

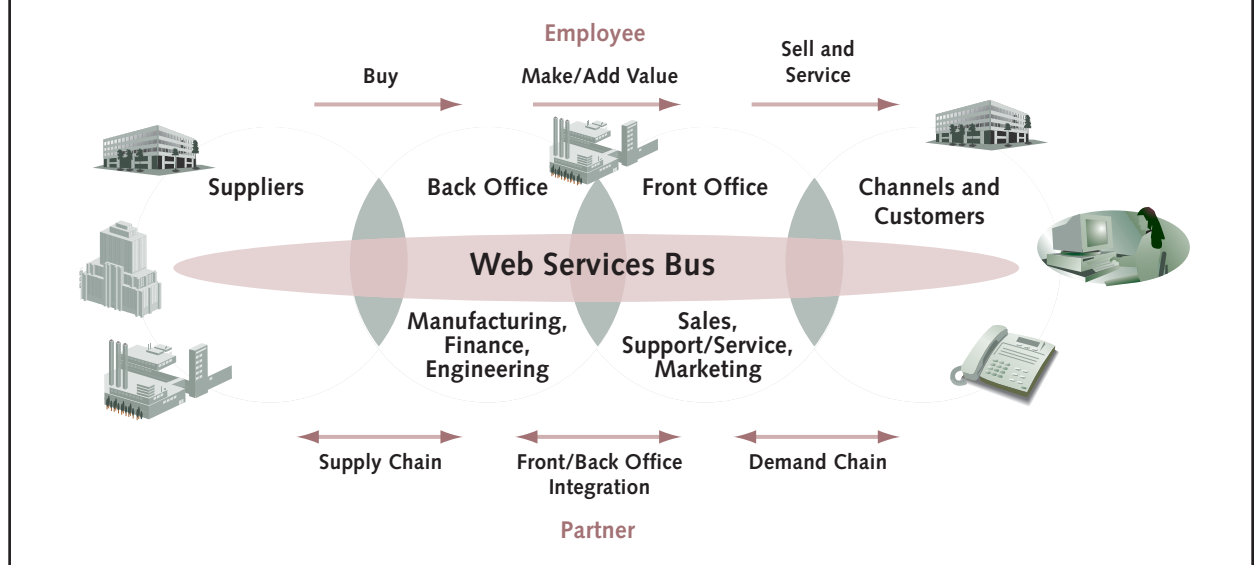
Interoperability Emerges as New Core Competency for Enterprise Architects

Executive Summary

To end users, the difference between integration and interoperability is mostly moot. They value that fact that things work together to support their business and work goals. But for technologists the differences are important, and the terms continue to evolve. Current trends in IT toward integrated infrastructure stacks based on two predominant frameworks, J2EE and .NET, are freeing enterprise developers and architects from some of the drudgery of developing, deploying, and supporting enterprise applications. Automation and deeper vertical integration on the platform level is being accompanied by an auspicious trend toward simpler and broader standards-based horizontal interoperability between and among applications, components, data, and many previously non-interoperable inputs. This new opportunity for interoperability comes from Web services standards and specifications and their expected role as catalysts to a new application paradigm, services-oriented architecture (SOA). The dual shifts—toward integrated stacks such as Microsoft's Windows Server System, IBM's WebSphere, Oracle's 10g, and BEA Systems' WebLogic—are also a move toward Web services and SOAs, and will require new skills and expertise. How well enterprises gain the skills to avail themselves of newer interoperability technologies and techniques will go a long way toward determining their competitive business advantage during the next 10 years. Yankee Group advises IT departments to focus on interoperability technologies and skills as a core competency imperative. Indeed, business process level productivity benefits will not reach their potential without an accompanying embrace of interoperability technology knowledge and skills. Enterprises should also begin converting myriad business endpoint values—from machine tool sensor feeds to purchase orders—into Web services digestible formats (see Exhibit 1)

Exhibit 1 Business Processes Gain From Web Services Bus

Source: The Yankee Group, 2003



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I. Introduction

Enterprise business and technology leaders have every right to be exasperated with the shifting demands of quirky IT technology trends. Since 1985, every three to five years has brought calls for deployment of yet another application support technology, and has required the skills and competencies to run them all—at considerable and ongoing expense. The 20-year trend trail includes migrations from host systems to client/server computing, to integrated enterprise application suites, to Web applications, to n-tier architectures and distributed computing, to enterprise portals, and now to Web services and grid computing.

There does not appear to be any end to the migration migraine in sight, as vendors have recently introduced newer versions of platforms, such as Microsoft's Longhorn, many of which require not just an upgrade but a true migration, due to significant technological changes in the core platforms. The plethora of platforms and their supported applications, naturally, require even more integration.

Integration has been a means to share data and transactions between applications, and also a means to functionally link infrastructure components to offer common support for applications. Integrated server components and tools lead to an integrated stack, or the new popular term by vendors, a "system." Integration between applications—especially cross—platform integration—has proven expensive and brittle, making integration efforts less common than many enterprises would like.

For Web services-based standardized technologies, cross-platform interoperability for applications, data, content, and to a lesser degree transactions, the differences between integration and interoperability, are dramatic. From a standards and product development perspective, there is less emphasis on integration technologies (such as pure-play enterprise application integration (EAI) products and enterprise Java specifications) than interoperability. The benefits of interoperability are where the action is, and for good reason.

Interoperability technologies offer a rare opportunity to gain with less pain. They also provide a hedge against platform lock-in. Although it may appear that IT vendors have used Web services as another reason to sell new tools and systems, the trend toward standardized interoperability technologies offers real and broad benefits to organizations and independent software vendors (ISVs). Web services standards and specifications, and other cross-application and data integration technologies, are far simpler and more valuable than past IT integration advancements. For example, Web services help enterprises and ISVs to:

- Make more of the applications and platforms in place
- Extend older applications into newer interfaces, applications and architectures
- Unify, efficiently distribute, and use more types of content and data to interface with applications and reach more end users and devices
- Orchestrate interoperable services to create new application value
- Migrate to newer platforms and applications that ease modernization and consolidation
- Create new business activity automation by broadly sharing applications and data for business-to-business and business-to-consumer commerce
- Give the business side of the organization a renewed sense that IT is a source of productivity and not just a source of spiraling and unpredictable costs

While there is still pressure to constrain spending, support for internal competency to exploit interoperability technologies and techniques is worthy of IT spending. Interoperability pays multiple dividends to nearly every aspect of business and IT investment activity.

While particulars differ, enterprises should invest in interoperability technologies in tandem with (and in many cases, before) vertical platform consolidation. As enterprises seek powerful interoperability capability, the skills and appropriate personnel and organizational structure must be given attention. In a sense, it is a matter of putting the horse *in front of* the cart: The advantages of interoperability will improve the efficiency of current systems, enable swift attainment of business goals, and make business process improvements faster.

II. Trends Propel a Need to Master Interoperability

The importance of Web services and standardized interoperability technologies is illustrated in a recent discussion at the October 2003 Enterprise Architect Summit in Rancho Mirage, Calif. In a keynote address, Rick Bergquist, the CTO of PeopleSoft, was asked if his company's August acquisition and merger with J.D. Edwards was related to Web services' role in allowing each company's systems to quickly interoperate. Bergquist said it was essential to the decision to go forward with the merger.

Because each company had prominent interoperability technologies in their systems, they made the merger decision with confidence and more predictable technological synergy. Interoperability also likely played a role in Oracle's hostile bid for PeopleSoft. Oracle has widely adopted interoperability standards, and understands their power.

Easier and broader interoperability has a clear impact on the largest business decisions. Expertise in interoperability extends, in some way, to almost any business issue. Businesses are increasingly defined, and actions and values are expressed, through IT systems and applications. If IT systems can communicate effectively, the businesses can communicate and interoperate effectively.

When more types of information and data can enter business IT systems, more automation can be extended to processes. This is true for the largest-scale business merger and in the smallest scale, when one worker can easily share a document. The ability to interoperate well technically gives executives a means to merge and craft business activities better, to scale processes at lower cost, and to extend efficiencies across and between various technical and organizational boundaries.

Ease of integration and interoperability has been a goal for IT developers and vendors for years. The path to interoperability, however, was often complex, expensive, and usually required tightly coupled integration between platforms on a transactional level, using technologies such as object request brokers (ORBs) and standards such as Common Object Request Broker Architecture (CORBA), Distributed Component Object Model (DCOM), and Enterprise Java. Such presumed standards, and other more specific integration approaches, have not proven as valuable, however, as the truly ubiquitous and broad interoperability that Web services-based approaches provide.

Drivers of Change

While the vast majority of transactional applications integration is still done using middleware messaging, store-and-forward interfaces, ORBs, EAI modules and discrete servers, a critical mass of interoperability is being reached for content, data, and other application outputs via standardized Web services. All indications point to an increased use of Web services and SOAs for cross-application and intra-application activities, and the stage is being set for their use in more transactional activities.

On Sept. 17, 2003 in New York, the lead software architects for Microsoft, Bill Gates, and IBM's top software executive, Steve Mills, announced an ambitious proposal for more Web services standards based on advanced specifications the two companies created together. While the work was done without any official standards body, the fact that these two globally prominent companies established specifications makes the prospect for de facto standards more than a slim possibility. If any companies can set standards on their own, it is IBM and Microsoft.

The duo described a vision for secure, reliable, transacted Web services, including methods for composition of the services and architecture for their use. A bevy of other standards bodies, from OASIS to W3C to WS-I, are also working to define, refine, implement, and enforce Web services standards. It will bear watching how and when the Microsoft and IBM specifications make their way into an official standards body. So far the record is encouraging, for most Web services specifications IBM and Microsoft designed ended up in standards groups with a royalty-free status (unlike enterprise Java specifications).

Some of the most wealthy and influential IT vendor corporations not only embrace Web services-based interoperability technologies, they are developing their own additional specifications to make interoperability extend into the reliable transactions domain. It also appears likely that these vendors will use Web services specifications and SOAs to integrate their own products, the server components within their data-center stacks. This means Web services could become a transport mechanism, or bus—much like Microsoft's Indigo initiative—to integrate disparate infrastructure components (a heterogeneous mix of Linux, Windows, and Unix-based servers, for example) in addition to application-level interoperability. The SOA extends throughout the IT system ecology, which portends even more ease moving to grid computing, compositing applications, and a flexible IT response to more business needs.

The inculcation of Web services transports and open interfaces into more IT functions, vertically and horizontally, will use interoperability technologies and standards as the glue for a matrix of systems interactions and accessibility. This is the concept behind a Web services information bus that could extend into platform interactions as well as cross-platform application activities. Applications, platforms and data-center components could be decomposed and reassembled in new ways, often using the ubiquitous Internet underpinnings of HTTP and SMTP.

This prospect augments the current thinking about grid computing and utility-like IT services, and breaks down traditional boundaries between architectures, such as servers, clients, applications, networks, and hosts. It's also why Web services are often described as disruptive. Microsoft's proclivity for Windows homogeneity may support Web services on the application level, but it may resist its use for infrastructure-level heterogeneity. It will be interesting to see how interoperable Microsoft's infrastructure components become.

Interoperability prospects on the infrastructure level are several years away for most users, but enterprises must recognize a high degree of interoperability expertise will soon be required. Interoperability technology will expand its scope, via fast-evolving Web services specifications and standards. Standards will soon embrace transactions, and extend deep into enterprise platform definition. Enterprises must master interoperability techniques, and soon.

Just as Web services made PeopleSoft's decision to buy J.D. Edwards easier, an enterprise can exploit Web services for its processes by cobbling together application services from any number of sources. Making Web services technologies a core competency is a clear and lasting competitive advantage.

Trends and Trend Analysis

Investment in interoperability and integration technologies, either through infrastructure investment or in an ad hoc fashion for application-to-application interactions, has three basic value propositions for enterprises: creating a whole greater than the sum of its parts, the ability to do more with less, and achieving new levels of productivity.

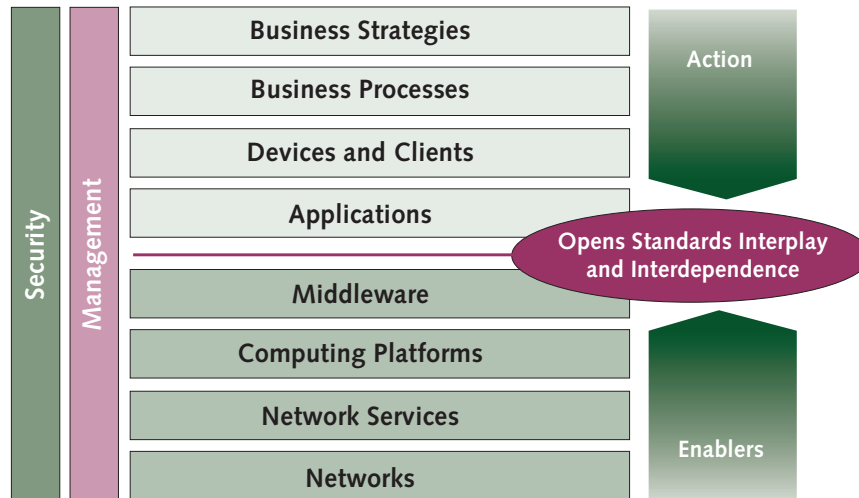
To derive a whole greater than the sum of its parts, enterprises and hosting organizations can combine and extend many applications to gather greater value. The goal is to leverage and exploit past investments in applications, regardless of their underpinnings, to enable business process-level integration.

Enterprises can accomplish more business value with less technology investment, disruption, and complexity with integration technologies. This allows greater use the application, its logic and components, and can also modernize the application infrastructure without tossing out the applications. Adding an interoperability interface layer to applications decouples applications from previous integration limits, as well as their platform (see Exhibit 2).

Exhibit 2

Web Services Interoperability Layer

Source: *The Yankee Group, 2003*



Enterprises can also do more with less using interoperable applications and services built on a grid-computing platform. Interoperability via standards-based Web services allows applications to be migrated to infrastructure and architectures that better exploit low-cost hardware, storage, and Linux. Applications and data can be defined as standardized services and more easily ported across more efficient deployment environments. Interoperability extends application life and value, and is a roadmap to lower-cost infrastructure via fewer platform instances and more resource virtualization via grid computing.

Interoperability also means new levels of productivity. Web services, standards, and skills in interoperability advance the benefits of unified data and the ability to bring more types of content into use. Cape Clear Software Inc., of Waltham, Mass., is releasing a technology package that hastens and simplifies inclusion of many types of content, data, and workflow inputs into a schema-based and metatagged format, digestible by Web services and a SOA.

This yet-to-be branded “tag-olator” capability brings a new level of productivity to many workflow processes, and allows broader exploitation of Web services and interoperability technologies. For example, the outputs of large production equipment on a factory floor, which in the past could not easily be fed to monitoring or management applications, can be processed using Cape Clear’s technology and standardized into Web services interfaces for swift use with existing factory automation suites and applications. The data can also be used with back-office applications to better predict daily, weekly, and quarterly financial results based on real-time production data from the actual machinery.

This interoperability-induced productivity advance allows greater visibility into business operations, and therefore opens the door for more agile reactions to process optimization. Productivity benefits emerge from a new ability to monitor and optimize application and workflow performance to further automate processes, extract business intelligence (BI) benefits, and invoke feedback loops in near real time across more operational levels. In a sense, wider interoperability via standards-based Web services interfaces allows for BI across extra-application behavior and business processes—monitoring and extracting trends from the integration activity itself—to define and exploit relationships across an the supply-chain or sell-chain business ecology.

Vendor Trends in Interoperability

As an object database and application development vendor, InterSystems Corp., of Cambridge, Mass., has strong adherents to its rapid development and Caché database capabilities, especially in the healthcare and financial services sectors. In November 2003, it debuted Ensemble, an interoperability platform that joins an integration server, application server, and object database with a unified development and management environment.

Ensemble is designed to enable fast integration and eliminate complexity and professional services costs typical of integration projects. By enabling rapid creation of composite applications—new strategic business solutions that integrate the functionality of existing applications, new business process logic, and data from across the enterprise—Ensemble cuts the time to value for interoperability, say early adopters.

“The work we have to do is going to require more data manipulation than the store-and-forward interfaces we have done so far,” said an architect at Partners HealthCare Systems, Inc., a large healthcare delivery network based in Boston. “Ensemble may be next evolution of the value-added network. It’s an environment that performs communication functions, treats messages as objects, and allows for a more abstracted environment. It is very appealing.”

Ensemble’s platform approach to integration is not necessarily germane to the Web services approach, but demonstrates the demand for interoperability ease and shows why interoperability skills and competencies are essential for enterprises to master.

Forecast

Financial incentives and the associated cost-benefit analysis of investing in interoperability and integration is so compelling that Yankee Group forecasts a significant increase in spending on interoperability and integration products, services, and personnel during the next five years. Interoperability as a category is broad and inclusive, and will include more types of products and environments, such as InterSystems Ensemble. Current global spending ranges from \$2.2 billion (tightly defined) to \$3.8 billion, according to Yankee analysis.

While the integration market, as a subset of the broad interoperability category, contracted during 2002, a compounded annual growth rate (CAGR) of 9 percent through 2007 will create a \$5.9 billion market for interoperability products. Yankee Group expects, however, that spending will be more than double when total spending for interoperability skills, personnel and ancillary services are taken into account.

Because Web services provide an interface layer and information bus, the ability to create application services as interoperable business processes without knowing specific application programming interfaces for each underlying application is easier. Building and deploying a Web services-oriented architecture is simpler than previous development and integration endeavors. The pool of talent from which to draw staff to implement a Web services-based interoperability, therefore, is much greater than the available talent pool of those who can program to DCOM, CORBA, or J2EE.

The Yankee Group expects quantitative a shift in interoperability and integration spending from primarily third-party integration products to platform and tools-based products, and the human capital to exploit them in in-house development departments. As grid computing, SOAs, and use of Microsoft .NET and Indigo technologies increase, the role of interoperability as a core enterprise function will increase. Leading verticals for the increase in interoperability spending will be financial services, manufacturing, telecommunications, and healthcare.

III. Conclusions

One of the greatest challenges for IT decision-makers has been determining what new technologies to embrace, and when. Enterprises are faced with a series of important decisions on factors such as frameworks-oriented data-center stacks, development and management tools, use of Linux and open-source server components, and the benefits of grid computing and networked storage. As they grapple with these decisions, an embrace of interoperability technologies and expertise will benefit them in the short, medium and long terms, and will make the migration from current systems to advanced architectures swifter and easier.

Many enterprise technology leaders have found Web services standards and specifications—and their role as a catalyst to SOAs—make a radical improvement in how they can provide business solutions within their budgets. Moreover, the benefits of investing in platform and enterprise stack consolidation are highly complementary with moves to Web services and standards-based interoperability.

A move to service-oriented architectures has two compelling business effects. First, it has a dramatic impact on the economics of integration. An integration project that took several years and costs tens of millions of dollars (and with a 50 percent probability of success) can now be accomplished in months with Web services-based interoperability, at less than one-third of the cost. Web services deployments have demonstrated payback at companies such as Schwab, Sky Broadcasting, AT&T, British Telecom, JP Morgan and Deutsche Telekom.

By leveraging the work done so far in XML, the Internet, Web services, and general document interoperability, SOAs allow business needs—not technology barriers—to direct spending and productivity efforts. Traditional integration solutions have not accomplished their goals, other than to prove that more systemic and standards-based approaches are needed. The essential ingredient of this transition will be to gain a mastery of interoperability technologies, standards, and techniques and apply them to the end-user organization's vertical industry and specific business goals.

Recommendations

- **Examine the competency mix for application development and deployment.** Extend the competency quickly to include a broad mastery of interoperability. The moves of the past few years toward enterprise portals highlight the need to consolidate and coordinate content, data, and application presentation methods. The payback from portal consolidation is significant, and has set the stage for better strategic decisions on grid infrastructure and cost-saving platform decisions. The same will be true for the embrace of standardized interoperability capabilities.
- **Convert business endpoint values into Web services-digestible formats.** Line-of-business managers should be encouraged to define all the data and information points that impact business processes. Teams of qualified workers who can convert those bits of information, be they trade orders for a bank or factory floor measurements, into Web services-digestible forms. Teams would include competencies for metadata functions, schema development, semantics translation, and the ability to automate conversion of new types of unstructured data into Web services formats.
- **Extend Web services.** Enterprise architects should insist that new purchases embrace and extend standardized Web services capabilities and paradigms. Vendors should use interoperability to regain lost trust in their overall worth and value of their solutions.

IV. Further Reading

Yankee Group Telecom Software Strategies Report

Web Services and OSS Create a Competitive Advantage, August 2003

Yankee Group Application Infrastructure & Software Platforms Report

Web Services Platforms Offer Carriers Application Agility at Lower Total Cost,
September 2003

Yankee Group Telecom Software Strategies Report

Service Management: Driving Business Value Through Service-Level Visibility, August
2003

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