



WebSphere software

Flexible application connectivity using IBM WebSphere Service Registry and Repository and IBM WebSphere DataPower Integration Appliance XI50.

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Overview

Most businesses have a diverse portfolio of applications that has been developed or acquired over a significant period of time, performing key business functions and representing much of an enterprise's intellectual capital and business advantage.

The breadth of the applications in a typical enterprise is incredible, and they are diverse not only in the range of platforms they run on, but also in the data formats and protocols that they use and the interaction styles between these applications and their users.

Cost reduction and increased revenue are achieved through flexible application connectivity. The need to react to new market opportunities increasingly requires information to flow between applications that were not designed to operate with one another. Businesses can increase revenue and reduce costs if they can connect their existing applications to new applications and business processes while ensuring that application interactions are loosely coupled, dynamically configurable and policy driven.

In this paper, we will take a pragmatic approach to describe how IBM's solution comprising IBM WebSphere® DataPower® Integration Appliance XI50 and IBM WebSphere Service Registry and Repository provides significant business value by extending the reach of existing applications through flexible application connectivity. After we have described the solution, two representative case studies will demonstrate how the solution has been applied to achieve business objectives for our clients.

Typical client challenges

Clients each have their own individual challenges, but many share some of the typical challenges that go along with managing a diverse set of applications. Our experience shows that clients often face the challenges of service versioning, policy discovery and enforcement, and flexible integration of applications.

Challenge one: Service versioning

Typical services deployed as part of a service oriented architecture (SOA) are varied and include multiple versions. Rigid version control makes it difficult to migrate to the latest backward-compatible versions. Often, businesses that are faced with this dilemma have great difficulty in offering different levels of services, which would normally allow stratified levels of customer service based on a range of business criteria. However, customers are often dissatisfied with the variety or types of services a company offers, resulting in little or no choice.

Moreover, customer dissatisfaction is a near certainty when companies are forced to make iterative changes. Higher costs can result from development teams making numerous code changes on the server side. Bringing the multiple service versions online can involve the cumbersome responsibility of conducting and managing service life-cycle approvals and checks.

Organizations attempt to address the problem by making manual changes to code and extensive regression tests that result in unacceptable levels of application downtime and redeployment of new applications.

Challenge two: Policy discovery and enforcement

A typical SOA deployment requires a variety of policies defined at different levels. These policies help you achieve overall corporate, IT and regulatory compliance across your organization. In general, policies comprise both business and technical requirements. An example of a business-level policy is, "Each message must carry information to uniquely identify its source, destination, timestamp and transaction ID for mandatory archiving requirements." A good example of a technical policy that ensures architectural strength is, "Do not use Remote Procedure Call (RPC)-encoded Web-service operations."

Together, business and technical requirements help create a common language of information and process.

To track and enforce adherence to policies, organizations often rely on ad hoc mechanisms, such as unwieldy documents, spreadsheets, wikis or other Web sites, e-mails, meetings or a combination of these. These mechanisms for achieving compliance are tenuous at best. Our experience with clients suggests that consistency and interoperability are essential to any SOA, and without proper mechanisms to discover and enforce policies, SOA becomes brittle, inflexible, unpredictable and difficult to maintain.

Challenge three: Flexible integration of applications

An SOA represents every application or resource as a service with a standardized interface. It follows that within an SOA deployment, organizations have a large number of diverse services (including traditional applications that are service enabled) that collectively implement enterprise-level, business-critical processes. An enterprise service bus (ESB) is a pattern of middleware that unifies and connects services, applications and resources within a business, providing an open, standards-based infrastructure for an SOA.

Often the service endpoints are hard coded in the ESB, which can lead to rigid IT systems that require constant maintenance, due to application-server upgrades, service-version changes, new services coming online or old services retiring, and service promotions from testing to production environments. Organizations engage in endless cycles of redevelopment, retesting and redeployment every time one of these changes happens, leading to missed business opportunities and long development life cycles.

WebSphere Service Registry and Repository in a nutshell

IBM WebSphere Service Registry and Repository provides management and governance capabilities that enable you to get the most business value from your SOA. It facilitates storing, accessing and managing service information, called service metadata, so that you can easily select, invoke, govern and reuse your services. WebSphere Service Registry and Repository is an essential component of your SOA. It is based on a highly scalable and available architecture along with robust registry and repository capabilities and tight integration with IBM SOA Foundation – an integrated, open standards-based set of software, best practices and patterns for SOA.

WebSphere Service Registry and Repository is an industrial-strength tool that enables you to publish, find, enrich, manage and govern services in your SOA (see Figure 1).

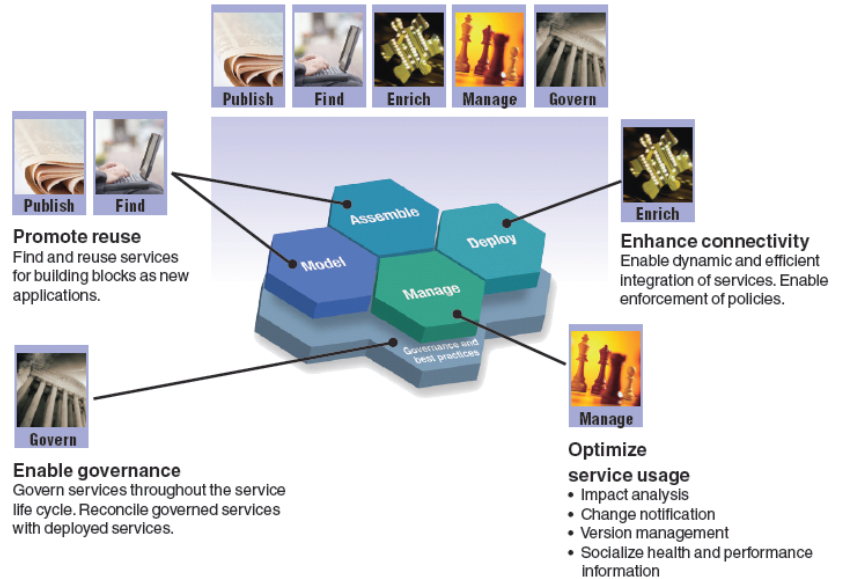


Figure 1. WebSphere Service Registry and Repository provides value throughout the SOA service life cycle.

The *publish and find* capabilities of WebSphere Service Registry and Repository promote service reuse in SOA projects by providing greater visibility of and easier access to existing services. These capabilities also expose redundant or inefficient services. The *enrich* capability enables dynamic and efficient access to services information by runtime applications and processes that facilitate better connectivity and efficiency. The *manage* capability enables management of service metadata, as well as service interactions, dependencies and redundancies. You can classify services into meaningful groupings based on business objectives, manage policies for service usage and monitor how services are changed and versioned. This capability helps you optimize the use of services in SOA by exchanging rich service metadata with runtime monitoring tools and operational data stores. The *govern* capability of WebSphere Service Registry and Repository plays an enabler role for SOA governance by providing sophisticated and customizable support for managing the SOA service life cycle of model, assemble, deploy and manage.

To help you get started easily and quickly, WebSphere Service Registry and Repository provides a well-defined governance profile that includes templates, associated life cycles and policies along with a generic validator, classification system, roles and perspectives that can be customized to suit your business needs.

Other leading registries in the market have separate registry and repository products, making the synchronization of metadata and associated services an operational issue. By combining the registry and repository into a single product, WebSphere Service Registry and Repository avoids this complication while providing an advanced and efficient application programming interface (API) based on standards such as Representational State Transfer (REST), Java™ and SOAP. In addition, it supports Universal Description, Discovery and Integration (UDDI) specification, making it an excellent choice for clients who are federating their service metadata in existing registries.

WebSphere DataPower Integration Appliance XI50 in a nutshell

IBM WebSphere DataPower SOA Appliances redefine the boundaries of middleware by extending the IBM SOA Foundation with specialized, consumable, dedicated SOA appliances that combine simplified integration, superior performance and hardened security for SOA implementations. WebSphere DataPower Integration Appliance XI50 is a complete, purpose-built hardware platform for delivering highly manageable, more secure and scalable SOA solutions (see Figure 2).

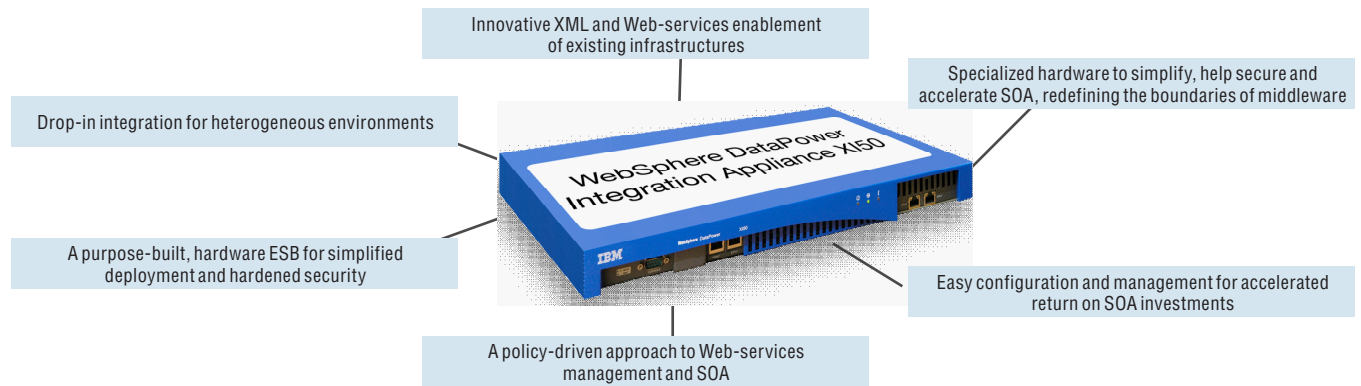


Figure 2. IBM WebSphere DataPower Integration Appliance XI50

WebSphere DataPower Integration Appliance XI50 provides core SOA functions, such as service-level management, routing, data and policy transformations, policy enforcement, and access control. It also provides core ESB functions, such as routing, bridging, transformation and event handling. Additional advantages of a hardware appliance in the network layer include the ability to perform more security and structural checks without performance degradation. By integrating these functions, WebSphere DataPower Integration Appliance XI50 simplifies an overall SOA infrastructure.

WebSphere DataPower Integration Appliance XI50 provides a reliable, performance-oriented solution to address many integration challenges. It is not limited to handling just XML, helping organizations to manage multiple proprietary, industry, company-specific and existing data formats. It is a true drop-in integration point for such environments, reducing the time and cost of integrations, and speeding the time to market for services.

Service versioning

With WebSphere Service Registry and Repository, multiple versions of services can coexist and be taken through the life cycle independently. Each version can have multiple endpoints, and each endpoint can be captured in a separate Web Services Description Language (WSDL) file. WebSphere Service Registry and Repository can consolidate multiple Web services with the same name, namespace and version number by automatically creating the logical entities, such as ServiceVersion, ServiceEndpoint, ServiceBinding and ServiceInterface. If a new version of the Web service is published, WebSphere Service Registry and Repository automatically creates a new ServiceVersion entity, making it easy to identify multiple versions of a service.

WebSphere Service Registry and Repository enables you to change the relationship between a service and the corresponding version dynamically.

Playing the role of a services gateway or proxy, WebSphere DataPower Integration Appliance XI50 asynchronously retrieves and caches the latest service metadata. It then leverages this service-metadata information to automatically route the request to the current and most appropriate version of the service (see Figure 3).

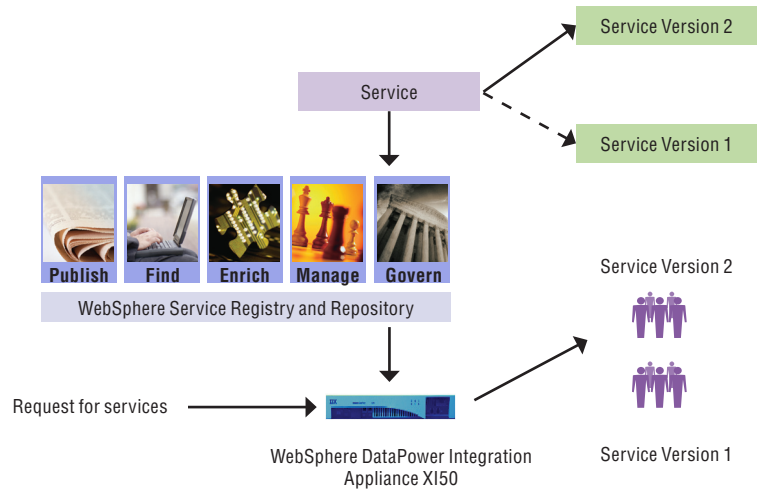


Figure 3. Service versioning with IBM WebSphere Service Registry and Repository and IBM WebSphere DataPower Integration Appliance XI50

Better version management based on IBM WebSphere Service Registry and Repository and IBM WebSphere DataPower Integration Appliance XI50 allows internal users, customers and partners to be moved to the latest version of the service as seamlessly as possible, leading to lower costs and downtime, accelerated time to market, and increased customer satisfaction.

Policy discovery and enforcement

In WebSphere Service Registry and Repository, you can capture runtime and IT policies that are critical to your SOA implementation (typically, these policies are based on the WS-Policy specification). Policies can be published, discovered, managed and governed in the same way as services. You can define and customize a policy life cycle to help ensure the consistency and currency of policies that are applicable across your SOA implementation. Various standards-based APIs supported by WebSphere Service Registry and Repository allow these policies to be discovered during run time.

WebSphere DataPower Integration Appliance XI50 acts as a policy enforcement point for SOA by establishing the effective policy, based on interpreting the collection of policy subjects and attached policies retrieved from WebSphere Service Registry and Repository. It then interprets and enforces the assertions defined in the effective policy (see Figure 4).

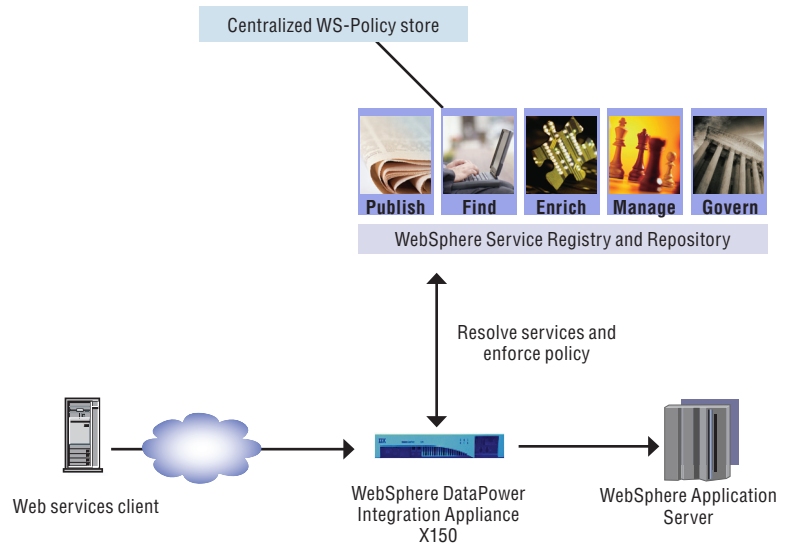


Figure 4. Policy distribution and enforcement with IBM WebSphere Service Registry and Repository and IBM WebSphere DataPower Integration Appliance XI50

Better policy management based on IBM WebSphere Service Registry and Repository and IBM WebSphere DataPower Integration Appliance XI50 allows you to track and govern your runtime policies while establishing contractual and enforceable relationships between various runtime policies and associated services. It also enables you to consistently enforce the most current policies in your SOA. These policies are discovered and interpreted dynamically during run time. By helping to ensure that your contractual obligations are strictly followed, you benefit by mitigating the risk of lost revenue and customer dissatisfaction, and achieving higher levels of service quality and responsiveness.

Flexible integration of applications

WebSphere DataPower Integration Appliance XI50 instantly connects disparate applications in your SOA by transforming between disparate message formats, and providing message routing and security. WebSphere Service Registry and Repository provides a catalog of services in your production SOA that not only come from a variety of sources (including service-enabled CICS applications, .NET, Java Enterprise Edition and Web services) but that are also updated frequently.

When WebSphere DataPower Integration Appliance XI50 routes client messages to service providers, it retrieves and periodically refreshes its cache to capture any changes made to services in WebSphere Service Registry and Repository. By reflecting the current services in WebSphere Service Registry and Repository, this information allows all service requests to be routed accurately and dynamically. Also, maintaining this information is the most efficient way to route requests to the appropriate endpoint, given that you can have multiple endpoints for the same service. This capability greatly increases the runtime flexibility of applications and processes by providing dynamic, intelligent selection of services based on service metadata stored in WebSphere Service Registry and Repository.

By building flexibility and agility with enriched service interactions, organizations are able to quickly satisfy new customer demands such as implementing changes to government regulations, lowering operational costs and dramatically increasing application availability and staff productivity.

Client case studies

IBM has extensive experience helping clients move to SOA. The following case studies demonstrate how a combined solution of WebSphere Service Registry and Repository and DataPower Integration Appliance XI50 has helped clients to deploy new services, reduce complexity, lower costs and speed time to market.

Travel and leisure industry

One of the largest hotel and leisure companies, with over 120 000 employees and 700 properties worldwide, embarked on an initiative to move its central reservation system from an IBM CICS® environment on the mainframe to a distributed SOA implementation. Its goal was to increase its organizational agility and significantly reduce costs. The company's size necessitated coordination among numerous semiautonomous entities within its IT organization. At the same time, it needed to apply an appropriate level of policy and control mechanisms.

The company's overarching goals were clear. In addition, as part of the solution-building process, the company needed to achieve goals that were supplementary to SOA. Siebel and other back-end applications would need to be integrated with one another. Requests would need to be rerouted to appropriate services with dynamic workload-management capabilities. And the solution would have to include robust service-level monitoring while reducing the burden of IT staff in monitoring the enterprise. To accomplish one of its primary objectives of increasing reuse of services, the organization recognized that it needed to integrate a registry and repository with SOA, which would provide support for runtime service discovery.

Its complex workflow and transaction-management needs led the company to seek out the combined solution of WebSphere DataPower Integration Appliance XI50 and WebSphere Service Registry and Repository. The company knew that WebSphere DataPower Integration Appliance XI50 would seamlessly integrate with WebSphere Service Registry and Repository, forging a clear path for eliminating redundancy and increasing reuse of its code, while promulgating end-to-end service governance.

The company gained a high-performance, hybrid ESB architecture powered by WebSphere DataPower Integration Appliance XI50 platforms and complemented by IBM WebSphere Enterprise Service Bus and IBM WebSphere Adapters for integration of existing applications (see Figure 5).

With the ease of use and configurability of WebSphere DataPower Integration Appliance XI50, the organization sped deployment of a large rollout. Seamless integration of the WebSphere DataPower Integration Appliance XI50 with WebSphere Service Registry and Repository significantly reduced operational complexity and lowered maintenance costs. Moreover, the synergies and highly efficient levels of integration attained reduced overall project risk significantly by enabling the company to miss fewer deadlines and have fewer budget overruns.

Challenge

A large travel and leisure company needed to move its central reservation system from a CICS environment on the mainframe to a distributed SOA implementation, with the goal of reducing costs and driving business agility.

Requirements

- *Automatic routing of requests to appropriate services with dynamic workload management*
- *Ability to integrate directly with Siebel and other back-end applications*
- *Integrated registry and repository as a catalog of services, with support for runtime service discovery*
- *Complex workflow support and transaction management for several use cases*
- *Broad requirements for service-level monitoring with automated operator alert*

Solution

- *Optimized, secure, high-performance hybrid ESB architecture powered by WebSphere DataPower Integration Appliance XI50 technology together with WebSphere Enterprise Service Bus and WebSphere Adapters for integration of existing applications*
- *Seamless integration with WebSphere Service Registry and Repository for runtime service discovery, eliminating redundancies and promoting reuse and end-to-end service governance*

Benefits

- *Accelerated speed of deployment, supporting a large rollout in a timely fashion*
- *Reduction of overall project risk in terms of missing milestones and running over budget*
- *Significantly reduced operational complexity and reduced maintenance costs*

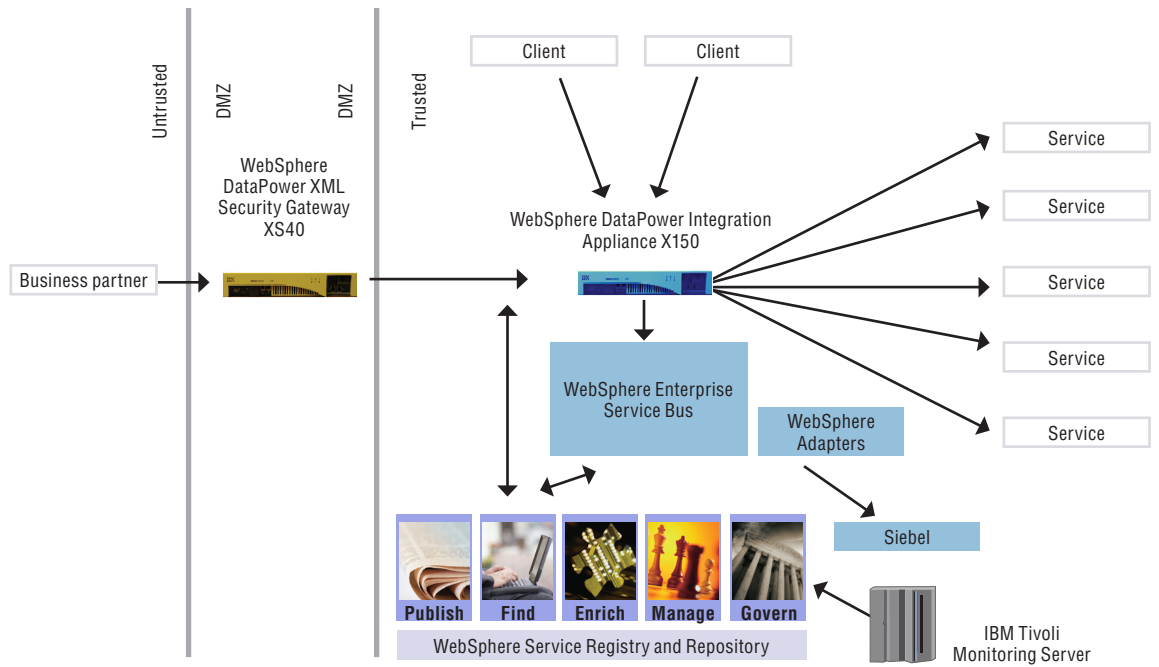


Figure 5. Example SOA deployment in the travel and leisure industry

Manufacturing industry

A European, multinational automotive manufacturer had strategic plans for growing its business. The company sought to increase its development and production to produce more than 800 000 vehicles between 2005 and 2009, and to improve its operating margin by six percent by 2009. Along with the production and profits, the manufacturer hoped to move its flagship sedans to within the top three models in its marketplace, in terms of service and product quality.

As the company boosted its operations to meet these goals, the number of IT applications increased. Numerous platforms became difficult to manage and expensive to license, so the manufacturer sought to implement an SOA in order to reuse existing applications, data repositories and Web-based services.

The company determined that with an SOA it would gain the ability to quickly and easily post all known issues, defects and recalls for each vehicle it manufactured to its U.K. Web site. According to U.K. mandates, such a list from automotive manufacturers must be current and available at all times to consumers and dealers.

To launch its SOA initiative, the company implemented five IBM WebSphere DataPower Integration Appliance XI50 platforms to act as the infrastructure's ESB. The platforms provide routing, transformation and bridging capabilities among message formats, cutting operational costs and improving performance. The devices parse and transform information at wire speed between disparate binary, text and XML message formats, including COBOL (see Figure 6).

To help ensure the security of various Web-service transactions, the organization also deployed an IBM WebSphere DataPower XML Security Gateway XS40 device within its DMZ as a Web-services proxy for message verification, digital signatures, WS-Security authorization and authentication. Each message and accompanying signature is logged so that the company can maintain a comprehensive audit log.

The company deployed WebSphere Service Registry and Repository software onto its IBM WebSphere Application Server platform running on the IBM z/OS® operating system. WebSphere Service Registry and Repository manages the company's Web services and contracts, and reports on usage statistics for the Web services. Moreover, the solution manages the provisioning for the WebSphere DataPower XML Security Gateway XS40 and WebSphere DataPower Integration Appliance XI50 devices, and maintains Web Service Definition Language (WSDL) subscriptions between the software and the WebSphere DataPower Integration Appliance XI50 devices.

Using the WebSphere DataPower Integration XI50 appliances, the manufacturer built an SOA based on Web services that is easy to scale and manage. The company deployed 21 services in 2006 and roughly 50 more services from January to August 2007. With these services deployed, the company can now provide dealers and consumers in the United Kingdom with accurate statistics for each car model through its Web site. In addition, the new SOA environment enables the manufacturer to reuse applications, thereby reducing additional software licensing costs.

Using the WebSphere DataPower XML Security Gateway XS40, the company was able to enhance all of its Web-service security requirements as well as implement its industry Web-service security best practices more broadly. By leveraging WebSphere DataPower Integration Appliance XI50, the company has gained the ability to conduct fast, trouble-free message conversions. The appliances make it easy for the manufacturer to provide consumers and dealers with access to known vehicle issues. The publish and find capabilities of WebSphere Service Registry and Repository promote service reuse in SOA projects by providing greater visibility of and easier access to the company's existing services. The company is well poised to support and manage the SOA service life cycle with the governing capabilities of WebSphere Service Registry and Repository as well.

Challenge

An automotive manufacturer needed to launch an SOA initiative to lower costs while simplifying and improving communication with customers.

Requirements

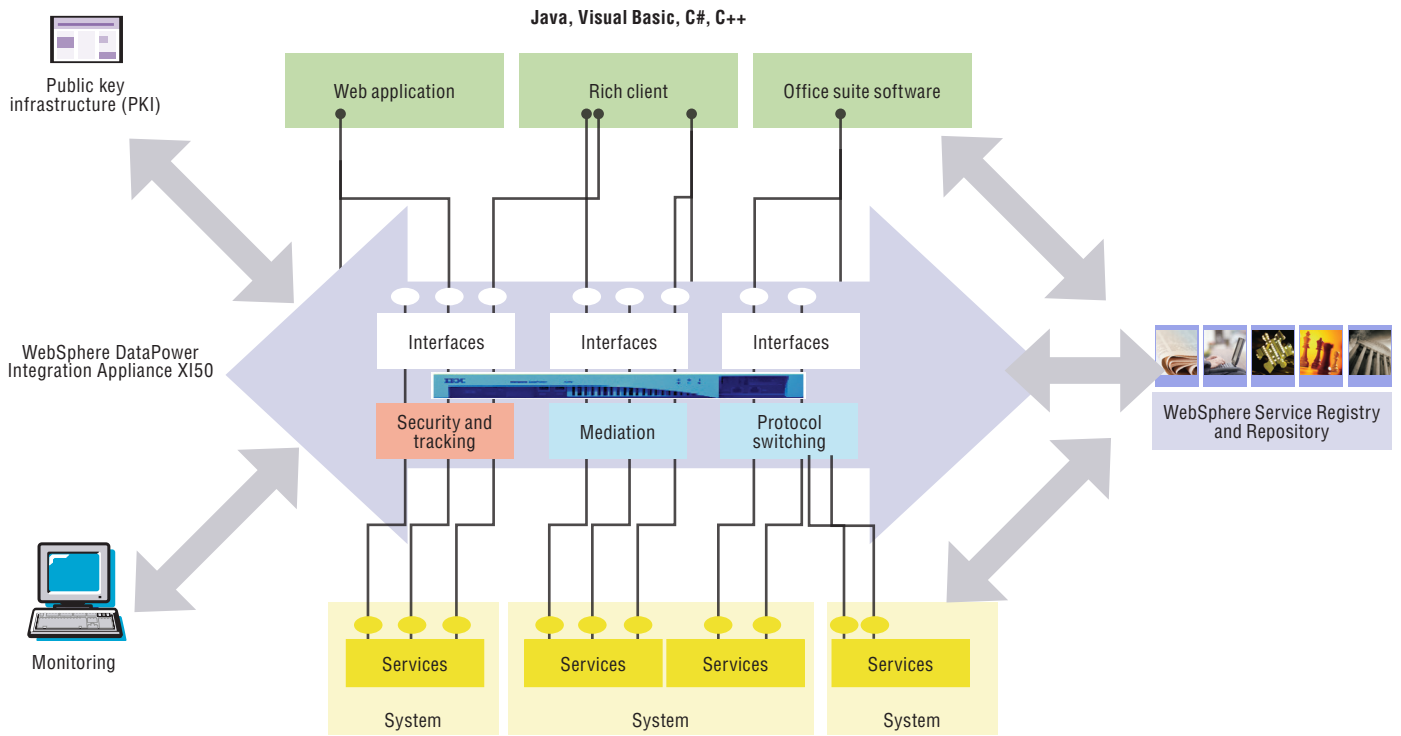
- *Reduction of redundancies*
- *Decreased number of applications through greater reuse*
- *Ability to access services that could provide a list of known issues for each vehicle*

Solution

- *Implemented WebSphere DataPower Integration Appliance XI50 as an ESB, improving performance and lowering operational costs*
- *Implemented WebSphere DataPower XML Security Gateway XS40 as a Web-services proxy for verification, digital signatures and authentication between the Web-server client and the reverse proxy*
- *Implemented WebSphere Service Registry and Repository to manage Web services and contracts, and report usage statistics for Web services*

Benefits

- *Gained scalable control and ability to govern growing services environment: 21 services deployed in 2006 and 50 new services in 2007*
- *Improved time to market by dynamic service interactions*
- *Reduced costs with visibility of services, enabling reuse and adoption*



Java, Visual Basic, C#, COBOL, Advanced Business Application Programming and other languages

Figure 6. Example SOA deployment in the manufacturing industry

Extended support for other products

As discussed, WebSphere Service Registry and Repository in combination with WebSphere DataPower Integration Appliance XI50 enhances connectivity in SOA deployments by enabling dynamic selection and binding of services during run time. Other ESB products, such as IBM WebSphere Message Broker or WebSphere Enterprise Service Bus, also integrate with WebSphere Service Registry and Repository. These help you achieve the benefit of increased run-time flexibility, similar to what you can achieve with WebSphere DataPower Integration Appliance XI50.

WebSphere Message Broker leverages service information retrieved from WebSphere Service Registry and Repository to resolve and select service endpoints dynamically at run time. WebSphere Enterprise Service Bus can route client requests to appropriate service providers based on mediations that can query current information from WebSphere Service Registry and Repository.

WebSphere DataPower XML Security Gateway XS40 strengthens your DMZ by providing a scalable, hardened, security-enforcement point. When deployed with WebSphere Service Registry and Repository, WebSphere DataPower XML Security Gateway XS40 can be used to query the policies stored in WebSphere Services Registry and Repository, enabling centralized control, configurability and flexibility to your environment.

A combination of IBM Tivoli® Composite Application Manager for SOA, WebSphere DataPower Integration Appliance XI50 and WebSphere Service Registry and Repository provides a robust and scalable solution for managing your Web services (see Figure 7). Tivoli Composite Application Manager for SOA can monitor Web-services traffic at WebSphere DataPower Integration Appliance XI50, logging service information and helping ensure service compliance with service level agreements (SLAs). WebSphere Service Registry and Repository can subscribe to performance and health alerts that Tivoli Composite Application Manager for SOA publishes, and record that information as service metadata, making it available for a variety of SOA applications. Also, Tivoli Composite Application Manager for SOA can build a dashboard view of services that are currently in operation and compare that information with the list of registered services obtained from WebSphere Service Registry and Repository, helping you detect and eliminate rogue or redundant services in your environment.

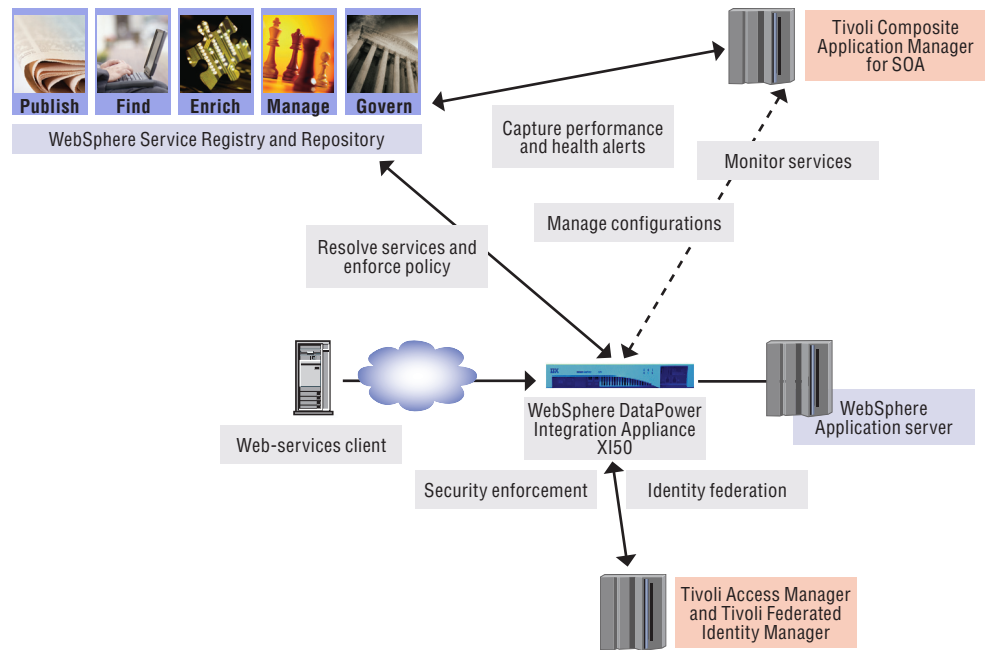


Figure 7. Service management with Tivoli Composite Application Manager for SOA

Conclusion

To help companies become and remain competitive in the marketplace, IT decision makers need to help steer their organizations toward flexible SOA infrastructures. Successfully navigating the murky waters of an evolving SOA starts with selecting the best solutions that anticipate unavoidable change, growth and the various stages of a product life cycle. As we have demonstrated, the combined solution of WebSphere Service Registry and Repository and WebSphere DataPower Integration Appliance XI50 help replace ad hoc mechanisms with robust solutions for the critical issues that will surface, supporting service versioning, policy discovery and enforcement, and flexible integration of applications. Working together, both WebSphere Service Registry and Repository and WebSphere DataPower Integration Appliance XI50 are game-changing solutions that can provide measurable results through flexible application connectivity, helping to increase revenue and lowering costs.

For more information

To learn more about WebSphere Service Registry and Repository, visit:

ibm.com/software/integration/wsrr

To learn more about WebSphere DataPower SOA Appliances, visit:

ibm.com/software/integration/datapower/

To learn more about service oriented architecture (SOA), visit:

ibm.com/soa

To learn more about SOA governance, visit:

ibm.com/soa/gov

To learn more about application integration, visit:

ibm.com/software/infocenter/websphere/index.jsp?tab=landings/appintegration



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Software Group
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Somers, NY 10589
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