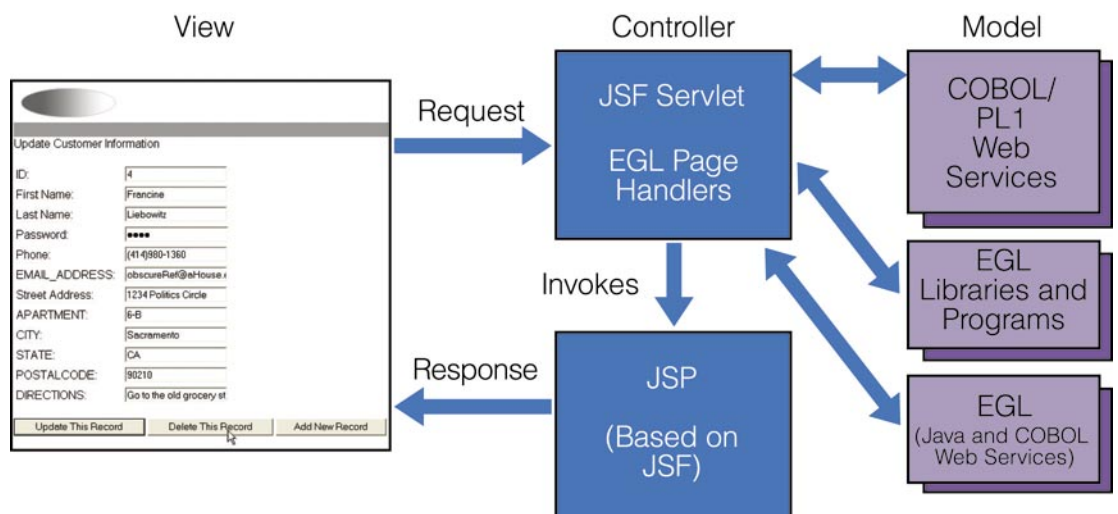
- Support for the latest Web services standards, including Java API for XML-based Remote Procedure Call, Java Specification Request-101 (JAX-RPC, JSR-101).
- Support for UDDI Version 3, Web Services Interoperability Organization (WS-I) Basic profile, and WS-Transactions.
- Concurrent support for J2EE 1.2, 1.3 and 1.4 specifications.
- Industry-leading support for Extensible Markup Language (XML).
- Interoperability between Web services (including those originating from CICS, IMS, COBOL and PL/I applications) and J2EE applications.

SOA implementation with MVC, JSF and COBOL

SOAs support the development and integration of Web applications with COBOL and PL/I applications by making use of the Model View Controller (MVC) framework and the JavaServer Faces (JSF) specification for JavaServer Pages (JSP). This integration and development is based on a J2EE architecture and can utilize native Java or the Enterprise Generation Language (EGL).

The important advantage of the EGL development environment is that the business-oriented application developer is not confronted with and does not need to understand how to implement the MVC pattern. The generation engine performs this task for the application developer. In an EGL based application, every page will have a “shadow” page handler. The EGL page handler controls a user’s runtime interaction with a Web page, providing data and services to the JSP that displays the page.

Web Application Architecture (EGL and JSF)



An EGL and JSF development environment can help support the development and integration of Web applications with COBOL and PL/I.

EGL has a construct called a library. An EGL library is simply a file that includes EGL code. It provides the application developer with the ability to easily decouple the business logic from other application code. EGL libraries provide a variety of entry points — one per function. These functions can be called from other functions in other libraries or from EGL code in EGL programs or EGL page handlers.

JSF is a set of Java classes and JSP tag libraries that provide a framework for developing Web applications. Its implementation in IBM Rational® Application Developer and IBM WebSphere Developer for zSeries allows developers to drag and drop JSF controls onto a page canvas instead of having to implement pages using hand coding techniques.

The integration of EGL and JSF produces an event-driven model in which each request is handled by a page-specific handler. The page handler can act on information submitted with the request, or forward it to another handler for processing. This event-driven model greatly simplifies the building of Web applications.

The page handler includes controller logic, which in turn can invoke services — via connectors and Web services — providing business processing in CICS, IMS, COBOL and PL/I, and EGL languages.

Integration and transaction processing on the WebSphere platform

WebSphere, CICS and IMS middleware support SOAs and provide an execution environment for business transactions consisting of the various business and user interface processes that make up SOA strategies. They support end users executing processes against several different data types.

IBM WebSphere Application Server for z/OS® is specifically designed for existing environments, combining the integrated, open, standards-based J2EE environment of WebSphere Application Server with the high qualities of service, reliability and availability of the z/OS operating system.

IBM WebSphere Studio Application Monitor can be used to monitor composite applications that combine a J2EE front-end with an existing CICS or IMS back-end. With WebSphere Studio Application Monitor, the user can trace the transactions across the different subsystems in real time and discover bottlenecks along the entire execution path. WebSphere Studio Application Monitor also offers performance analysis and report capabilities to support historical or trends analysis.

IBM CICS Transaction Server Version 3.1 provides Web services capabilities to extend CICS applications to an SOA environment. CICS has a proven track record of successfully delivering new technology at a pace that makes sense for the enterprise while minimizing the risks inherent in the adoption of new technologies. CICS and IMS together provide unparalleled transaction processing and manage the operating environment to provide performance, scalability, security-rich capability and integrity. CICS Transaction Server provides the base for the majority of mainframe applications today and supports the development of applications in popular languages such as COBOL, PL/I, C/C++ and Java.

IBM CICS Interdependency Analyzer for z/OS Version 1.3 automates detection of runtime resource relationships within your CICS system, and provides flexible reports to help you use this data to more easily maintain, enhance and reuse your business applications, balance workload and improve productivity.

IBM CICS Performance Analyzer for z/OS Version 1.4 can complement your online monitor to produce a wide range of reports on the CICS-related System Management Facilities records. It provides detailed analysis for offline CICS performance problem determination, performance management, tuning and capacity planning.

IBM WebSphere Studio Asset Analyzer for Multiplatforms Version 4.1 provides an enterprise-wide repository of application insight. Seamless integration of these applications with *Asset Transformation Workbench Version 1.1* means you can perform high-level, cross-application analyses in WebSphere Studio Asset Analyzer and then easily pass this application insight through a software bridge for use in Asset Transformation Workbench.

The two technologies work in concert, giving users a compelling solution for planning and implementing enterprise application modernization initiatives. Project teams using Asset Transformation Workbench can, for example, tap into the WebSphere Studio Asset Analyzer repository to find all application artifacts related to a particular application. Asset Transformation Workbench Version 1.1 provides developers, analysts and managers with the information and function they need to accelerate the transformation of your organization's enterprise applications.

IBM WebSphere Developer for zSeries Version 6.0 gives application developers the ability to rapidly develop composite-based applications and components as SOAs. This includes user interfaces via Web and session components, connectivities via Web service and JCA components, and business processes via Java, COBOL, PL/I and EGL components. Integration developers can quickly assemble and connect visual and business processing including the ability to create complex flows consisting of multiple business services.

In addition, WebSphere Developer for zSeries can help improve team-wide efficiency by making use of a broad set of skills, including JSP, Java Server Faces and Struts visual assembly.

For traditional applications, WebSphere Developer for zSeries provides connectivity to z/OS, as well as the ability to define, access and work on z/OS assets locally and remotely. It creates a deployment environment to integrate, compile and build processing in z/OS environments while remote debugging is enabled via integration with IBM Debug Tool for z/OS. WebSphere Developer for zSeries also provides a local Asset Analyzer environment delivering project-based understanding integrated to the enterprise understanding provided by WebSphere Studio Asset Analyzer.

Finally, WebSphere Developer for zSeries also generates WSDL, COBOL adapters and CICS service flows. This enables rapid creation and generation of direct Web services access and testing of CICS and IMS based Web services, as well as integration via Java clients to J2EE front ends and applications.

IBM IMS Version 9 provides support for SOAs. IMS transactions can be published on the Internet as Web services, connecting via SOAP and EJB bindings and using unchanged COBOL, C and MFS-based applications. For rapid response for business transactions and inquiries, IMS V9 provides Integrated Connect function, offering easy-to-install, easy-to-use, high performance, high volume and security-rich transparent access to IMS applications and data from any application environment, including Linux®. This integrated Connect function also assists in managing the network environment and assisting with workload balancing for better resource utilization. It can also be used with IBM WebSphere servers and tools to quickly transform IMS transactions into Web services.

To ease customers' increasingly complex environments, IMS V9 also provides a DLI Model utility (for generating metadata) and state-of-the-art Java and XML development tooling. And to ensure continuous access to critical business information and unlimited data management capacity to handle unpredictable volumes, IMS V9 provides Integrated High Availability Large Database (HALDB), On Line Reorganization (OLR) and XML DB support. IMS V9 can also help maximize reuse and support collaboration by widening the interfaces to IMS with a SOAP Gateway, using standard interfaces to IBM and non-IBM components, within and beyond the enterprise boundaries, and utilizing IBM WebSphere Developer for zSeries to create converters for transforming XML messages and COBOL data. A technology preview/demo is currently available at ibm.com/ims.

IBM IMS Problem Investigator for z/OS Version 1.2 provides an enhanced level of problem determination services for IMS Transaction Manager (IMS TM) and IMS Database Manager (IMS DB) systems. These services include navigation aids and investigative procedures as well as powerful automated features, which help to reduce the amount of time required to identify and analyze defects or other events of interest in the IMS log. IMS Problem Investigator supports IMS Connect Extensions for z/OS event data collection, formatting and the other features available with IMS log records. IMS Performance Analyzer for z/OS system definitions can now be shared with IMS Problem Investigator. IMS Problem Investigator makes IMS log analysis quicker and easier than ever before.

IBM IMS Performance Analyzer for z/OS Version 3.3 provides comprehensive performance analysis and tuning assistance for IMS transaction and database managers. IMS Performance Analyzer for z/OS processes IMS Log, Monitor and IMS Connect event data to provide comprehensive reports for use by IMS specialists to tune their IMS systems and use by managers to verify service levels and predict trends.

IBM IMS Connect Extensions for z/OS Version 1.1 enhances the basic IMS Connect function with extended features and functions in the areas of availability and security. By enhancing the IMS Connect function with the high-performance IMS Connect Extensions, you gain the ability to measure and analyze the activities that take place within your IMS connectivity environment.

IBM WebSphere Host Access Transformation Services (HATS) helps make both IMS and CICS 3270 applications available as HTML through the most popular Web browsers and as published Web services while converting host screens to a Web-like look and feel. Because HATS provides a zero-footprint Web-to-host solution, the only software needed on the client is a Web browser.

Benefits summary

SOAs with IBM WebSphere products provide a strategic framework that allows end-to-end application integration to be adopted as a multi-tiered process over time.

SOAs can help large organizations better manage complex transactions, adapt more easily to growing workloads without impacting system responsiveness, improve end-user service and promote secure access to heterogeneous enterprise computing resources.

Equally important, SOAs offer significant advantages as strategic integration and development platforms for large organizations that want an organized, strategic transition to an on demand IT infrastructure. IBM has backed this belief with a comprehensive and evolving family of WebSphere software solutions.

Charles Schwab improves customer services and leverages existing investments

The Charles Schwab Corporation is one of the nation's largest financial services firms, serving eight million active accounts with US\$758.4 billion in customer assets. Over the past few years, a market downturn coupled with issues involving apparent conflicts of interest have created pressures on traditional, full-service brokers. As an industry leader, Schwab recognized that these same conditions also provided new opportunities based on the ability to improve client services, backed by a clearly defined fee structure.

To take advantage of these opportunities, however, Schwab would have to standardize and simplify its infrastructure in order to provide seamless support across multiple channels. Schwab worked with IBM to develop an SOA infrastructure that would support enhanced communications and integration, allowing Schwab not only to enhance customer services but also to make better use of existing assets.

With SOAs and the new processes and applications it supports, Schwab is creating a more efficient, available and resilient architecture and set of tools to meet market demands. As a result, the company can deliver relevant, consistent advice in a more responsive manner — whether the customer is at an investment center, on the phone or on the Web. With IBM and SOA-based solutions, Schwab has positioned itself for success in the on demand world.

Integration of existing applications and their processes with IBM WebSphere can offer a number of benefits for large organizations. An SOA-based integration strategy using WebSphere solutions can help organizations respond to rapid changes in markets, capture new markets, improve products, better address regulatory issues, strengthen business partnerships, lower IT overhead, increase profits and better align IT with long-term business goals.

For line-of-business (LOB) managers, benefits include the ability to increase sales by developing channels and reaching new customers, improve staff productivity and enhance collaboration within the organization and with business partners. WebSphere solutions can also help managers and staff leverage existing IT infrastructures, reduce information silos, strengthen collaboration between COBOL and Java developers, promote modern Web user-interface skills for COBOL developers, control training and personnel costs, and increase productivity.

IBM's commitment to SOAs

IBM is fully committed to SOA solutions:

- *In 2004, IBM estimated that it would spend US\$1 billion on Web services, SOA and Enterprise Service Bus (ESB) initiatives.*
- *Over 50,000 developers in 164 countries are actively working on Web services applications through the IBM Speed Start for Developers program.*
- *IBM now has over 35,000 industry-oriented consultants with experience and expertise in SOAs and Web services.*
- *Three Web services Centers of Excellence leverage IBM's deep industry knowledge.*

Learn more

IBM's standards leadership, core system experience and integrated, security-rich development and deployment platform provide the ability to deliver products and technical expertise across the components of an SOA environment. This helps IBM deliver SOA solutions tailored to meet the unique needs of your organization.

For more information about SOAs and IBM WebSphere, visit ibm.com/websphere



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