System i application renovation to SOA
White paper

Extend the value of your IBM System i platform.

Transforming System i applications into an SOA framework

March 2007

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Unshackling your core business systems

Facing tremendous pressure to improve responsiveness, companies are hampered by the very technologies they rely on to run their businesses. Many of their core IT systems have been in service for years. Developed and optimized in most cases more than a decade ago, these systems are difficult to link to new technologies such as Web services and service oriented architecture (SOA). They also lack the flexibility to adapt quickly to changing business requirements.

IBM SOA-enabled application-modernization approaches can help enterprises liberate their core business assets by making it easier to enrich, modernize, extend and reuse them well beyond their original scope of design. These methods complement proven software-development tools, such as the Web service wizard and IBM WebSphere® Host Access Transformation Services (HATS) Toolkit in IBM WebSphere Development Studio Client for System i or WebSphere Development Studio Client for System i Advanced Edition. This white paper introduces you to the IBM vision for application modernization through SOA. It explains the benefits of modular systems, defines the steps that are necessary to develop a modularization strategy and road map, and describes successful techniques for implementation that enable you to:

- *Use existing investments and assets.*
- *Employ an incremental approach that helps lower risk.*
- *Maximize flexibility to align your application transformation to business priorities.*

Although existing applications embody many of the competitive advantages that enterprises need to succeed, they can also be rigid and costly to maintain.

The case for application modernization

Aging applications impose serious roadblocks to business agility. If a business process is going to adapt rapidly as the environment changes, so too must the underlying applications that support it.

It is reported that more than five billion lines of Report Program Generator (RPG) and COBOL code are added annually[1] on a base of more than 200 billion lines of code.[2] These applications support core business processes and provide crucial information for day-to-day operations. They contain business logic that provides competitive differentiation and institutional knowledge in the form of customer, product, supply-chain and channel-partner data. They also are optimized for performance and scale, and embody many of the competitive advantages that enterprises need to succeed. They are, however, rigid and difficult to use in new ways, and costly to maintain (see Figure 1).

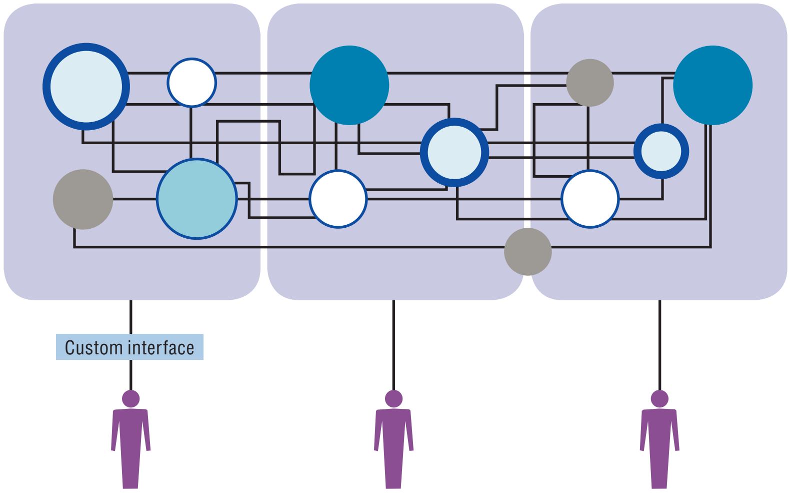

Figure 1. Tightly coupled, complex, existing systems with many point-to-point interfaces limit fast, flexible responses to business changes.

What is needed is a prescriptive approach to modernizing this style of software engineering to one that fosters agility. The SOA approach has been shown to provide the value required by businesses today.[3]

Common options

Options are available for making IBM i5/OS® applications more responsive to business needs. You can rewrite, replace and retire them. However, these options can involve significant investment in capital, and implementation and training time. And the business might want to retain many, if not all, of the complex, custom functions that the older applications provide.

Rewriting or replacing applications can involve significant investments in capital, as well as implementation and training time, and can result in less-robust software.

Other approaches might include modification of the applications in place, which typically satisfy the immediate need, and might be delivered in an acceptable timeframe (if the skills and knowledge exist and are available). These short-term approaches, however, do not move IT and business closer to the agility that's really needed.

Using existing core assets wherever possible is the best approach to capitalizing on the years of work spent perfecting them.

In 2003, Robert C. Seacord described several options for modernizing applications.[4] SOA concepts were not well known at that time, but the basic ideas, challenges and risks remain true today. In particular, the risks of total replacement, or "big bang" replacement, include a potential lack of deep knowledge of the business logic, as well as the risk that the new application might not be as robust as the old. Existing applications have been tuned and streamlined over many years, and they most likely perform very well. Using these existing assets in place, where possible, is the best approach to capitalizing on the investment and years of work spent perfecting them.

The SOA alternative

A better option is to unlock the business function buried in the i5/OS applications. By crafting modular, componentized business processes and creating service-based IT assets that take advantage of the business value in current applications, you can reposition IT for rapid future changes to your business model. With an SOA, you have an inventory of structured, loosely coupled services that perform a single function and can be choreographed to build business processes – yet the underlying implementation is isolated from the consumer. The user of the service is only aware of the function being performed, not of the details of how the function is implemented. With this service model in place, IT can rapidly add new functions and modify existing processes by simply assembling the services required to meet the new or enhanced business-process model. In other words, flexible reuse of core application assets for accelerated business adaptation.

An SOA, which provides an inventory of structured, loosely coupled reusable services, can help you tap into the business value in current applications and position IT for rapid future changes to the business model.

Within the construct of an SOA transformation, there are a number of complementary approaches for maximizing the value of your RPG or COBOL applications, improving the alignment between business and IT function and processes. You can componentize applications to discern reusable and flexible functions that can become key service elements. Additionally, you can modernize application software and technology to enable services in the most efficient and effective way, for example, creating a Web service out of ILE RPG or COBOL source using the Web service wizard. These approaches can position existing assets for SOA participation.

With an SOA, IT can more quickly add new functions and modify existing processes by simply assembling the services required to meet the new or enhanced business-process model.

Benefits of an SOA

An SOA can support powerful business capabilities. Overall, a business-centric SOA approach delivers a host of benefits, including:

- *Reduced time to market*
- *Improved business alignment for growth*
- *Reduced costs*
- *Reduced business risk*

Defining the concept of System i transformation to SOA

Essentially, SOA and Web services provide a foundation for orchestrating business processes in the IT domain. When combined with the transformation of existing applications, these services provide the structure for releasing deeply locked business functions out of i5/OS code and exposing those functions to the enterprise in a consistent fashion.

Figure 2 depicts an SOA implementation for a business process with high transaction volumes that requires tight integration with core business function, customers and vendors. The business objective of this particular process is to streamline the rental process to help reduce costs and improve service. The SOA reference architecture[5] is used to create the layers of abstraction necessary to expose services and choreograph those services in a business process. IBM System i™ machines are resident at the lowest layer of the architecture, where business function is identified, componentized and made available to the service-component layer as callable components. These components are then organized into services and exposed to the upper layers of the architecture for service choreography. Using the legacy-to-SOA method, and adhering to the SOA reference architecture, System i assets at the operational layer can participate in the SOA implementation, and the business can realize the value of business function locked in these assets.

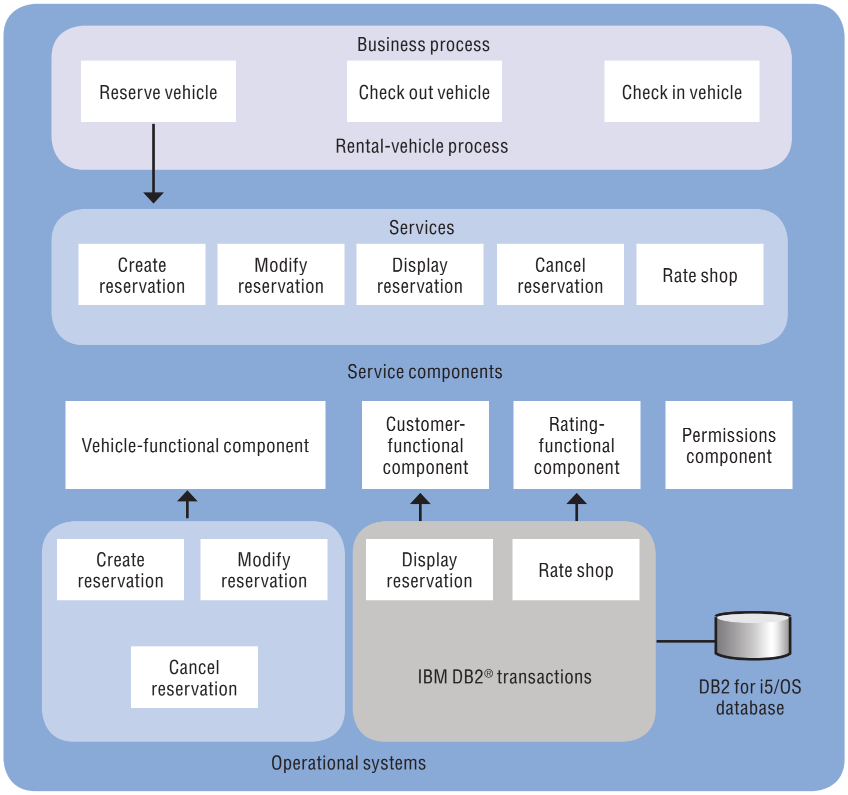

Figure 2. Using Service Oriented Modeling and Architecture (SOMA), the legacy-to-SOA method decomposes a business process and identifies services from the existing assets that implement process functions aligned to business goals.

Using the legacy-to-SOA method, and adhering to the SOA reference architecture, businesses can unlock the business function in existing assets at the operational level. An SOA-based application-modernization strategy enables process redesign to add new functions and better connect with customers and partners at a lower cost.

For more information about the benefits discussed in this section, refer to *The IBM Systems Journal*, Volume 44, Number 4, 2005: "Impact of Service Orientation at the Business Level" available at www.research.ibm.com/journal/sj/444/cherbakov.html.

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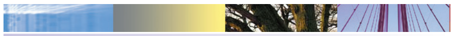


The IBM approach comprises five phases that support and promote best practices for renovation of existing assets.

An SOA-based System i application-modernization strategy enables process redesign to add new functions and better connect with customers and partners at lower cost. SOA aligns IT function to business-process function and significantly enhances agility by supporting modular systems. For the first time, businesses can easily construct and manage their business processes in real time without investing heavily in custom application development.

The IBM approach

Transforming the code in a renovation project is not a simple matter. The key to successful renovation projects lies in proper implementation. An unstructured, silo-based approach merely extends the existing environment, with all its problems, to include some poorly conceived and implemented Web services.

Therefore, a prescriptive method for running application-modernization initiatives is needed. The IBM approach comprises five phases that support and promote best practices for application renovation:

- Strategy. *Build a set of goals and objectives, and develop a road map and set of strategies to achieve those goals.*
- Model. *Decompose the business process, and construct a service model that aligns with business-process goals and requirements.*
- Assemble. *Create the services and choreograph the business process.*
- Deploy. *Install the physical environment for services and deploy the service containers.*
- Manage. *Make sure that the SOA continues to deliver the business value you need, and expand the service model as business requirements evolve.*

As Figure 3 shows, the IBM approach is iterative, as is each major phase.

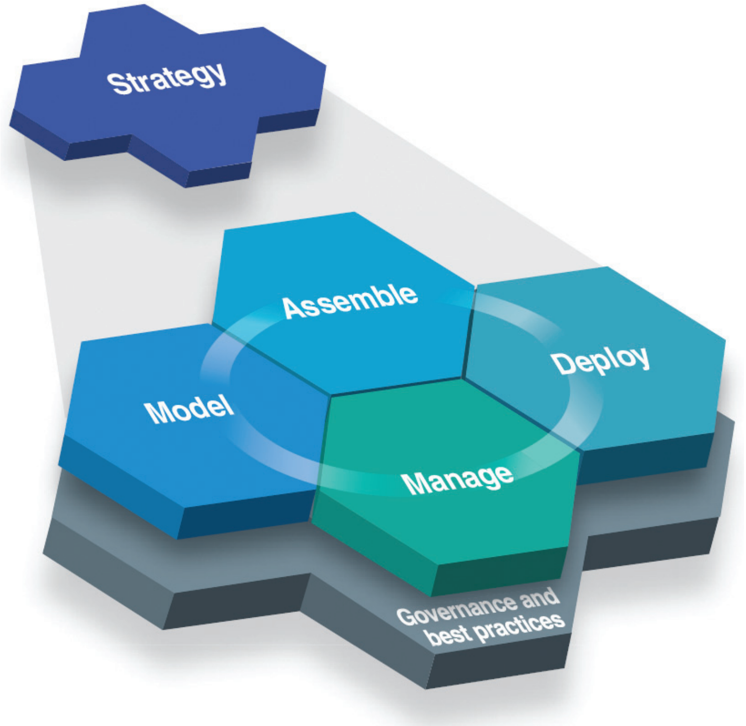


Figure 3. IBM offers a proven approach to application modernization that supports an evolving SOA.

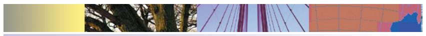
The strategy phase is critical to properly aligning business and IT goals with a long-term SOA approach.

Strategy

When evolving System i assets to SOA, you can narrow your strategy to a few simple principles:

- *Understand the broad business and IT goals. Incorporate the process of evaluating the current state, understanding business and IT goals and directions, and defining measurements and key performance indicators (KPIs) aligned to those goals.*
- *Formulate a strategy. Define the target state at the conceptual level that can allow the organization to achieve its goals, and identify what needs to be done to move from the current to the target state.*
- *Create a plan for the future. Prioritize required initiatives to transform the business.*
- *Monitor the plan over time. Collect and evaluate the effectiveness of the initiatives in providing improvements (as measured by the KPIs) in support of the stated business objectives.*

The most important first step to a successful renovation project is assessment of the current environment and modeling of a desired end state.



Modeling is the process of identifying the service candidates required from the business process, and aligning them with the goals of the business.

Model

The most important first step to a successful renovation project is assessment of the current environment and modeling of a desired end state. *Assessment* refers to the process of evaluating the current state of the IT and business environments, determining the suitability of those environments for an application-modernization project, and establishing the necessary steps to prepare the system for renovation to SOA.

Modeling is the process of identifying the service candidates required from the business process and aligning them with the goals of the business. This process seeks to create what is known as a *service model*—a collection of services to be exposed and made available to those who are implementing business processes.

The IBM approach uses the SOMA method.[6] IBM's modeling activities align with the existing asset-analysis and domain-decomposition activities, as well as with the service-specification and service-realization decision activities, in the SOMA method. Service realization is a key step in the process of using existing assets, where the technical implementation and location of components and services are decided.

Special considerations are required when identifying and specifying services from existing i5/OS applications. The top-down modeling activity considers the business process and seeks to break down the process into small pieces that can be aligned with a service. Generally, the System i environment is not being considered during this step. Only the business process itself, looked at logically, is considered in top-down analysis. The objective is to isolate business function with respect to the overarching business process. Later, service candidates identified in the top-down decomposition of business processes can be reconciled with candidates from bottom-up modeling to create a comprehensive service model for the domain.

Bottom-up modeling, which analyzes existing assets to identify service candidates, is a critical activity in application-modernization projects.

Bottom-up modeling is a required and critical activity in application-modernization projects. During this process, you analyze existing assets to identify service candidates. Some care must be taken to limit the scope of bottom-up modeling to those components that are likely to yield services in the business domain targeted for renovation. Proper scoping of the project during the initial stages of the renovation, as specified in the method, can provide the necessary inventory from the existing assets. The method is iterative so that the entire process can be refined to achieve complete use of available System i assets.

The final result of this analysis is a service model that identifies candidate services aligned to the business-process steps derived from the top-down model. The service model has a mix of services: those that are well matched to existing assets, those that are a partial match, and those from top-down analysis that have no match in the existing base and will need to be constructed from scratch. After the service model is defined, a process called *service-realization decisions* is conducted. In this vitally important step, technical implementation details of components and services are decided, and allocation of components to services is performed. In this step, System i assets are used to create functional and technical components, or decisions are made to use, modernize, integrate or replace existing assets to achieve the goals of the business-process and service model. In addition, at this point, data usage is rationalized within the service model, and an information architecture is defined for the business domain.

Numerous service-enabling techniques and associated technological components are used to complete the various steps of the assemble phase. The assemble phase involves designing and constructing low-level services from service components.

Assemble

After a service model is created, you can embark on the task of low-level services design and construction from service components. Service components are the basic components of the exposed services in the model. They run the actual business function and can be made up of technical and functional components. This is the layer of enterprise components that is responsible for realizing functionality and maintaining the quality of service for the exposed services. Functional components supply the business capabilities required, while technical components provide operational capabilities such as database access, queue support, authentication and authorization, error handling, auditing and logging.

Service components accumulate these technical and functional components and build a deployable service. The service itself does not contain any function. It is merely the interface. The service is what is exposed to the system, and it defines the inputs and outputs of the service component. Numerous techniques and tools, such as WebSphere Development Studio Client and WebSphere Development Studio Client Advanced Edition, are available to extract business function from existing assets, to wrap existing assets to form a functional component or to coordinate existing assets through messaging or databases to form a service component. During the assemble phase, the appropriate service-enabling technique and associated technological components are chosen. The IBM Application Modernization Assessment method links with other IBM methods for services-development or services-integration application renovation, providing the modeling and design input to development activities in these methods. These methods work together to form an end-to-end capability for SOA transformation.

In the deployment phase, the renovated and constructed components and services are released into a production operating environment. During the manage phase, you maintain the operational environment and the policies expressed in the assembly of the composite applications deployed to that environment.

Deploy

In the deployment phase, the renovated and constructed components and services are released into a production operating environment. In addition to the actual deployment of the composite applications, this phase involves creating the hosting, or runtime, environment. This means addressing any application-resource dependencies, operational conditions, capacity requirements, and integrity and access constraints. You also need to carefully evaluate the techniques you will employ for ensuring system availability, reliability, integrity and efficiency. With scalable systems and software from IBM that support multiplatform IT infrastructures, you can optimize the SOA runtime environment to reliably run composite applications while providing the flexibility to make updates dynamically in response to changing business requirements.

The management phase also involves tuning the operations environment to meet the business objectives expressed in the business design, and measuring effectiveness.

Manage

System i renovations to SOA result in a mix of service and nonservice components in the system, all of which need to be monitored and managed. During the manage phase, you maintain the operational environment and the policies expressed in the assembly of the composite applications deployed to that environment.

This phase also includes managing the business model—tuning the operational environment to meet the objectives expressed in the business design, and measuring success or failure to meet those objectives. This feedback loop requires the ability to easily track and measure composite application service performance against defined metrics (KPIs) and to adjust accordingly. IBM system-management software offers a composite-application manager that enables the KPIs identified during the strategy phase to be monitored at run time, giving you real-time visibility into business processes for ongoing improvement and innovation.

SOA governance is an extension of IT governance that focuses on the life cycle of SOA services and composite applications. It helps to mitigate many of the business risks inherent in SOA adoption.

Underpinning all of these life-cycle phases is a governance framework that provides guidance and oversight.

Governance

Adoption of an SOA raises new issues in IT decision rights, and measurement and control. SOA governance is an extension of IT governance that focuses on the life cycle of SOA services and composite applications. It enables organizations to maximize the business benefits of SOA, which include increased process flexibility, improved responsiveness and reduced IT maintenance costs.

SOA governance also mitigates many of the business risks inherent in SOA adoption by establishing decision rights, guiding the definition of appropriate services, managing assets, and measuring performance and realized business value. Effective SOA governance systems help you answer questions such as:

- *What are the common business services that are needed?*
- *Which services can be shared and under what rules and circumstances?*
- *Who makes a decision on whether a service can be accessible to other applications?*
- *Who owns the data, and is there agreement to allow the service access to the data?*
- *Who should fund the shared service? Who owns it?*
- *Who's responsible for initiating and approving changes?*
- *How is the business going to promote reuse of enterprise assets and shared business services?*
- *How do we measure the business value achieved through services creation and reuse?*

Defining the approach that works for you

When you're ready to modularize your System i applications, having the right approach is critically important. There are multiple points of entry to successful application modernization. IBM has the business knowledge and technical skills required to help you define and implement the approach that is best for your business.

IBM provides flexible combinations of expertise, tools and technologies that enable SOA infrastructure and IT innovation based on your needs at each stage of the modernization process.

The IBM SOA-enabled application-modernization specialists and IBM Systems and Technology Group Lab Services architects are experienced at helping companies just like yours understand what options you have — and how to explore those options and put them into practice. They can help you build a road map and a plan that can lead you and your IT department step by step on your road to contemporary application architectures. They know what you need to know because they have worked on these kinds of engagements for firms both large and small. They can show you how, when and where to gain and use that kind of knowledge and power. And they can stand by you every step of the way.

For more information

To learn more about IBM Systems and Technology Group Lab Services offerings, visit:

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To learn more about the IBM SOA services including SOA-enabled application modernization, visit:

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To learn more about WebSphere Development Studio Client, WebSphere Development Studio Client Advanced Edition, and WebFacing Deployment with HATS Technology, visit:

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