iWay Software | Accelerating Business Integration

Service-Oriented Architecture –
A New Alternative to Traditional Technology Integration

A White Paper

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Executive Summary

Today, service-oriented architectures (SOAs) are being heralded by industry analysts and software vendors as the only viable way to overcome the complexities involved in creating agile business systems. These software structures offer great promise for accelerating deployment of new applications and capabilities, streamlining business-critical processes, reducing costs, and enabling organizations to increase their return on investment from an accumulation of diverse systems and communication technologies.

To better understand SOAs and how they can be effectively employed, it helps to understand the principles on which they are designed. It also helps to become acquainted with tools that are helping enable application developers and integrators to quickly and cost-effectively make SOAs a reality within their specific organizations. This paper will examine the basic premises underlying SOAs and describe how universal technology and service adapters, such as those from iWay Software, can help organizations realize the benefits of SOAs.

Characteristics of Service-Oriented Architectures

Today's businesses depend on electronic processes at every level. An organization's ability to stay competitive relies heavily on being able to adapt its electronic processes in support of initiatives designed to improve productivity, reduce costs, deliver higher-quality information, and accelerate routine tasks. However, adapting these business-critical electronic processes requires evolving the systems they run on – quickly and cost-effectively. If only it were so easy.

Organizations adopt new technologies over time, and many enterprises own systems and software decades old, as well as the latest technologies. The old systems typically run some of the enterprise's most critical processes – which is why they haven't disturbed them. The new technologies are purchased to provide leading-edge capabilities. The result is often an incredibly complex environment composed of incompatible and proprietary information technology assets that were never designed to aggregate data or enable collaboration. These include:

- Legacy applications – a wide range of them, written in a variety of procedural languages that typically do not have well-defined interfaces for collaboration with other applications

- Object-oriented applications – many different applications developed as components for other applications, such as Enterprise JavaBeans™, COM, or CORBA objects

- Transaction systems – custom-developed applications that run under the control of transaction processing monitors such as customer information control system (CICS), IMS Transaction Manager (IMS/TM), BEA Tuxedo, and other software; and whose individual transactions are well suited to incorporation into collaborative business processes

- Packaged application systems – vendor-supplied, proprietary systems with well-defined, often completely proprietary, collaborative interfaces

- Databases and files – vendor-supplied, proprietary relational database management systems (RDBMSs), legacy database management systems (DBMSs), and file systems with varying degrees of standard and proprietary interfaces

- Communication transports and message formats – industry-standard transports such as hypertext transport protocol (HTTP), file transfer protocol (FTP), and simple mail transfer protocol (SMTP); vendor-supplied proprietary messaging and queuing systems from companies such as IBM and TIBCO; and a variety of formats for exchanging data between enterprises, such as electronic data interchange (EDI), Society for the Worldwide Interbank Financial Telecommunication (SWIFT), Health Insurance Portability and Accountability Act (HIPAA), and others

- e-Business exchanges – proprietary and standards-based public and private exchanges through which businesses collaborate with other businesses
- Application server platforms – application and integration servers that host all manner of applications and facilitate electronic collaboration within and between enterprises

Until recently, the largest enterprises have custom-developed new solutions or engaged system integration experts to connect existing information assets for supporting new initiatives. However, these efforts are costly, time-consuming, and sometimes impossible. Today's enterprises must be able to adapt quickly, using their existing information technologies and avoiding the cost of ripping, replacing, or rewriting every incompatible technology that impedes business agility. They must be able to build a foundation for new agile services by quickly exposing existing systems as fine-grained services – without having to write extensive code. These services must also be available across channels in multi-protocol environments in order to allow organizations to adapt existing applications and systems to accommodate new business processes.

Service-oriented architecture is a new approach that helps organizations weave together diverse information technologies in a way that assures each technology's independent functionality while simultaneously enabling them to collaborate effectively within large-scale business processes – without having to scrap the investment or custom-develop massive amounts of code. SOAs promise to provide unprecedented flexibility and cost savings for deploying new applications and capabilities.

Service-Oriented Architectures – A Definition

According to Gartner, SOA is "an application topology in which the business logic of the application is organized in modules (services) with clear identity, purpose and programmatic-access interfaces. Services behave as "black boxes": Their internal design is independent of the nature and purpose of the requestor. In SOA, data and business logic are encapsulated in modular business components with documented interfaces. This clarifies design and facilitates incremental development and future extensions. An SOA application can also be integrated with heterogeneous, external legacy and purchased applications more easily than a monolithic, non-SOA application can." (Gartner IT Glossary)

Service interactions are defined using a description language, such as extensible markup language (XML). Each service interaction is self-contained and loosely coupled, so that each interaction can function independent of any other interaction.

Frequently, IT organizations prefer to standardize their systems and create enterprise reference architectures, resulting in protocol dependence. However, in practice this approach is often difficult to implement and maintain, especially when the next "new standard" inevitably arrives. Instead, SOA offers protocol independence, meaning that different consumers of computing services – such as an application, a server system, or a human end user – can communicate with the same service in a different way to obtain the data or functionality desired. Services themselves function as discrete components, designed to aggregate underlying complex computing interactions into reusable "packages" that can be invoked whenever that particular piece of functionality is required.
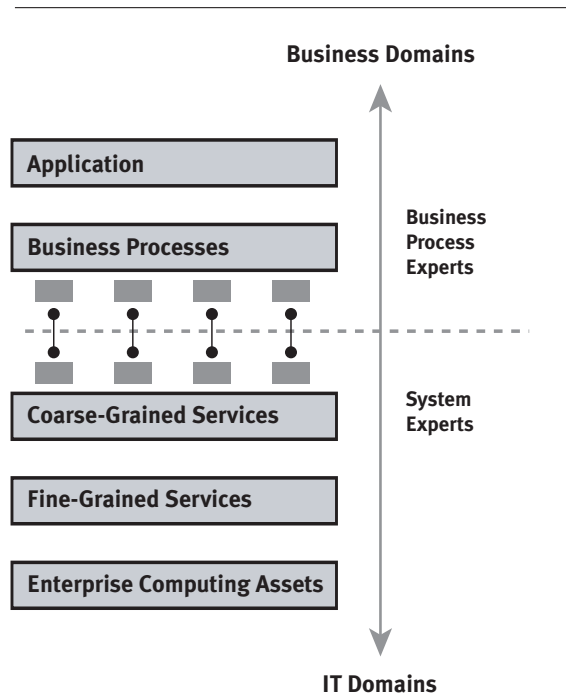
With SOAs, application developers, implementers, and IT teams gain great flexibility in adapting existing systems and software to work together. In practice, there are additional software layers between information providers and information consumers that serve a range of purposes, such as simplifying implementation, masking unnecessary complexity from the user, and automating complex translation processes.

Simplifying Through Aggregation

A primary goal of deploying SOAs is to simplify development and implementation of new applications and capabilities through aggregating many low-level tasks into higher-level services. To use a human analogy, the heart is a discrete system comprised of smaller, specialized systems, such as valves, arteries, and veins. These microsystems are aggregated, or work collectively, to form a macrosystem we think of as the heart. Lungs, the circulatory system, and brain are other vital human macrosystems. Ultimately, the body's major macrosystems – heart, lungs, circulatory system, brain – collaborate to support global processes such as respiration, speech, and movement.

Within each level of aggregation, the microsystems function independently; however, each successively higher level sees the lower-level functions as ubiquitous and available to it through a common interface. The heart doesn't worry about what the lungs do or how they do it; when the heart needs oxygen, it simply extracts it from an artery without knowing how it's supplied.

An SOA is similar. All electronic business processes are implemented at the lowest levels as specialized functions designed to perform specific tasks. Low-level services are designed to behave like text messaging – as short, to-the-point interactions. These low-level services are created and maintained by people who have the expertise required to weave them together to produce a desired business result. A service doesn't necessarily know about other services or how they operate. For example, when a financial reporting application needs data, it simply asks for it from a software service without knowing or caring from where or how the data is supplied. And at higher levels of aggregation, neither does a Web application, portal, or application system worry about what other applications do.
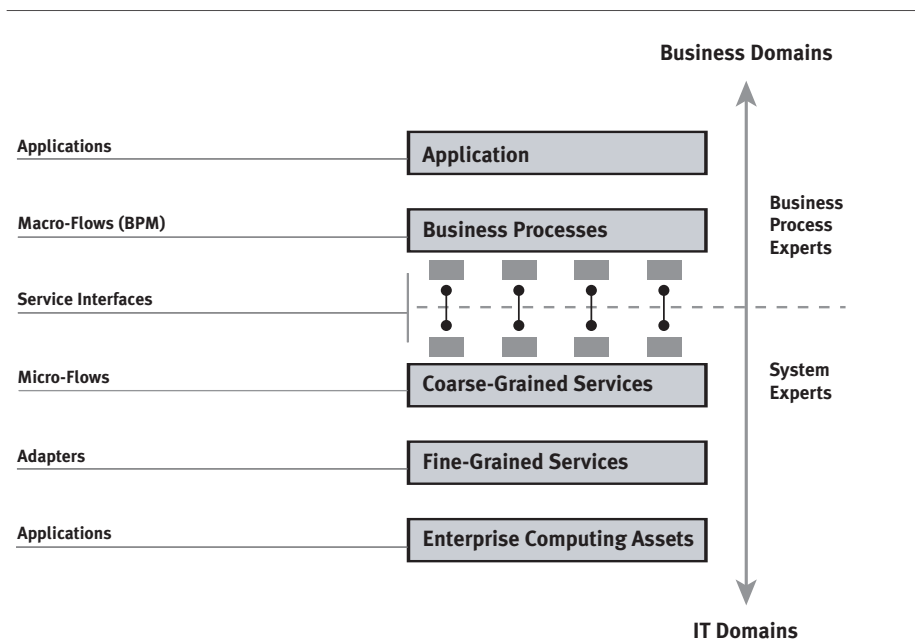
Business Domains

Application

Business Processes

Business
Process
Experts

Coarse-Grained Services

System
Experts

Fine-Grained Services

Enterprise Computing Assets

IT Domains

Service-oriented architectures are based on existing computing assets and aggregate lower levels of functionality to effectively enable diverse assets to collaborate for improved business processes and enhanced application capabilities.

It is rare that one low-level service, such as an SAP Business API or JDE Master Business Function, will produce enough data, in a rich enough context to be useful by itself. At the same time, using too many low-level services directly requires additional interactions between service providers and consumers, which will have a negative effect on application performance. Aggregating low-level services to higher levels helps developers and implementers avoid overly complex, difficult-to-use systems. An implementer will aggregate multiple individual services in ways that vary depending on how the application or process must support the organization.

For example, in producing "customer" data, the context of "customer" will vary, depending on the role of the consumer of that data. An implementer may manipulate low-level services to support a customer service application that provides call center agents with a total view of customers' relationships with the business. The same implementer will manipulate services differently to support a product shipping and tracking application.

An SOA introduces discipline into software architecture design with the understanding that electronic business systems need to be aggregated at different levels. Services shield application developers and integrators from having to know how to navigate and manipulate specific, low-level information resources in order to build or maintain composite applications and higher-order business processes.

Business Domains

Applications	Application
Macro-Flows (BPM)	Business Processes
Service Interfaces	
Micro-Flows	Coarse-Grained Services
Adapters	Fine-Grained Services
Applications	Enterprise Computing Assets

Business Process Experts

System Experts

IT Domains

Aggregated levels of services shield developers and implementers from unnecessary complexity while retaining important low-level functionality.

Like the heart, applications and processes simply request what they need from a service. This enables organizations to create large-scale business processes that improve operations and competitive advantage without having to manipulate every individual function each time a new feature is needed or a system must be adapted.

Enabling Rapid Adaptation

Aggregation of lower-level functions masks the complexities of systems navigation and manipulation at each successive level while permitting each function to operate effectively. Higher-level services that produce data, or make data actionable, also insulate implementers from low-level changes within underlying application systems.

For example, packaged application systems continually change to improve performance of specific business processes. If individual low-level services are exposed directly and embedded in application code, then whenever they change, the application utilizing them would need to be reprogrammed or replaced accordingly. Application vendors frequently change functions from release to release, often eliminating older functions in favor of more advanced functions. Applications relying directly upon services utilizing older functions would have to be modified.

However, by masking lower-level services behind higher-level service aggregations, implementers who are familiar with an application's inner workings can modify service implementations independently, without disrupting the applications or processes that take advantage of higher-level services. Aggregation accelerates deployment of upgrades and new application systems and significantly reduces deployment costs.

Extending New Capabilities Enterprise-Wide

A secondary goal of SOAs is to enable any application or process to utilize the services of any other application or process, over any means of interconnection. Enterprise business processes rely on a wide variety of message formats and transports to communicate within and between systems. A unique message format, combined with the communication transport over which it travels, is called a service channel.

Service channels define unique language and communication characteristics needed to enable disparate systems to collaborate. Today, every business enterprise utilizes numerous service channels. Common channel transports include http, e-mail, ftp, and proprietary networks such as UCCNet, SWIFTNet, and public or private exchanges. Common message formats used in conjunction with these transports would be EDI, SWIFT, HIPAA, MQSeries messages, and Messaging Application Programming Interface (MAPI).

In SOA, any service should be usable over any type of service channel, rather than being confined by unique or proprietary combinations of message format and channel. SOA can aggregate a business enterprise's service-channel architecture into a single, extensible service-channel implementation, enabling any service to operate across any channel without having to implement multiple gateways or trading partner agreement managers. The universality of SOA can help enterprises use their existing systems in new ways, for new purposes, for greater competitive advantage, efficiency, and return on investment.

Facilitating SOA With Universal Adapters

iWay Software, the world's leading supplier of adaptive software technologies, is a leading proponent of SOA. iWay provides fully integrated, standards-based, proven adaptive software that simplifies the design, development, and maintenance of SOAs at all levels of implementation. Our foundation technologies enable an enterprise to implement an SOA incrementally, taking into account newer, standards-based systems, as well as the many legacy systems and proprietary software technologies that comprise any business enterprise's information assets. And iWay Software helps organizations achieve this goal with the lowest total cost of ownership and highest return on investment of any vendor.

A Reusable SOA Foundation

iWay service-oriented adapters provide a comprehensive SOA foundation, enabling disparate applications, databases, files, communication transports, message formats, e-business exchanges, and platforms to be easily connected over an organization's existing standards-based or proprietary communications transports. This reusable infrastructure spares implementers the time, expense, and complexity of cobbling together a common service-channel infrastructure from multiple vendors' proprietary infrastructures on a per-platform, per-application, per-transport, per-exchange basis. SOA:

- Services virtually any information asset used within and between business enterprises
- Reduces or eliminates the need for multiple, proprietary integration servers or B2B gateways
- Replaces difficult-to-code or high-maintenance custom interfaces between legacy systems and other applications
- Provides software bridges between proprietary and packaged application systems

Tailoring SOA With Technology Adapters

While a generic, reusable adapter architecture supports any enterprise implementing SOA, within each organization resides a microsystem of discrete platforms and applications. SOAs miss the mark if they enable an organization to connect information assets without retaining the value-added productivity features and consistent user experience of vendor-specific platforms.
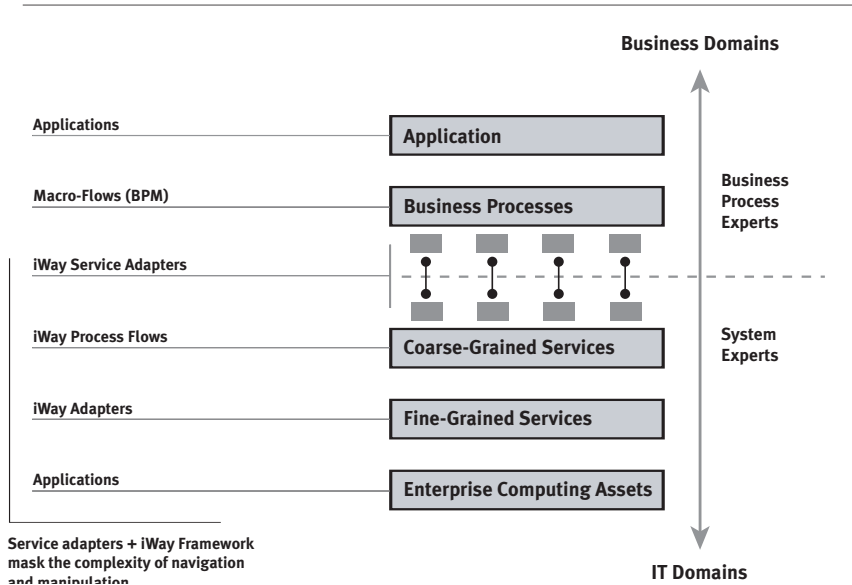
Reusable technology adapter solutions from iWay Software adopt the look, feel, and operational characteristics of the major technologies and integration tools underlying all or part of an SOA implementation. This means that the enterprise can deploy, configure, and use adapters retaining a user experience consistent with the platform's tools. Without having to dramatically change how users work, the enterprise can further reduce deployment costs and accelerate productivity with new applications. iWay Software has also developed key strategic partnerships and customizable adapter deployments for leading vendor platforms, including those from:

- Microsoft – iWay Adapter Suite for BizTalk Server 2004®
- SAP – SAP NetWeaver 2004® Adapter Suite
- PeopleSoft – PeopleTools® ETP Adapter Suite
- Oracle – Oracle eBusiness Adapter Suite for Oracle 10g®, InterConnect®, ProcessConnect® and BPEL Server®.
- BEA – iWay Adapter Suite for WebLogic® Integration Platform
- Sun – Sun Enterprise Java® Platform Suite
- IBM – iWay Adapter Suite for WebSphere® Integration Platform

For a list of additional companies whose products or platforms utilize iWay Software solutions, visit www.iwaysoftware.com.

Using technology adapters built and maintained by iWay Software, organizations can reduce the time, cost, and complexity of SOA deployments. They can deploy, configure, and tune adapters and processes using the same tools and techniques across all information resources. And most importantly, iWay adapters contain the all-important built-in message translation mechanisms that enable diverse information resources to collaborate without worrying about communication or translation obstacles.

Where iWay Service Adapters Fit in SOA

Business Domains

Applications — **Application**

Macro-Flows (BPM) — **Business Processes**

Business Process Experts

iWay Service Adapters

iWay Process Flows — **Coarse-Grained Services**

System Experts

iWay Adapters — **Fine-Grained Services**

Applications — **Enterprise Computing Assets**

IT Domains

Service adapters + iWay Framework mask the complexity of navigation and manipulation

iWay Universal Adapters simplify aggregation and communication between service levels, enabling developers and implementers to accelerate deployment of new services and applications and reduce costs.

Aiding Aggregation With Service Adapters

As mentioned earlier, one significant reason for deploying SOA is to simplify development and implementation of new services and applications by aggregating low-level tasks into higher-level services. Aggregation requires manipulating multiple information sources to produce a higher-level service; therefore, this requires that application developers and integrators understand how to navigate and manipulate these sources appropriately to deliver the desired business result. iWay service adapters can significantly reduce the burden on these valuable staff by containing the knowledge of how to navigate and manipulate specific information resources and exposing services at a high level of aggregation.

Service adapters enable services providers to easily create microprocesses that manipulate specific or cross-resource information sources to create reusable services that may be utilized by any application or integration tool. For example, in SAP, Invoice Management is performed using a variety of SAP business APIs (BAPIs) that must be manipulated in a particular sequence in order to create, change, process, or delete invoices. Knowledge of how to use Invoice BAPIs to produce meaningful business results lies outside the realm of most application or integration implementers. Manually manipulating invoice BAPIs is complex enough. When the application also changes frequently, relies on business processes that change frequently, or must include manipulated objects such as Siebel Business Objects, J.D. Edwards Master Business Functions, PeopleSoft Component Interfaces, and others – the challenge can be overwhelming.
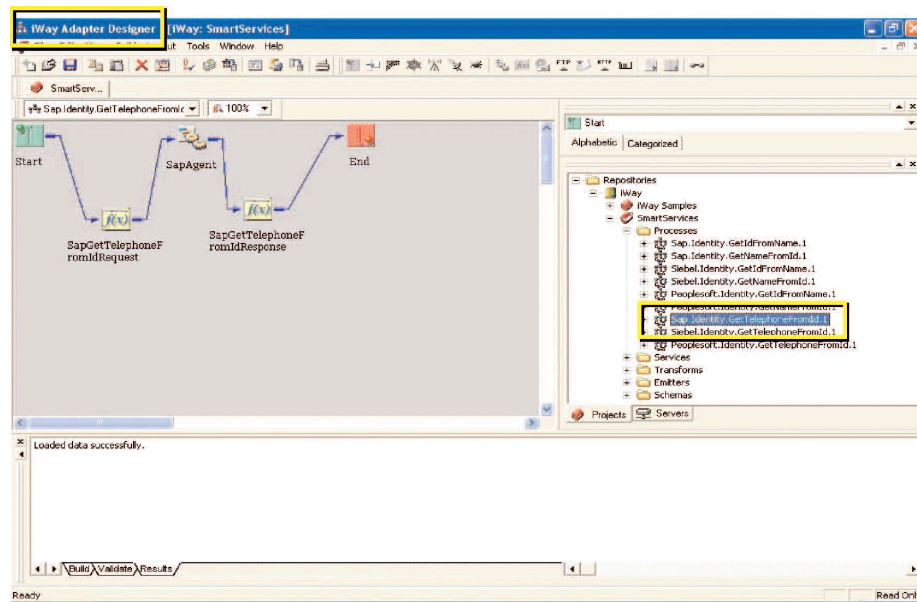
| This simple service adapter extracts customer ID data from SAP using SAP business APIs.

iWay service adapters overcome this complexity by enabling information resource experts to create processes on an individual or cross-resource basis for generalized or role-specific use, and then publish them as JCA-deployable or Web services to be accessed directly by any application development or integration tool.

Service adapters can also be effectively used to create cross-resource services that involve complex manipulation of multiple business functions, such as creating a customer record that contains information from SAP R/3, Siebel Call Center, and PeopleSoft General Ledger applications. Service adapters may also utilize other service adapters to create levels of business function aggregation to meet the needs of any application or integrated business process.
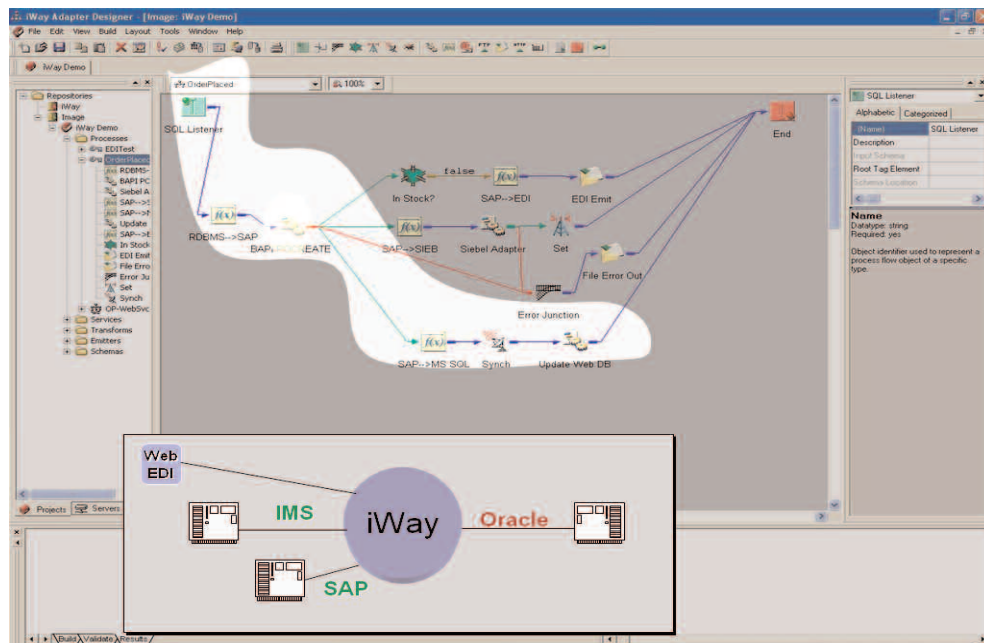
A process-oriented adapter that defines a complete process accepting an EDI document, converting it to XML, then appending IMS and SAP information, then updating an Oracle database.

Smart Services Enable Transparency

iWay Smart Services orchestrate the responses that enterprise applications must make to respond to a user's request. For example, the Microsoft Office Information Bridge Framework (IBF) 2003 exposes line-of-business data to Microsoft desktop systems. When a user clicks "show invoices approved by this person," iWay Smart Services can automatically retrieve appropriate invoice information from SAP, correlate it with information held in Siebel, and return a standardized view to Microsoft IBF, which enables users to quickly and easily conduct further research, meet customer needs, or escalate a service problem. The application developer does not need SAP or Siebel skills to create the application and the user does not need to know which enterprise applications are involved in the process. This kind of transparency streamlines large-scale business processes and makes it possible to extend superior business intelligence throughout the organization.

SOAs – The Next Step

For many organizations, SOAs represent the next step in increasing competitive advantage while preserving significant information assets investments. By understanding the principle of lower-level service aggregation, organizations can maximize the capabilities and flexibility of their new SOA deployments. And with powerful iWay Universal Adapters, they can dramatically reduce the time and cost associated with SOA deployment.

About iWay Software

iWay Software, an Information Builders company and the world's leading adapter vendor, accelerates business integration by providing tools that make service-oriented architectures easy to implement. Clients achieve short-term ROI by using iWay tools to reduce custom programming and solve problems quickly, while incrementally creating an architecture that supports long-term projects. The biggest names in software, including BEA, Microsoft, and SAP, use iWay adapters to simplify access to ERP and CRM systems, messaging, legacy systems, e-business protocols like AS2 and ebXML, and more. Additional message transformation and data integration make iWay a natural integration choice – standalone or with other middleware.

About Information Builders

Information Builders sets the standard for operational business intelligence by delivering business intelligence at all three levels of the enterprise: executive (executive portals), tactical (back-office analytics), and operational (wide-scale usage by employees, partners, and customers). This completeness makes our total cost of ownership the lowest in the industry. We give organizations who seek a consistent view of their complex business environments the ability to extend that view to their extended enterprise. Our robust ecosystem, which includes over 280 data adapters, facilitates informed decision-making by providing less latency of information and tight integration with all operational systems, coupled with utmost scalability and self-service usability. We fill the inherent need for an autonomic, secure information architecture and a single, standardized yet flexible reporting environment that empowers a smaller pool of IT resources to fill all corporate informational needs while reducing the cost of having to move data across multiple systems and maintain numerous specialized BI products. We provide all these capabilities through 30 years of organic, customer-first development – not last-minute mergers and acquisitions.

Headquartered in New York City with 47 offices and 26 distributors worldwide, Information Builders employs 1,750 people, has over 350 business partners, and generated revenues exceeding $300 million in 2004.

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