



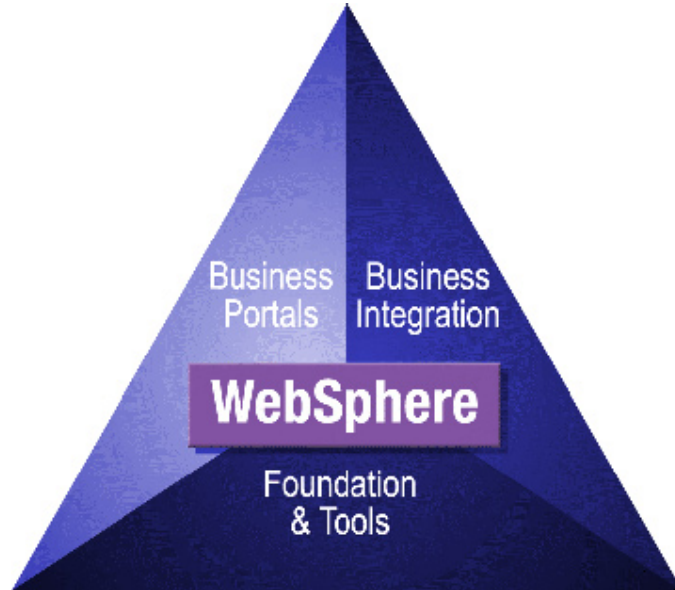
WebSphere software

A foundation for e-business on demand.

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Executive overview

IBM WebSphere® Application Server, Version 5.0 is a proven, agile e-business platform designed to support today's urgent business imperatives. WebSphere Application Server can help you reduce overall costs, improve customer loyalty and respond quickly to new business opportunities.

Serving as an operating system (OS) for the Internet, WebSphere Application Server provides:

- *A comprehensive open standards-based integration platform*
- *A highly integrated application development environment*
- *Agile application deployment and administration*
- *Intelligent, comprehensive application optimization*

As a foundation for e-business on demand™, WebSphere Application Server provides features to support dynamic applications, improved ease of management and the latest Java 2 Platform, Enterprise Edition (J2EE) technology and Web services standards. WebSphere Application Server now builds on its proven scalability and performance with new automated performance tuning and load-balancing services. Version 5.0 is available in several configurations across a wide range of platforms to help eliminate overinvestment today and maintain future growth.

WebSphere Application Server integrates with the IBM WebSphere Studio application development platform, based on the Eclipse open-source project. This combined development and deployment environment speeds time to market and helps you leverage existing assets across the organization and over time.

WebSphere Application Server and WebSphere Studio provide a common foundation for IBM software, including the rest of the WebSphere software products, IBM Tivoli® management, Lotus® collaboration and IBM DB2® information management software products. As a result, WebSphere Application Server and WebSphere Studio help provide immediate value and offer a highly extensible platform that can continue to deliver efficient returns as you employ new portal, commerce or business process integration projects in the future.

The evolving role of application servers

Application servers were once standalone products. An application server in an organization often hosted new applications side by side with messaging servers, Web servers and customer relationship management (CRM) servers. Then it became clear that the core engine required to build, deploy and manage applications containing new business logic could be defined as a single set of core application server functions. And if this common engine could be standards-based, it could more quickly and easily become the foundation for any number of specialized software packages.

This evolution has taken place rapidly, because an OS for the Internet directly addresses acute problems faced by many enterprises, independent software vendors (ISVs) and solution providers. These organizations grapple with how to improve asset efficiency, centralize control over decentralized operations and increase infrastructure flexibility to respond rapidly to business changes.

These goals are difficult to achieve when faced with the realities of today's computing environment. Major challenges of this environment include:

- *Handling heterogeneous systems*

The world is heterogeneous. Almost every organization uses a variety of hardware, operating systems and programming languages. Any time an organization needs to connect with another business, another assortment of technology platforms must be negotiated.

- *Simplifying management*

Packaged and custom-built applications have sprung up throughout the organization. These applications need to be managed, secured and frequently integrated.

- *Increasing developer productivity*

Developer productivity is a question mark. Existing skills need to be leveraged. New skills have to be learned. Assets need to be integrated by the people on staff today.

- *Leveraging existing resources*

Available resources are constantly changing. Vendors go out of business. Budgets shift. New assets cannot be readily acquired.

This challenging environment means an OS for the Internet must meet robust requirements to deliver an infrastructure that maximizes efficiency and flexibility. CIOs and IT managers today need:

- *A comprehensive build-to-integrate platform*
- *Highly integrated development and deployment environment*
- *Agile deployment and ease of management*
- *End-to-end intelligent application optimization*

This paper outlines these requirements in more detail and describes how WebSphere Application Server addresses them to deliver a simplified and more productive IT infrastructure.

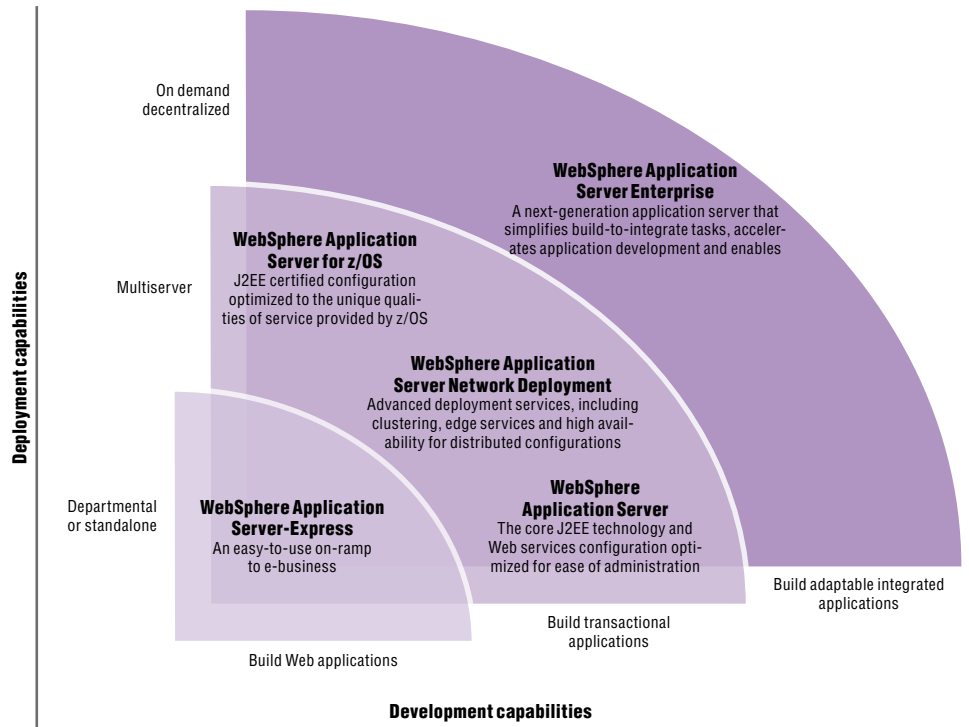


Figure 1. WebSphere Application Server, Version 5.0 configurations

A comprehensive build-to-integrate platform

Nearly all new applications require integration with other applications and existing enterprise systems. Specific integration requirements include, but are not limited to, your ability to:

- *Integrate and reuse existing IT assets within a dynamic e-business infrastructure.*
- *Increase developer productivity with the ability to compose integrated applications.*
- *Create flexible applications that enable updates with a minimum amount of effort.*
- *Combine synchronous application server services with asynchronous messaging services.*

A services-oriented architecture

Many customers are looking to Web services to provide a standardized way of encapsulating new and existing applications. They can then reuse and integrate them within a dynamic e-business environment. WebSphere Application Server, Version 5.0 and WebSphere Studio provide a platform that exploits a services-oriented architecture based on J2EE technology and Web services standards. Because WebSphere Application Server features an open approach to transforming any application asset into a modular service, you can have these services accessible for reuse by other developers throughout your organization. WebSphere software provides visual tools for developing business objects, business logic, and integration logic that are all compatible, using one repository for metadata and a single approach for defining data handling and transformation.

Web services-based software aids internal development and integration, and it provides a standardized method for publishing encapsulated business services to drive business-to-business (B2B) collaboration and, in time, new revenue streams. Examples of these services include stock quotes and charting, credit card verification and payment processing, integrated travel planning and auctioning.

WebSphere Application Server, Version 5.0 provides leading Web services capabilities, including:

- *Intuitive interfaces, along with support for utilizing the latest Web services standards like Simple Object Access Protocol (SOAP) and Web Services Description Language (WSDL), with access and security updates, all natively integrated with the J2EE programming model. SOAP allows for easy, standardized access to public and private registries and other Web services applications and is the Web services version of RPC (Remote Procedure Call), an XML-based protocol and encoding format for inter-application communications. The Apache SOAP architecture, which is incorporated in WebSphere Application Server, Version 5.0, defines a set of stable, published interfaces for component-oriented deployment.*
- *Information connectivity through prebuilt and tailored application adapters using the latest Web services standards for generation and service composition.*

- *Expanded access integration with flexible services in a network-aware business environment, with privacy and protection being provided for directories and public and private registries, such as Universal Description, Discovery, and Integration (UDDI). A private UDDI registry can be used within the enterprise or between trusted parties and provides a dynamic mechanism to publish and use services. WebSphere software also supports use of the public UDDI registries. Public registries enable anyone to publish services and for other, effectively anonymous users to locate them and understand how to use them. Normal access restrictions will still apply from a technical and business perspective. These are currently operated by IBM, Microsoft®, NTT and SAP. Visit www.uddi.org for more information.*
- *Web services-based invocation framework, providing protocol flexibility and easy-to-use tools that generate Web services applications.*
- *Support for Web services gateways, which offer more security and protection by filtering Web services access to registries and other applications as suitable for B2B solutions.*

Integration and reuse of existing IT assets

New Java™ technology-based applications frequently need to leverage existing legacy assets in combination with the development of new business logic written in Java. The ability to create new applications that incorporate a variety of enterprise resources quickly and easily is a key requirement in a variety of industries. Businesses are looking for new ways to reduce the complex underlying coding required to create these dynamic applications without sacrificing transactional integrity. For example, an insurance or telecommunications company that stores a multitude of customer data utilizing IBM CICS® now needs to integrate this information within its J2EE environment.

WebSphere Application Server, Version 5.0 delivers a productive environment to visually create dynamic application adapters that you can easily integrate with others within complex, multimode transactional schemes. WebSphere Application Server leverages Java Connector Architecture (JCA) and provides a consistent way of connecting to and communicating with a wide range of enterprise systems and applications, as well as advanced transaction coordination. This capability, coupled with support for XML-based Web services, provides simple to sophisticated

application connections and data aggregation. JCA defines the function that WebSphere Application Server provides and determines which back-end system vendors (for example, SAP, PeopleSoft, Siebel, Oracle or third-party connector developers) can use to plug into J2EE software.

JCA has two basic components:

- *A common client interface (CCI). Manages the flow of data between the application and the back-end system and has no visibility into how the container and application server perform*
- *A set of system-specific services. Implements system-specific services as part of its base J2EE platform*

CCI is a programming interface that application developers and client programs can use to connect and access back-end systems. It's a low-level application programmer interface (API) and is similar to Java Database Connectivity (JDBC). Unlike JDBC, however, CCI can work with nonrelational systems. Although it's possible for application developers to call CCI directly, in most cases an application developer will write to an abstraction layer, provided by the connector provider or enterprise application integration (EAI) framework vendor, simplifying the development process.

On the platform side, JCA defines a set of service contracts that a connector developer can expect will be available to the adapter at application runtime. The three services defined in JCA 1.0 and implemented in WebSphere Application Server include:

- *Connection management. Enables WebSphere Application Server to create and manage connections to back-end systems. WebSphere Application Server also implements connection pooling, because connections to back-end systems are expensive.*
- *Transaction management. Supports transactional access to underlying resource managers. This service enables the transaction manager within the EJB server to manage transactions across multiple back-end systems.*
- *Security management. Enables the developer to define security between the EJB server and the back-end system. The specific security mechanism that is used is dependent on the security mechanism provided by the back-end system.*

Composing long-running workflows

WebSphere Application Server, Version 5.0 provides the ability to integrate Web services with long-running workflows that leverage new and existing applications. The capability to easily choreograph application interactions allows for realtime adjustments in the future. With new WebSphere Application Server features, applications can be generated with adaptable intra-application flows and behaviors that you can change dynamically through human interactions or rules engines. Figure 2 outlines how you could combine and choreograph a multitude of services within an integrated workflow.

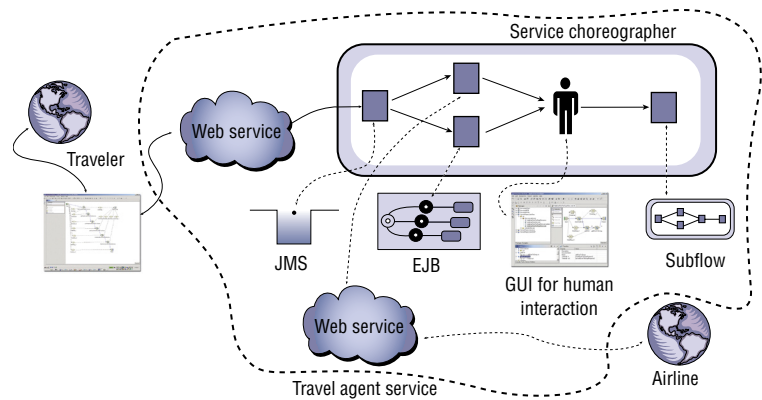


Figure 2. WebSphere Application Server workflow capabilities

Long-running business processes (macroflows) encompass shorter running, synchronous activities (microflows). These long-running flows can be exposed as services that process a series of activities and can be reversed if one or more activities fail. For example, a service called BookTravel could combine a series of activities called Bookcar, Bookflight and Bookhotel. If one of these activities fails, the entire service is “rolled back” and undone. These services could also support human interaction as an activity, or the multiple services could be combined into a single service. This flexible programming model promotes the future reuse of existing services.

WebSphere Studio provides a visual tool to create and assemble services into workflows or applications. WebSphere Studio also provides application usage profiling and a business-rules engine that can be populated dynamically to control a Web services-oriented architecture and EJB transactions.

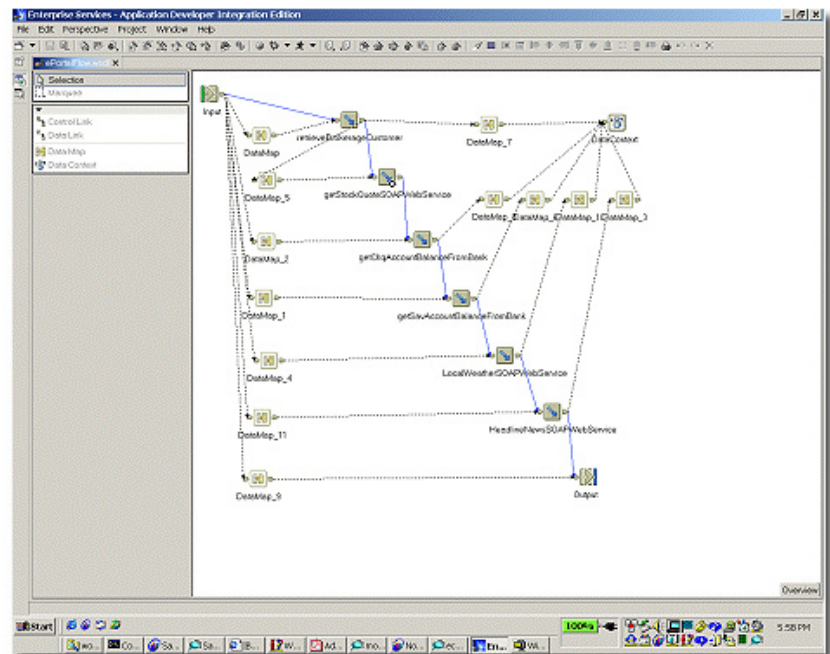


Figure 3. WebSphere Studio Application Developer with visual workflow composition capabilities

Another key requirement that companies place on a Web application server is support for process automation facilities. The ability to host and schedule a living business model in the application server environment brings new opportunities for nondisruptive process integration. You can accomplish a smooth process integration with service choreography. It includes scripted interactions with enterprise information systems and other services, along with the longer-running workflows that tie together activities into more coarse-grained business process steps.

Application flexibility

WebSphere Application Server helps you create and maintain flexible applications to increase productivity. How much time can be saved if a business has the ability to maintain and change code and coding parameters on the fly?

WebSphere Application Server provides dynamic extensions designed to do just that, without programmer involvement.

Many companies today across different industries rely on business policies and rules that define the structure of their businesses. For example, the insurance industry relies heavily on regulations—both government and self imposed—that determine insurability. Meanwhile, the telecommunications industry constantly faces regulatory policy changes. Businesses need the ability to respond quickly to these changes. WebSphere Application Server provides a business-rules framework and an internationalization framework to help create agile applications.

The business-rules framework

A business-rules framework provides the ability to define, execute, manage and schedule the rules that encapsulate variable business policy. Any discrete unit of business logic can be expressed as an externally managed rule.

Developers initially create or select a rule that will be triggered from an application. Business analysts maintain the rule thereafter without programmer involvement. This framework decreases maintenance and testing costs, increases the consistency of business practices, allows for reuse of policies across business processes and provides the ability to identify and correct conflicting rules throughout the business.

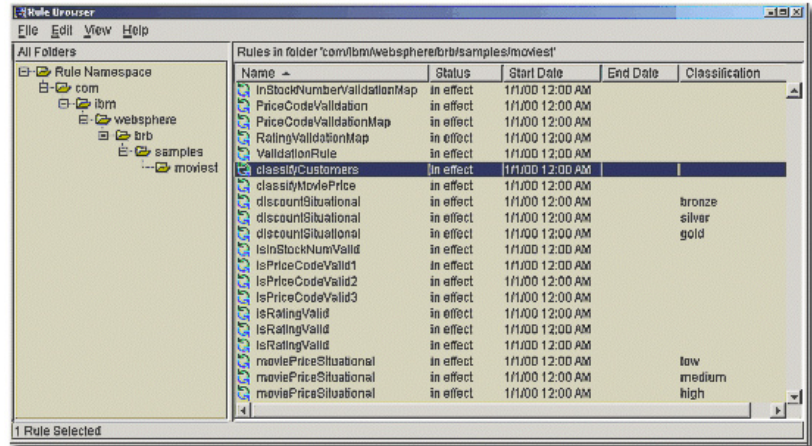


Figure 4. The WebSphere Application Server business-rules console

One example of how you can use this framework is in delivering differentiated service to different sets of customers. You can dynamically classify your best customers and then offer them the highest levels of service. You can also use this rules framework to enact changes to risk-classification policies dynamically and respond to myriad state and regional regulatory changes in realtime.

The internationalization framework

The WebSphere Application Server internationalization framework provides the ability to extend applications to global constituencies with ease. It provides the framework to display content using appropriate local language conventions and currencies and to account for client time zones as time-sensitive transactions are processed. The WebSphere internationalization framework helps eliminate months of programming costs and significant maintenance IT costs typically associated with expansion into international markets.

With WebSphere Application Server, businesses trying to leverage global opportunities can deliver intelligent applications that account for customer languages, geography, formatting rules, sorting algorithms and time zones.

Integration of asynchronous messaging services

By enabling dynamic, flexible application interactions, businesses can now build integration capabilities in new application logic or create new applications that they want to integrate with other systems.

A powerful part of integration is being able to build new applications that initiate and respond to asynchronous invocations, conversations and broadcasts. WebSphere Application Server, Version 5.0 delivers extended services for mixed synchronous and asynchronous transactional environments as part of the native J2EE 1.3 and Web services environment. A comprehensive, self-contained Java Message Service (JMS) implementation is included that encompasses queue management and publish/subscribe components.

JMS relies on concepts established in the application messaging market for a number of years. JMS is based on the concept of a JMS consumer application (for example, an EJB application listening for the arrival of a message on a queue). And then executing some business logic based on the message (for example, updates to an online catalog) and possibly putting a response (such as an acknowledgement) on a response queue. A new specification in J2EE 1.3, EJB 2.0 message-driven beans, includes the concept of a listener interface with the EJB container that monitors the appropriate queues.

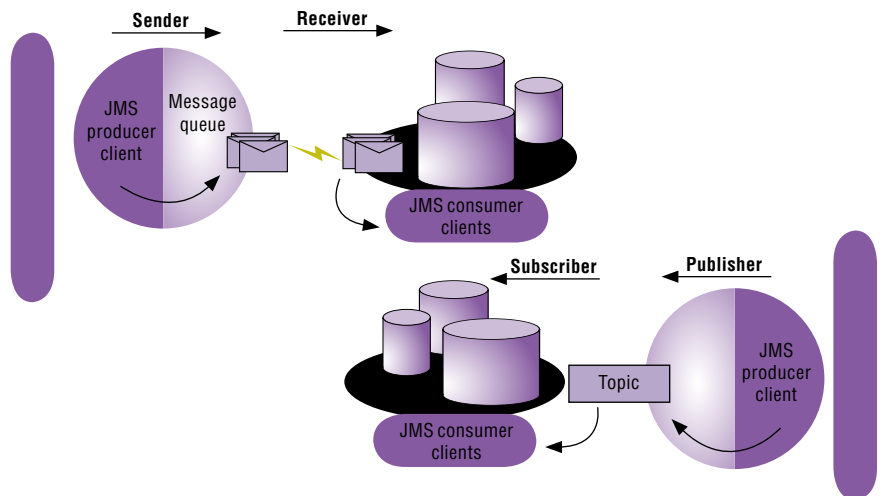


Figure 5. A publish/subscribe process through a JMS framework

WebSphere Application Server also implements a publish/subscribe message broker, where messages are published to a broker against an identifying topic. You can distribute messages to subscribers whose registered subscriptions match the published messages. All of this is done within an environment that provides fault-tolerant clustering and load balancing and full support for distributed transactions for a more robust implementation of JMS—offering high-performance publish/subscribe technology.

WebSphere Application Server adds value on top of the core EJB 2.0 specification by delivering container-managed messaging as a way of simplifying the development of these asynchronous applications. Container-managed messaging shifts responsibility for interacting with the messaging services to the EJB container, allowing EJB applications to exploit messaging facilities without making explicit JMS calls. Container-managed messaging is analogous to container-managed persistence, where data in entity EJB applications can be persisted to the database tables without developers having to implement any database calls.

WebSphere Application Server helps you minimize costs by maximizing utilization of existing computing resources to support line-of-business (LOB) applications. WebSphere software provides the ability to process workloads through parallel processing. These capabilities enable scheduling of high-priority work processing, adding speed and productivity. You can automate background tasks and schedule them to process during low-traffic off hours.

With WebSphere Application Server, Version 5.0, you have a comprehensive build-to-integrate platform. WebSphere Application Server and WebSphere Studio provide integrated visual development tools and dynamic frameworks to leverage existing skills and assets, as well as to help build agile applications. With open-services-oriented architecture, you can easily integrate new and existing assets, increase your business flexibility and facilitate the efficient use of your IT resources.

A highly integrated application development environment

The workflow capabilities in WebSphere Application Server and WebSphere Studio are just one example that demonstrates the power of integrated development and deployment environments. WebSphere Studio provides a visual tool for composing new applications out of a set of enterprise services—whether they are Web services, EJB applications or legacy resources—that enable you to test this new application immediately and implement subsequent changes without disruption to the running production applications.

WebSphere Studio also integrates Web site development (HTML, CSS), dynamic Web applications (JSP, XML, JDBC) and J2EE applications with a WebSphere Application Server unit test environment. The integrated tools and server enable a tight develop, test and debug cycle for both functional and performance testing by each developer.

An integrated application development and deployment platform can provide direct positive impact on your return on investment (ROI) by:

- *Enabling rapid time to market for new applications, from concept through debug and test into production—regardless of the deployment server platform or operating system*
- *Facilitating the reuse of existing assets and skills when creating new applications*
- *Making it easy to expand and adapt applications as business needs change*
- *Driving productivity for the individual developer—through wizards and templates—and within the development team by supporting different developer roles throughout the organization*

Utilizing Eclipse technology, an open, industry-supported software platform for application development, IBM WebSphere Studio provides an integrated environment for the many different developer roles throughout the application lifecycle. The result for your company is higher quality, lower cost, more flexibility and faster time to value.

Build quickly; expand easily

The time required to roll out new applications is a key concern throughout all industries, and improved developer productivity is clearly a way to address this concern. One way to vastly improve productivity is to reduce the need for manual programming. You can do this through powerful frameworks that absorb much of the work involved in development, or through tools that generate code used by the runtime.

WebSphere software delivers a combination of frameworks and tools that work together to provide best practice implementations, a realization of the industry's best architectures. With WebSphere Studio, developing and maintaining applications is largely facilitated through visual programming. For example, a developer can create basic service definitions with tools that visually connect Java applications to enterprise information systems.

Through service choreography, the same or another developer can then combine these basic services into composed services that perform higher-level business activities. Wiring these interactions together in a visual fashion, as shown in Figure 6, makes it easier for developers to create applications and to preserve the flow structure of the application when underlying service implementations change over time. Still other productivity gains come from the close integration of components and messaging systems. This includes the automated transformation and mappings required between message flows and components to satisfy diverse application needs.

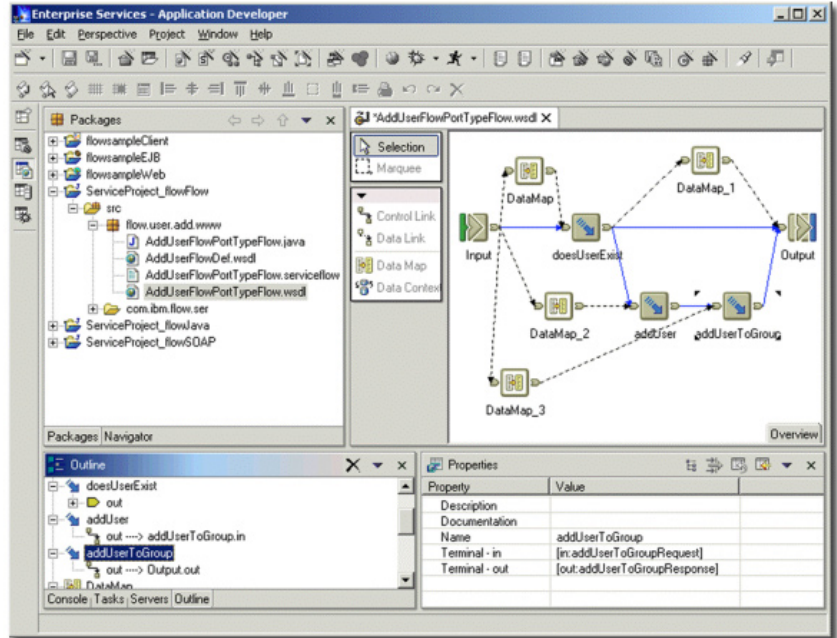


Figure 6. Visual programming and services choreography

Maximize the value of development assets and investments

Building new applications that integrate multiple back-end systems requiring data transformation and transactional integrity is integral to information and data connectivity. WebSphere Application Server delivers productivity through an open approach to transforming any application asset into a modular, network-accessible service, which others can easily identify and reuse.

Many companies are strongly committed to J2EE technology and to the development of new Java technology-based applications. These new applications frequently need to leverage existing legacy assets in combination with the development of new business logic written in the Java language.

IBM WebSphere Studio Assets Analyzer is a powerful member of the WebSphere Studio family that can be used to analyze existing application assets from Web pages, to Java components, to host assets, such as COBOL, PL/1 and JCL. Using the knowledge store built from the analysis of assets, WebSphere

Studio Asset Analyzer helps identify reusable components, helps you understand the impact of changing them and helps prepare them for broader use as services accessible by new and existing business applications. The result: You can maximize the value of existing assets that have been running your business for years (if not decades) and continue to leverage the skills and experience of all your developers.

Develop dynamic applications

WebSphere Application Server simplifies the development of dynamic applications through an industry-leading J2EE technology and Web services-based application server platform that provides advanced extensions to legacy systems. It allows an e-business to create new business opportunities by exposing application services for integration by other businesses, organizations or platforms.

To aid in developing truly dynamic and expandable Web applications and components, WebSphere Application Server offers sample applications for quick startup and easy migration of applications from other development environments to WebSphere software production environments.

At the more advanced enterprise level, a dynamic EJB query service is offered to expand the J2EE application server's role with more robust CORBA-like services. For worldwide transactions, the internationalization service offers dynamic translations to specific country code pages and formats.

Many businesses find it difficult to expand into international markets. Imagine the business value that results from an application server runtime with the flexibility to adapt to global constituencies. Customers around the world expect to be served in their own languages – with appropriate formatting rules for currency, decimal points, and commas – accounting for differences that exist in various time zones. Applications that dynamically adapt to such differences will enjoy more flexibility in serving new geographical markets. WebSphere Application Server provides this ability to adapt applications to expanding markets. With the integrated development environment provided from the low end to high end, productivity is enhanced and improved, no matter the skill level.

WebSphere Application Server allows you to optimize development resources by facilitating the reuse of development assets and automating the process of building, deploying, and managing applications with a tightly integrated environment. The combination of WebSphere Application Server and WebSphere Studio gives companies the improvements in developer productivity needed to remain competitive in an ever-changing marketplace.

Agile deployment and administration

Deployment and administration of an e-business infrastructure have been challenging. Point products provided a variety of administration systems, and because many of the e-business platform products were first or second generation, their ease-of-use capabilities were limited. As the application server platform becomes the new OS for the Internet, it must provide a simpler, more unified deployment and administration model.

An infrastructure must provide a stable base for the services and applications built on top. And it must provide for the ability to grow over time with minimum disruption to the existing infrastructure and applications.

WebSphere Application Server systems management has been significantly enhanced in Version 5.0. It is now easier to update and manage both middleware and applications within 24x7 operations, utilizing an improved administrative client. The overall result is improved integrity and scalability, reduced administrator training time and operations costs and improved application service and uptime.

Migration tools and documentation available with WebSphere Application Server, Version 5.0 enable simplified migration of infrastructure from previous versions or different configurations of WebSphere Application Server – or even from other Web application servers.

Efficient deployment

WebSphere Application Server, Version 5.0 delivers a centralized Web-based user interface to remotely manage multiple applications or middleware, helping to reduce complexity and management costs. The updated administrative client includes an intuitive and friendly user interface to present a comprehensive look at applications, servers and resources within a Web application server environment—allowing for efficient and effective application deployment. The administrative client interface offers consistent implementation across WebSphere Application Server configurations to help reduce the training and experience levels required to implement or migrate to multiple configurations.

You can install WebSphere Application Server smoothly across platforms and configurations improving ease of migration with a single consistent installation. Even more simple, IBM WebSphere Application Server - Express offers a simplified installation when you need a less sophisticated application server configuration. You can install WebSphere Application Server, Version 5.0 to interoperate with previous versions of WebSphere Application Server within the same network, even the same machine. You can add more WebSphere Application Server nodes dynamically and manage them in the network asynchronously, regardless of individual or overall network status and updates when server and network communication is available.

You can store and manage application server configuration information as XML files and use it to more quickly and conveniently configure new servers that have similar requirements. Each application server starts from that local configuration file, avoiding dependency on a central repository and reducing single points of failure.

To efficiently reuse XML and the new Java applications and components, WebSphere Application Server implements a service-oriented architecture to reuse critical business processes. A service-oriented architecture allows you to see virtually any software resource through the lens of a business service

interface. This generalized notion of services builds upon the Web services value proposition to provide a consistent and inclusive programming model that easily incorporates existing assets as new solutions. The result is faster assembly and deployment of new applications with reuse of existing investments.

WebSphere Application Server offers new capabilities to install, deploy and update applications and components within 24x7 operations, including the graphical application assembly tool and administration client (an expanded command line interface, now based on the bean scripting framework, offering support for JACL and executable ANT tasks for common administration functions). Install and uninstall application components on the fly, enabling updates to be implemented without impacting other application components operation. Start and stop applications manually or through application logic individually, without impacting overall application server availability.

The administrator at a large global enterprise can take advantage of the capabilities available in WebSphere Application Server to easily manage updates to intranet applications that employees can access virtually anytime, anywhere. For example, the administrator can update pricing methodology within an application component at the time a new sales tax law becomes effective without impacting the rest of the product pricing application operation by first uninstalling and then installing the new component on the fly. Through the remote administrative client, the administrator can update the component on both the primary and backup servers located almost anywhere in the world with virtually no impact to your enterprise.

Automated management

WebSphere Application Server, Version 5.0 delivers automation across many application server management functions, enhancing productivity and reducing the cost of administration.

With expanded XML-based administration console that works using HTTP, you can simplify server administration. This console gives the WebSphere administrator more capabilities through a simpler interface that renders the tasks associated with administering a WebSphere Application Server environment more efficient. With the enhanced administration capabilities, WebSphere Application Server clusters can be created and managed, and new components, applications and services can be deployed quickly and easily. The administrative client is a J2EE application and can remotely manage all networked application servers from a single client. The admin client can run on any installed application server or even separately on its own admin server, as it can be installed and run with its own application server.

A DB2 database is included in IBM WebSphere Application Server Network Deployment for session persistence and container-managed persistence – providing a database right in the box to take advantage of these application server features.

Performance monitoring

From an application and server management perspective, WebSphere Application Server supports JMX (Java Management eXtensions), recording and logging statistics on usage and resources. These resources can in turn be picked up and used by more extensive performance monitoring and management products from IBM Tivoli and others that also support the JMX standard. WebSphere Application Server supports JMX in a distributed, quality-of-service context with operating environments that involve:

- *Multiple processes*
- *Multiple Web application server nodes*
- *Distributed events*
- *Performance monitoring interfaces through JMX*

The JMX standard provides a simple, lightweight method of assigning Java objects. Throughout the WebSphere platform, manageable objects are exposed through JMX so that compliant management systems can manage WebSphere resources in a standard way. A resource that has been instrumented with JMX can expose its read only and read/write attributes, expose methods that can be invoked to perform operations on the objects within the managed resource, and enforce event notification registration to allow management systems to be notified when a particular event occurs within the managed resource.

A central and open management interface helps customers administer multiple applications and components from the same environment, reducing the complexity inherent in application and systems management. Significant improvements in the administration console design provide a cleaner and more user-friendly interface. Basic administration functions, such as error messages provide more intuitive help, allowing administrators and developers better insight into application or server issues. The IBM WebSphere InfoCenter online has been improved to offer guidance to help quickly resolve issues and improve WebSphere Application Server implementations.

Several tools are available to streamline common administrative tasks for verifying implementations and tuning the application server for improved performance. For example, autotuning simplifies the administrator's job by automatically tuning the most critical WebSphere software parameters to maximize performance. This process leverages live data collected from a running system to refine the specific application and environment. These capabilities are critical in a scenario where the administrator is responsible for successful operation, performance and management of a high-volume application running on networked servers. As Web site volume grows, for example, as a result of an advertised holiday sale at a commerce-oriented Web site, overall application performance will most likely be affected. With WebSphere Application Server, Version 5.0, the administrator can monitor critical performance indicators using an integrated Tivoli or Wily performance-monitoring tool. The administrator can then take action to adjust workload for any application server on the network through the remote administrative client or using the autotuning capability—all easily accomplished with WebSphere Application Server.

Grow from any starting point

By offering several different configurations and support, you can grow from basic implementations to sophisticated ones. Expand capabilities beyond wherever you decide to start building your infrastructure – all depending upon how your business needs change and evolve. WebSphere Application Server, Version 5.0 offers the right value to most closely match your needs – without making you pay for more than you'll ever use or want.

WebSphere Application Server supported growth scenarios include:

- *Extending or migrating to new hardware and operating system platforms*
- *Upgrading to more sophisticated configurations of WebSphere software*
- *Consolidating operations from other application servers as part of the WebSphere software platform*

Upward compatibility and migration paths are clear. For simple servlet/JSP deployment, start with WebSphere Application Server - Express. For a more distributed environment with diverse platforms and multiple enterprise systems on the backend, start with the fully J2EE 1.3 technology-compliant WebSphere Application Server base. For advanced needs involving higher levels of performance, scale, clustering and security, you can start with WebSphere Application Server Network Deployment. If you require higher levels of performance, scale clustering and security, you can migrate to IBM WebSphere Application Server Enterprise. For all that the WebSphere Application Server base offers – and workflow and business process management capabilities – you can start with WebSphere Application Server Enterprise.

WebSphere Application Server supports the broadest range of platforms. Customers routinely run WebSphere software across a variety of hardware and software platforms. Companies can pilot the application on Microsoft Windows® and later deploy on a UNIX® or Linux® technology-based system.

WebSphere Application Server for z/OS offers optimization within the IBM OS/390® and IBM z/OS® operating system for even better quality-of-service characteristics, such as near-linear scalability, high availability and security-rich functionality and tight interoperability with OS/390 system-based resources. These configurations are available to match your requirements for handling dynamic e-business, whether starting simple or dealing with more complex environments.

Intelligent end-to-end application optimization

In today's volatile business environment, the ability to continually optimize your network for enhanced performance, scalability and availability has a direct impact on the top and bottom lines of your business. High-volume, dynamic Web sites place significant demands on an e-business infrastructure. Attracting and keeping customers who have a choice to go elsewhere requires reliable and secure access to business-critical applications. And refreshing frequently requested data must occur dynamically and transparently so the Web sites are available without interruption. All these functions must happen while continuing to drive efficient operations and keep costs down.

WebSphere Application Server leverages the proven IBM experience to deliver a scalable, highly available and security-rich e-business platform. Through performance and availability features, together with edge-of-network technology and advanced security capabilities, WebSphere Application Server, Version 5.0 can dynamically and more securely react to network pressures. WebSphere software provides an intelligent, optimized application platform that benefits business today and lays the foundation for e-business grid services capabilities.

WebSphere Application Server, Version 5.0 uniquely exploits key facilities like Workload Manager (WLM), IBM Parallel Sysplex® and Intelligent Resource Director for true optimizations in that environment.

Always on, always available

To improve network performance and system availability and to reduce unplanned outages, WebSphere Application Server, Version 5.0 provides an improved and more advanced implementation of workload management, offering more intelligent application-level load balancing across WebSphere clusters.

The new load-balancing component in WebSphere Application Server provides a scalable solution for distributing and routing HTTP server and EJB requests. As the load on one server or a cluster of servers with similar content increases, the load balancer can redirect this incoming traffic to underused servers to help maintain optimal response times for each site visitor. Incoming user requests are routed to back-end servers depending on their availability, performance and on the relevance of the application or components they host.

Use custom advisors to load-balance requests based on unique application and platform criteria. To enable accurate traffic allocation to back-end servers, deploy an advisor to be as high level as periodically determining the overall status of the servers, or as granular as checking specific application response times on the servers. Once server health is determined, the advisor informs the load-balancer manager function, which then sets weights for the servers to determine which server should receive new session or application requests. Through advisor code, traffic is appropriately routed to the optimal back-end server.

To extend the load-balancing capabilities beyond a purely WebSphere Application Server environment, you can use consultant code to optimize server performance within a Cisco or Nortel infrastructure. Consultants generate server-weighting metrics and distribute them to Cisco CSS 11000 switches or Nortel Alton 180 series of switches for optimal server selection, load balancing and fault tolerance.

If a failure occurs, WebSphere technology helps capture the root cause of the failure and helps you quickly diagnose the necessary corrections. If solving a problem requires remote support, everything the remote support team needs for diagnosis is automatically captured for further investigation.

Enhanced user experiences

For improved system response times and enhanced user experiences, you can deploy WebSphere Application Server caching technology to reduce network congestion by storing frequently accessed content so information can be retrieved only once. Information can be cached depending on when it will expire, how large the cache should be and when the information should be updated. Faster download times for cache hits mean better quality of service for customers and reduced load on back-end servers.

The new edge-of-network caching capability in WebSphere Application Server improves response time by offloading back-end servers and peering links. And in contrast to other caching proxies that can cache static content, the edge proxy server can also cache – and invalidate – dynamically generated content from the WebSphere Application Server. For example, JSP and servlet results to create a virtual extension of the application server cache into network-based caches – or caches in the Akamai network through the implementation of Edge Side Includes (ESI) technology.

ESI is a simple markup language and proposed standard for the dynamic assembly of Web page fragments, such as stock quotes and individual catalog prices. By leveraging ESI technology, dynamic content caching is extended by moving fragments from the application server to a proxy server that resides in the network, such as the Akamai network. This enables caching to occur at a more granular level and allows companies to position page composition at the most optimal location, closer to the end user. As a result, companies can improve user experiences through expedited, personalized page composition and help reduce workload on the network servers that occurs because of fragmented offload to the edge. WebSphere Application Server maintains control over the externally cached fragments through the ESI Invalidation Gateway component.

To further enhance network performance, WebSphere software exposes performance monitoring interfaces to allow Tivoli and third-party performance monitors to better integrate with WebSphere software. And to provide services to help you fine-tune your systems for the best possible overall performance, regardless of the typical peaks and valleys of transactional application needs.

Instill confidence with security-rich features

WebSphere Application Server offers a sophisticated security-rich infrastructure, single sign-on capabilities and extensive support of open, standards-based Java specifications. WebSphere Application Server provides a secure infrastructure to help prevent unauthorized access to the J2EE technology and Web resources it protects, through strong authentication capabilities that consist of basic (userID/password), forms-based certificate options for user validation and roles-based authorization.

From a single sign-on (SSO) perspective, WebSphere Application Server includes SSO capability across the Lotus Domino™, WebSphere and Tivoli resources to allow Web users to move between different applications, located on the same or different physical machines, without being prompted for a username and password (or certificate) every time.

WebSphere Application Server, Version 5.0, supports:

- *JAAS for authenticating new principals and managing privilege information for a principal*
- *Java 2 Platform, Standard Edition (J2SE) for securing system resources*
- *Java Secure Socket Extension (JSSE) for securing communication channels based on transport level security (TLS/SSL)*
- *JCE and JCA for PKI integration*
- *Common Secure Interoperability V2 (CSIv2) for secure interoperability between application servers.*

You can also leverage WebSphere pluggable security architecture to implement sophisticated enterprise topologies and infrastructure. This includes pluggable user registries to enable customers to exploit LDAP or custom registries, Web single sign-on exclusively provided by WebSphere software platform, or through integration with front-end authentication endpoints through Trust Association Interceptor (TAI) technology. And if you require a centralized approach to security, tighter integration has been developed between the WebSphere Application Server and the IBM Tivoli Access Manager. This helps you build centralized identity management solutions with global sign-on capabilities and enforceable policies to secure cached and noncached J2EE, portal, Web and legacy resources. Companies who implement this integrated solution can benefit from the ease of working with a single object namespace, representing the full set of security policies for the resources you want to protect. When T. Rowe Price needed to create secure Web-based access with single sign-on across 120 applications for over 1 million users, they chose an integrated WebSphere Application Server and Tivoli Access Manager solution. The result was a secure enterprise environment that greatly simplified administration and enhanced user experiences.

In the Web services security space, WebSphere Application Server provides support for the Web services security specification that was jointly developed by IBM, Microsoft and VeriSign and recently submitted to the OASIS standards body. The Web services security specification defines the propagation of security credentials, including identity assertions, digital signature support and XML-based encryption.

Harness the power of z/OS

WebSphere Application Server for z/OS allows you to deploy your J2EE applications and Web services to the platform that was specifically designed to respond to the demanding quality-of-service requirements for large-scale enterprise e-business: IBM @server™ zSeries™ servers running the z/OS operating system. WebSphere Application Server for z/OS utilizes zSeries and z/OS unique features that translate into real, tangible business benefits in a variety of key areas, including:

- *Availability: the z(ero downtime)/OS brand promise. z/OS is capable of consistently delivering expected service regardless of capacity-constrained environments, unanticipated workload spikes, or failures in applications, system software or hardware. WebSphere Application Server for z/OS is designed for availability through its focus on workload isolation; exploitation of z/OS Parallel Sysplex clustering; integration with z/OS Automatic Restart Management (ARM) and utilization of the self-managing behavior of the z/OS Workload Manager (WLM).*
- *Selectivity: managing resources towards achievement of business goals. z/OS enables the ability to help ensure service levels (response time, throughput and so on) for specific types of customers and high-priority workloads as defined by business needs. WebSphere Application Server for z/OS is designed to rely on the z/OS WLM to provide goal-oriented workload balancing, management and reporting within a system and across a Parallel Sysplex cluster.*
- *Integration: enabling reuse of existing assets. Composition and integration with multiple z/OS resource managers is a key requirement for any application that needs to reuse existing assets. WebSphere Application Server for z/OS is designed to provide optimized, heterogeneous two-phase commit concurrency control with IBM IMS™, CICS and DB2. Using WebSphere Application Server for z/OS as your integration engine can provide optimal performance (through closer data proximity and a reduced duration of held locks), better availability (through reduced points of failure) and faster recovery in rollback situations.*

- *Efficiency: maximizing people and system resources. z/OS is designed for efficiency and can provide a lower total cost of ownership through reduction in trained system programmers to configure, monitor and adjust multiple systems, and fuller utilization of existing capacity. z/OS is able to automatically handle unpredictable spikes in mission-critical workload without wasting spare cycles during periods of low and average utilization. WebSphere Application Server for z/OS easily fits into the heterogeneous nature of z/OS workloads running simultaneously in either a single z/OS image or across multiple images configured in a Parallel Sysplex cluster.*
- *Security: providing a trusted environment. z/OS is a proven security leader, maintaining the integrity and availability of systems, applications and data in the face of threats. WebSphere Application Server for z/OS is designed to fully integrate with the IBM SecureWay® Security Server for z/OS or equivalent z/OS security products.*

For the existing z/OS customer, WebSphere Application Server for z/OS helps you fully leverage your existing investment in zSeries in new ways. Utilize the skills and procedures already in place for your data center with WebSphere Application Server for z/OS as you take these battle-tested, proven assets to the Web environment.

WebSphere Application Server for z/OS provides the best of both worlds for your environment—the deep exploitation of the zSeries hardware and z/OS software, with the application portability of J2EE standards. As business needs demand, you can redeploy a J2EE application or Web service already deployed to another platform without code changes to z/OS. With WebSphere Application Server for z/OS, you can leverage your existing assets and investments without new skills or hardware purchases, and you can reuse well-established operational procedures for the zSeries for your Web environment.

A leading technology partner

While WebSphere Application Server, Version 5.0 has a lot to offer, IBM understands the selection of a product isn't just about the product; it's about selecting a strategic business partner. One with the experience to successfully tackle immediate problems as well as help a business respond to new challenges over time. To help you, IBM provides:

Support for complete solutions. The value proposition for WebSphere Application Server starts with support for complete solutions. WebSphere Application Server and WebSphere Studio provide the foundation for a complete e-business infrastructure that spans everything from business portals to deep business integration.

Core strengths and competencies. WebSphere Application Server incorporates IBM's core capabilities in building system software. These capabilities include transactional and security leadership; an ongoing focus on interoperability; IBM's heritage in delivering messaging and persistence capability, as well as component technology; strengths related to Web services and XML; industry-best support for manageability (including synergies with Tivoli); and significant experience in the area of application integration and connectivity.

Clear industry leadership. The WebSphere Application Server strong industry momentum that is second to none (as measured by both analyst and press opinions, market share numbers and trends and growing developer momentum). WebSphere software has won key competitive battles in accounts like eBay and Abbey National, and more than 50,000 customers are now using WebSphere worldwide. Business partners are also increasingly selecting WebSphere technology as their application server of choice. WebSphere software delivers first-rate support 24 hours a day, seven days a week. WebSphere Application Server and Java solutions from IBM have together won more than 30 industry awards. Beyond garnering an impressive number of industry awards, WebSphere solutions have allowed customers such as Bekins Van Lines to receive first-place industry awards of their own.

Excellent return on investment. WebSphere Application Server helps businesses improve customer loyalty, respond more quickly to change and reduce overall costs. WebSphere technology provides advantages related to overall cost of ownership measured in terms of truly excellent price and performance, as well as the provision for customers to leverage their existing investments. In terms of price and performance, according to Evan Quinn, chief analyst with the Hurwitz group, the 2002 eBay win suggests that WebSphere technology is “reliable enough to handle the huge transaction volume served up by even the busiest Internet sites.” WebSphere customers are able to achieve many tens of millions of page views per day in production on the Web. Kana recently set an eCRM solution industry benchmark by running on WebSphere software. And IBM has demonstrated more than 12,500 EJB-based transactions per second—serving 800,000 users—with approximately one quarter of a second average response time. WebSphere is supported by a High Volume Web Site team, and by a High Volume Web Site Performance Simulator used in capacity planning.

Support for industry standards. WebSphere Application Server is J2EE technology-compatible on more platforms than any other vendor. WebSphere is the first and only major application server brand to become J2EE 1.3-certified last year (through the Technology for Developers release). WebSphere engineers have contributed to more than 80 percent of the J2EE specification, and these engineers continue to define the next wave of standards through participation in the Java Community Process. WebSphere was first in line to deliver an integrated Web services solution with a complete set of associated tooling. WebSphere engineers have defined, coauthored, or significantly contributed toward all of the relevant standards in the Web services and XML space.

Best practices and industry expertise. WebSphere Application Server is about delivery of expertise and not just software. WebSphere solutions include the services of a talented and experienced team of engineers and consultants who stand ready to work with you on your most pressing business needs. IBM WebSphere Developer Domain provides a wealth of complimentary online information, community resources and access to publications, such as detailed implementation guides (called IBM Redbooks™).

A total e-business on demand

WebSphere software – the leading platform for e-business on demand.

- Deliver your products and services to meet individual customer demand fast – ahead of the competition.
An integrated environment helps your developers get applications up and running quickly.
- Quickly respond to market fluctuations and new industry supply chain requirements – in realtime.
A robust platform lets you easily adapt to new technologies and integrate your business with that of your partners.
- Improve operational efficiencies with dynamic and automated processes.
Leading process integration software makes it easy to create, change and publish new business processes.
- Give everyone along your value chain access to the same view of information, applications and services on the fly – regardless of location or device.
Sophisticated portal technology provides a single interface that simplifies information and application access.
- Use the business expertise and assets you already have.
Modular, market-leading solutions let you start small and grow your business at a pace that suits your needs.

With the WebSphere software platform, you can address your business challenges in entirely new ways. And create an on demand e-business – regardless of the business you're in.

Summary

As demonstrated by the examples in this paper, WebSphere Application Server, Version 5.0 delivers new and often unique capabilities that are designed to help you reduce costs while sustaining competitive advantage.

The technology benefits WebSphere Application Server provides can be summarized as:

- 1. Comprehensive build-to-integrate platform*
- 2. Highly integrated development and deployment environment*
- 3. Agile deployment and ease of management*
- 4. End-to-end intelligent application optimization*

WebSphere Application Server is designed to help you realize these benefits within your existing constraints, including heterogeneous platforms, legacy assets and a range of developer skills. WebSphere Application Server and WebSphere Studio provide the opportunity to dramatically reduce total cost of ownership and future risk by providing a unified application development and deployment platform bolstered by best practices, support and services from IBM and third-party solution providers.

For more information

Contact your local IBM representative today for more information about how you can achieve business results well ahead of your competition.

Visit **ibm.com/websphere** for more information about WebSphere Application Server software and solutions.



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