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WHITE PAPER

InterSystems Ensemble: Integration for Today's Rapidly Changing Enterprise

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IDC OPINION

A key challenge confronting enterprises today is the costly and wasteful complexity crisis that arises from the chaotic assortment of information technology (IT) applications and databases that drive the business. Integrating their operations and data is key to relieving this crisis, enabling greater efficiency and flexibility in the business.

Technology that eases and speeds the integration process is imperative in today's volatile business environment, especially one that unifies heterogeneous systems around common information and process elements. One cannot address integration solely with workflow, nor with only data mapping and transformation. Thus a solution that works within a framework for developing composite applications and processes that can be used to address the individualized needs of an enterprise is the ideal mix. Because it is inevitable that business requirements and systems will change, laying a foundation that is flexible and open to work with industry-accepted standards is critical.

Sharing a common metadata and object model that is captured from and utilized for integration and process flows is a very effective way to unify the environment and reduce redundancies for efficiency and optimization. InterSystems Ensemble blends together these elements with a service-based architecture, leveraging a vehicle for storing and managing messages, which InterSystems calls its persistent object engine, a unified development environment, and a customizable management and monitoring system. Clients interviewed indicate that this unique combination provides them with a powerful software platform that eases rapid integration and development, while its underlying infrastructure offers high performance.

IN THIS WHITE PAPER

This paper examines issues that enterprises are facing as they pursue integration initiatives, and it looks at varied technologies that need to coalesce to solve these concerns. The InterSystems Ensemble approach to addressing composite application development and integration is then discussed and highlighted through customer case studies.

InterSystems provided references to contact in preparation for this white paper; however, IDC independently interviewed these representatives without InterSystems' involvement or prior approval of questions or subject matter to be discussed. IDC bases much of the descriptions, opinions, and conclusions regarding Ensemble on these findings as well as other customer experiences of which IDC is independently aware.

THE CHALLENGES OF INTEGRATION

Integration — IT departments have been at it for years, so why is it so elusive? Well, unlike most projects that have a finite business problem to solve, integration is a moving target. Most organizations to date have tackled integration activities as part of each new development project, calling in just the information and processes required at that time. A few have attempted the big-bang approach to connect as much information as is feasible together all at once with brute force. But with the first method in particular, the result is a patchwork of software that is both fragile and expensive to maintain. And with both methods, especially the latter, the task is never complete; it becomes a perpetual resource drain to keep up with a changing systems environment.

Most organizations believe the primary impetus for integration is to be able to adapt to changing business requirements. Thus we've matured from the concept of integration as pulling in information to map from one location to another to the concept of addressing processes and change via integrated systems. This requires an organization to think of its integration solution as a flexible entity and preferably not so tightly coupled to discrete applications.

Silos of applications and systems result in a tremendous amount of transactional messages and data. This information, although highly disconnected and processed on a point-to-point basis, needs to be combined and shared as well as interfaced with human activities. Business dynamics are demanding that this take place as close to real time as possible because timely awareness and response to pertinent events have become ever so critical.

Some of the hurdles that organizations currently face as they struggle with integration include:

- Interdependencies and exposure to failover within a distributed environment
- Management and monitoring across separate physical environments
- Exception handling and adjusting workflows in a timely manner across environments
- Interchanging graphical modeling and code base development paradigms cleanly
- Developing custom adapters that can be reused versus intensive one-to-one mapping
- Handling backward compatibility, versioning, and application upgrades

Until now, options to address integration have been costly, especially with respect to resources and time, often requiring specialized expertise and knowledge about the proprietary integration technology. A large percentage of these efforts involve the development of customized interfaces to legacy and industry-specific systems.

Some workflow tools to address business processes and associated connections for more simplistic integration tasks often can make manual tasks and coding much easier but tend to not address significant scaled-up environments with respect to performance and transactional data requirements for state management and persistence.

TECHNOLOGIES FOR INTEGRATION

Over the past few decades, organizations have accumulated multiple generations of technology including monolithic, 2-tier, and then 3-tier client/server architectures. Now the industry is embarking on a newly reformed version of service-oriented architecture, promoting layers of abstraction for the user interface, the data, the process workflow, and the business logic.

Recent innovations introduced into this market have centered around standards in the form of Web services to address interoperability, security, and messaging. At the same time, momentum is building regarding the creation of common business process standards. There is also increasing convergence of development, integration, and business monitoring and intelligence technologies, with software vendor consolidation influencing some of these dynamics. The services-oriented architecture approach of reuse is fueling heavy interest and buildup in specialized composite application process and development environments.

An arsenal of technologies exists today, and each technology addresses specific requirements within the integration continuum. Most enterprises find it necessary to employ a combination of these solutions to satisfactorily achieve a reasonable state of systems interoperability. Key products in the holistic software market for integration include:

- Message-oriented, access, and transactional middleware
- Integration server software
- Application server deployment platforms
- Information portals
- Technology and application adapters
- Workflow, modeling, and coding tools
- Business process automation software
- Business monitoring and intelligence software
- Data integration and optimization technology

There are few products in existence today that have been built from the ground up to natively interoperate and leverage a common foundation. Many vendors are in the process of cobbling together a stack of discrete, proprietary technologies to address a uniform framework but not necessarily on the same foundational and metadata elements. And most IT enterprises are attempting to put together this stack for themselves, running across significant hurdles and costs in doing integration between the products. This assembly approach surfaces issues in custom manipulation to handle embedded and OEMed technology and integrate across varied storage and management requirements.

Enterprises today are under extreme pressure to apply and optimize information technology targeted at solving very specific, increasingly complex, and volatile business needs. Many organizations are undergoing comprehensive reviews of their critical business processes, systems architectures, and core infrastructure technologies in order to establish a technological foundation for adaptability. A highly modular and centrally managed approach to systems design and development is being targeted as a preferred goal. Mounting support for interoperability standards across the IT industry, currently in the form of Web services, is contributing dramatically to enabling this vision.

While there are undoubted technology advantages in using Web services for exposing and extending legacy applications in new ways, a more significant benefit is achieved when services are configured into logical activities aligned directly with business functions. Such services may be "orchestrated" into many different configurations supporting multiple business processes. Many refer to these solutions of combined services as "composite applications." These solutions may, for example, address sophisticated order processes, intra-enterprise supply-chain automation, regulatory compliance, and many advanced cross-silo operational systems. As a composite application is designed to live and breathe with the day-to-day interworkings of the business, an environment focused on building, deploying, and managing composite applications should ideally be able to address the configuration and change management of all these facets efficiently and cost effectively.

The primary benefits facilitated by unified services-oriented architecture for developing and integrating composite applications include but are not limited to:

- Increased leveragability
- Resource efficiencies
- Consistency for quality, measurement, and governance
- Obtaining a common view of the business and its customers, products, and activities
- Effectively monitoring processes to continuously improve the business

INTERSYSTEMS ENSEMBLE

InterSystems, with more than 25 years in the high-performance and post-relational database environment, is a firm with a wealth of experience. And in today's environment, remaining a profitable and viable business is a strong consideration in many organizations' decisions regarding what and whom to select for the mid- to long-term perspective. The company estimates that there are more than 4 million concurrent users of InterSystems' technology.

InterSystems capitalizes on existing core capabilities for what it calls its "persistent object engine" as a foundation for its Ensemble platform. On top of this foundation is a full set of new technology designed to provide flexible interaction with existing applications and databases, object-based messaging, metadata governing relationships among the elements to be integrated, and a toolset to develop those rules.

InterSystems differentiates its composite application and integration platform, Ensemble, by positioning it to address some very critical development and integration goals:

- Facilitating the rapid development and deployment of connections and value-added transformation and process code
- Handling integration performance and scalability required to address enterprise demands in a distributed, services-based, and compliant environment
- Building and utilizing a robust, reusable object-based message warehouse and shared metadata repository
- Providing an integration and development environment with a common user interface

Key elements of Ensemble include:

- **Universal service architecture.** With its adapter framework of more than 200 prebuilt adapters, the underlying service platform not only facilitates connections but introspects diverse back-end application data and databases and abstracts them into Ensemble's metadata repository, creating one consistent object model and set of classes. This architecture is optimized for high performance and scalability. The unified set of components can subsequently assume varied forms, such as relational tables, stored procedures, Web services, or multiple native object formats, allowing diverse skill sets and methodologies to coexist (InterSystems refers to this capability as "projection").
- **Persistent object and message engine.** This is a virtual machine, object store, shared data repository, transformation engine, and repository with cross-application indexing, SQL and object access supporting content, and rules-based and publish/subscribe routing. This allows for native persistence and warehousing for all messages and metadata, and it also supplies built-in data management and federated database support for unique requirements of interapplication processing and business activity monitoring.

- **Unified development environment.** This is for creating and extending data transformation and graphical business process modeling. Ensemble provides XML- and BPEL-based representation linked to a code base for document, graphical, and code-based development work. Ensemble Studio Extensions include wizards for creating custom adapters, messages, business services, operations, processes, and data transformation.

- **Customizable management systems.** Built-in customizable management and monitoring capabilities are linked with the development environment and the shared metadata repository for business activity monitoring and business intelligence support. Ensemble also can also interoperate with third-party enterprise systems management software. It provides a portal-based, centralized configuration, business process, and messaging management facility, with a message browser, BPM viewing facility, event management and alerting, and Visual Trace — an end-to-end cross-application message tracer.

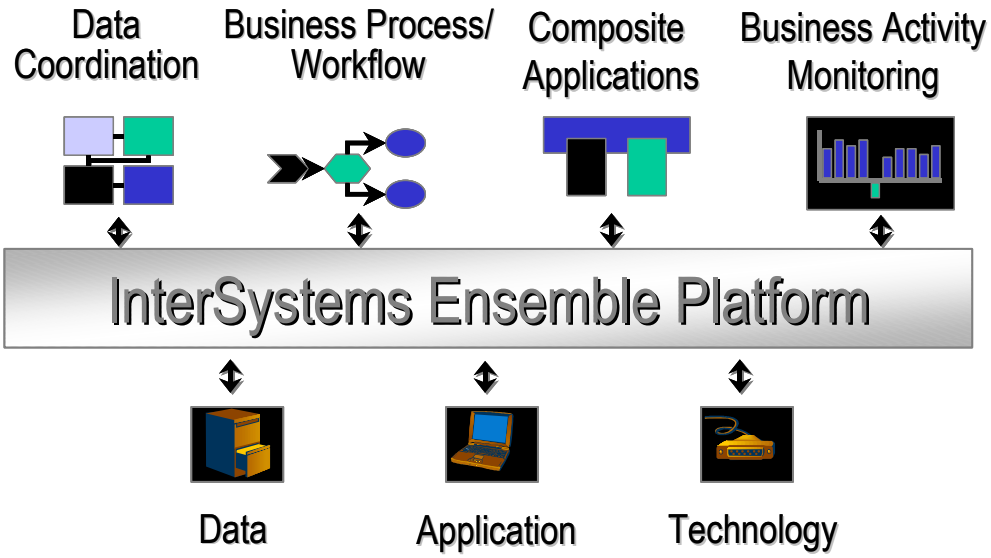
What Ensemble brings to the marketplace is a fusion of an application, integration, and data server in one virtual system. It offers an integrated development environment and a toolkit, allowing developers to easily create dynamic server pages that can be ported into their own choice portal environment. One of the key issues plaguing the adoption of BPM technology is the top-down and bottom-up approach to building process workflow. Some developers may opt for graphical connotations that generate code, while many still prefer to work at the code level. Ensemble supports both these paradigms (see Figure 1).

Ensemble offers a consistent architecture across a queuing and message broker and a data transformation engine. Having committed industry standards and technology support for common external messaging engines such as MQ and JMS, the product can be used in conjunction with other hubs used in the enterprise. For flexibility to address heterogeneous environments, this solution interoperates with Java and .NET, and it supports orchestration and Web services protocols and standards, including XML, WSDL, SOAP, UDDI, and BPEL4WS. Additionally, other common industry standards Ensemble supports include J2EE, JDBC, ODBC, and COM.

As for industry-specific formats, InterSystems currently supports the likes of HL7 for healthcare; FIXX and SWIFT for the financial sector; and RosettaNET for EDI, manufacturing, and other industries via its adapter technology. The company plans to evolve support for industry-specific features as they emerge in the market and as warranted for its client base. Key markets that InterSystems sees Ensemble ideally addressing include but are not limited to healthcare, government, and financial services. These sectors often contain large, heterogeneous legacy environments as well as newer application platforms and technologies, and they often require support for high-volume transactional data integration. The company is also working on supporting WS-Security, and it anticipates releasing this in the near future and as the Web services standards development work reconciles.

FIGURE 1

InterSystems Ensemble



Source: InterSystems, 2003

CHALLENGES AND OPPORTUNITIES

Integration and composite application frameworks will evolve over the course of time and be adopted in varied stages and intensities. Therefore, a few additional considerations need to be addressed:

- **Coexistence with preexisting computing environments and software investments.** Many organizations are looking to simplify or eventually consolidate and standardize on a common platform, but budgetary, business cycle, or technology dependencies and constraints often prevent immediate or total deployment of a single framework. Therefore, companies must consider the existing IT portfolio when they evaluate any new technology. The ability for a unified composite application platform to interoperate with and enhance a foundational technology, such as an application server or integration bus, is essential in today's heterogeneous environments. InterSystems has designed Ensemble to be able to integrate with existing messaging technologies, such as TIBCO's Rendezvous, IBM's WebSphere, JMS, and Web services, as well as to equally support J2EE and .NET.

- **Specific functionality.** Many enterprises believe their unique set of requirements for their given industry is the next major challenge and opportunity for integration-oriented technology providers to address. As a result, vendors such as InterSystems do include specialized adapters in their offerings to handle such regulatory requirements as HIPAA for healthcare, insurance, and government. Few are offering specific process solutions, opting to partner with service providers and specialized ISVs to address detailed needs.

  On a separate note, integration vendors need to step up to the plate and help organizations master the migration from 16- to 32- to 64-bit technologies and the intersection of interoperating between these technologies as they incrementally evolve.

- **Vendor viability and customer service.** IT organizations are looking long and hard at introducing a longer-term architecture. They need the security of selecting a technology and preferably a software provider that will support them over time. Each entity moves at its own unique pace, thus maintaining support in versioning, and backward compatibility can be crucial. Many companies use a variety of metrics to assess vendors, including profitability, customer reference sites, and long-term vision.

  InterSystems' consistent profitability and year-on-year growth along with its history of customer satisfaction make it a viable option, especially for those looking for special performance considerations. However, IDC believes one of InterSystems' specific challenges will be to quickly build market awareness beyond that of being a high-performance, post-relational database vendor to also being a comprehensive integration solution provider. This is especially critical in light of the significant field of existing integration and business process software providers and an influx of newer Web services technology participants.

- **Organizational behavior.** Each entity will have different experiences and behavior modes with respect to IT development paradigms and addressing change. For example, a government locale may experience a change in direction every four years as a new regime steps in, while a large insurance institution may need to address a decades-long mindset in a legacy development paradigm. Selecting an integration methodology and toolset that can be incrementally used and easily learned is an ideal solution. Most IT organizations today are targeting new integration and Web services technologies to address discrete business needs that can act as scenarios and expose concrete benefits. Business champions, as well as IT champions, gain experience and knowledge about how to best apply the technology, then evangelize the message across the enterprise. In this fashion, often grassroots efforts can turn into momentous shifts.

- **The risk-benefit ratio of utilizing a single platform.** Organizations vary as to combining best-of-breed point solutions versus proprietary, fully integrated packages. While the former can present tremendous complexity and interoperability challenges, the latter may pose its own set of unique issues, such as supporting a concentrated specialty skill set, possible compromises on specific features and functionality available, and potential economic and performance constraints of vendor and platform lock-in. However, current dynamics have changed somewhat as Web services standards are almost universally being adopted by the IT vendor community, especially those in the integration and business process frontier. Fundamentally, adherence to standards should more readily enable interoperability across multiple products. In this way, existing skills and information stores in relevant technologies may continue to be exploited, and concerns over committing to a specific vendor's product are greatly mitigated. IDC believes that conformance to industry standards within a unified platform should be an important consideration in product selection. Ensemble is currently designed to support J2EE, .NET, Web services, and BPEL, among other standards, and the impetus placed on InterSystems, along with all other software providers, will be continued advancement on these critical standards and interoperability planes.

CASE STUDIES

Florida Department of Children and Families

The Environment

Florida Department of Children and Families (DCF), with more than 23,000 in staff, is the state's largest agency and serves a statewide population of millions with a wide range of programs, including mental health coverage, substance abuse, refugee assistance, family safety, and more. It also supports hundreds of clinics and crisis units in multiple districts across the state. DCF will also undergo a major transformation over the next few years as it moves from provisioning services to managing a network of external service providers. This requires a high degree of information sharing and processing, and its goal is to become fully community based by mid-2005.

DCF is fairly mixed in its use of development languages and related skill sets, such as Visual Basic, C++, Basic, Cobol, and Java to name a few. With 59 databases across all imaginable operating systems, DCF's systems environment is highly heterogeneous.

The Challenge

Over the years, agency programs were implemented on hardware platforms that ranged from IBM mainframes to PCs and data repositories that included Microsoft SQL, Oracle, IMS, DB2, Access, and Visual FoxPro as well as Caché. Service providers were working with a series of disparate applications, with no common interface, and with no means of easily tying together all of the information that might be relevant for each individual. In some instances, the result could be unnecessary

duplication of overlapping services. In other cases, an individual might not receive all of the appropriate services because care providers are unaware of all of that individual's circumstances.

Glenn Palmiere, director of Information Technology at DCF, examined multiple integration technology solutions and elected to become an early adopter of the Ensemble integration platform. He regarded Ensemble's high-performance persistent object engine, RAD environment, and support for sophisticated reporting in real-time mode as key factors in the decision to use this product for enterprise integration.

The Solution

With its "OneFamily" application series, DCF's goal is to integrate the information from multiple disparate systems in a composite portal application that provides a single view of all relevant data about an individual. This facilitates an increased level of service from and to community-based providers and in turn to the ultimate client. Having this consistent view based on connections formed around a unique ID with a significantly higher level of confidence converts, in business terms, to lives saved.

DCF now sees what began as an integration project blossoming into a full-blown architecture strategy. The agency is building up a Web services data exchange for both public and private information, abstracting information and exposing only relevant data for human interface and consumption.

As new applications are added to the Ensemble-based integration architecture, others are being rolled out statewide. For example, a module that manages services provision for clients in mental health and substance abuse programs will be rolled out to 422 community care providers by mid-2004. Another project scheduled for completion this year is the implementation of a single consumer wait list interface across 10 program areas, involving the development of a unique identifier that will be common for all 59 systems and a unified registration process for all clients. This project will also target real-time connectivity to the Florida database — the largest IMS database in the world.

The agency is currently involved in training and rolling out Ensemble to distributed teams of developers, moving beyond just a central core group and involving some remote locations. With this effort, DCF anticipates that of its approximately 150 major applications, 20 will be functional using Ensemble connectivity by mid-2004.

Key Benefits

- **Rapidly performing integration tasks for existing and new development.** DCF developers created a test bed integrating information from five systems. The composite application was rapidly prototyped and, after a series of reviews, went live just 90 days after project initiation. Building on the success of the initial project, the organization is mounting an aggressive development and deployment schedule that calls for integrating information from at least five additional systems every 90 days.

- **Utilizing a comprehensive, unified toolset for development, integration, and reporting.** DCF sees Ensemble offering it a unique and comprehensive solution for integrating information and applications, creating reports, and combining legacy information into new screens. After examining many other integration products, Palmiere did not find any other solution that offered the range of functionality that suited the organization in a single user interface.

- **Leveraging and building a services-based architecture.** DCF is building a Web services–based data exchange and plans on using Ensemble to optimize its capability to integrate across data, application, and Web services layers. It has found that the product eases its process of developing and changing interfaces, thus promoting greater connectivity across the agency's districts and providers.

- **Optimizing with rapid data retrieval and adapters.** A critical component to DCF's OneFamily solution is connecting to DB2, Oracle, IMS, and SQL, among other sources, via utilizing Ensemble's adapter and centralized messaging technology. In a somewhat different context, DCF is utilizing Ensemble in conjunction with specific look-up routines run against an external data source. By utilizing the data retrieval process provided by Ensemble, DCF can eliminate the need for third-party retrieval processes and avoid substantial costs.

- **Saving on development and support costs.** DCF expects to achieve significant savings from using the Ensemble-based integration architecture by cutting support requirements typically required by legacy relational technology and improving services delivery. With nearly 80% of needed information already existing in its legacy systems, the cost to rewrite all the applications would be millions of dollars. By building composite applications, DCF expects to save over 90% of that effort.

Partners HealthCare Systems

The Environment

Founded in 1994, Partners HealthCare is a Boston-based healthcare delivery system that offers patients a continuum of coordinated high-quality care. It comprises Massachusetts General Hospital, Brigham and Women's Hospital, Faulkner Hospital, McLean Hospital, Newton-Wellesley Hospital, Spaulding Rehabilitation Hospital, and North Shore Medical Center as well as other major institutions. Partners is recognized nationwide as a leader in leveraging information technology to support ongoing innovation and improvement in healthcare delivery.

Partners is currently a large Microsoft shop combined with an extensive legacy systems environment. Moving forward, the IS organization plans to fully adopt object technologies and a services-oriented architecture.

The Challenge

One of the primary business challenges facing Partners today is in creating a single view of the patient that interfaces with a variety of services across Partners' network over the course of time. The corporation and network continue to grow; thus Partners needs to assimilate diverse systems into the fold. There is in particular a strong initiative to increase the utilization of clinical systems by existing care providers that do not now use them. This will increase IT resource utilization dramatically. With a goal to increase interoperability among this tremendous volume of providers and partners, Partners is looking for a strong data and process foundation.

Although the company already has a traditional integration broker in place (running over 130 interfaces), it has had to hand-code a significant amount of middleware and point-to-point client-to-application connections. This has been in part due to the large diversity of systems and specialized requirements in the healthcare environment. It has also been exacerbated by the industry's orientation toward custom-built solutions and hanging onto legacy systems for long periods of time.

Developing and maintaining custom interfaces, along with managing and monitoring these interfaces, are tedious albeit very important parts of the equation for this or any organization. What Partners envisions is an environment in which developers who create business logic are armed with the software to perform these critical endeavors themselves versus perpetually bringing in, and paying for, specialized service providers.

The Solution

Partners is gearing up to create much more fluid systems between itself and its partners and other external entities. The ability to take in a message and abstract it into a data object lays the foundation to then generate custom code to manipulate and process that information further. The integration environment turns into a development environment —thus providing a manner to add business process value. For example, as part of its Enterprise Master Patient Initiative project, Partners looks to utilize Ensemble by creating a front end to handle input data received from member institutions and subsequently augment this information with enhanced processing and transformation logic to create uniformity. One large hospital in its network is currently undergoing a massive software porting exercise and expects to gain tremendous efficiencies in using Ensemble to facilitate the conversion.

Ethan Fener, associate director of Application Development for Partners HealthCare, estimates an average of 1 million transactions currently cycle through Partners' existing integration hub per day. Partners has performed proof-of-concept testing simulating real-world workloads and expects the Ensemble engine will be able to meet its future high-volume throughput performance requirements.

One industry-specific protocol that InterSystems has already addressed for Partners HealthCare is to support HL7. With an evolving regulatory-intensive environment, the network will most likely need to incorporate even more healthcare-specific standards into the systems that Ensemble will touch.

Key Benefits

- **Blending the development and communications environment into one uniform framework.** One of the key elements of the Ensemble solution that Partners anticipates leveraging highly is the product's rich development environment. IT plans on utilizing its own staff with this toolset and capitalizing on their business domain expertise with the knowledge to better address Partners' unique corporate requirements. This technology will allow the conversion of an incoming message to an object that can be manipulated with value-added logic.

- **Capitalizing on a facility that manages messages as persistent object assets.** Seeing that all transactions can be kept and managed via Ensemble's persistent object engine, Partners will be able to store critical audit trails for reporting and recreation of messages. The incumbent integration technology emphasizes what Fener describes as "store and forward messaging" only. The data abstraction capabilities in Ensemble, however, will allow for the parsing of messages in queue, teasing apart the necessary information to then discretely route and handle each as warranted in a development and integration environment.

- **Augmenting versus replacing existing technology.** With the product's open, standards-based design, Partners sees Ensemble coexisting with the integration technology already in existence, thus not requiring an expensive rip-and-replace scenario. The enterprise can thus build up the use of Ensemble in increments as it takes on new projects and reworks existing systems to meet business requirements.

- **Handling high-performance workloads.** Partners specifically looks to utilize Ensemble's object-oriented technology for integration and message handling in conjunction with demands for message persistence, a scalable architecture, and support of high-performance informational requirements.

CONCLUSION

The key to dealing with integration is to architect one's systems in a forward-looking fashion. The short-term and reactionary point-to-point methodology has built up amazing complexity that is difficult and expensive to maintain, allowing for limited flexibility and building upon what already exists. To get out from the massive amount of tedious work and move to place skilled resources in the thick of new business innovation, an open, standards-based environment is key. A more rational approach is one built on a strong data and process foundation, although flexible to incrementally evolve with one's needs.

The InterSystems Ensemble product presents a unique mixture of technology not commonly found in today's integration software that unifies the data, process, and application-centric integration worlds, differentiating especially with its optimized object model. It is here that vast gains are anticipated by customers. And with a successful heritage tackling performance and object orientation, the company is one of the first to address such issues that will inevitably surface in the highly modular and distributed world of services-based computing. Both organizations we interviewed

have had tremendously positive experiences working with InterSystems technology — for performance, scalability, and responsiveness as an IT partner.

According to these and many organizations, the role of the developer is very critical even as their enterprises tackle more business-specific process automation and optimization. By leveraging a shared metadata repository, message warehouse, and integration processing layer combined in one software environment with a composite application development toolset, these case study interviewees are planning on greater efficiencies allowing the "develop to integrate" paradigm to take hold. And Ensemble, in particular, appears to have unique benefits in environments in which data management demands are highly critical to the business.