



# The Critical Need for Connected Healthcare: Meeting Today's Integration Challenge

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## WHITE PAPER

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## EXECUTIVE SUMMARY

Today's changing healthcare IT (HIT) environments have resulted in a greater demand for data and process integration. Traditional connectivity between internal systems provided by early generation "interface engines" has evolved to include external data sources that encompass XML and other Web-based messaging standards. This has led to the introduction of a new generation of products, aptly named "integration platforms," to meet these evolving requirements.

Today, many hospitals that have legacy integration products in place are seeking to replace their aging "interface engines" with less expensive, more robust "integration platforms" to meet these new requirements and improve the productivity of their integration efforts. Many smaller hospitals, as well as other healthcare-related organizations, such as commercial laboratories and public health agencies, are now entering the market for the first time. Given the demand from each of these groups of buyers, Health Industry Insights believes that the data integration segment of the HIT market will see significant and sustained growth over the next several years.

This Health Industry Insights white paper presents the findings and analysis of in-depth interviews conducted with senior IT executives and system architects at four hospitals acknowledged to be industry leaders in their use of HIT. The four institutions are Cedars-Sinai Health System, Los Angeles, California; Metropolitan Health Corporation, Grand Rapids, Michigan; Partners HealthCare, Boston, Massachusetts; and the University of Maryland Medical System, Baltimore, Maryland.

The purpose of this research was to highlight the critical system and data integration challenges faced by these provider organizations, the criteria for their selection of an integration platform, and the benefits they have realized from its implementation.

Key findings include the following:

- Interface volumes are increasing significantly—especially to connect external stakeholders such as community-based physician practices.
- Aging legacy interface engines cannot keep pace with this growing demand and the complexity of heterogeneous IT environments created through mergers and acquisitions.
- A connected healthcare environment enables access to health information across the continuum of care. Improved access to health information by clinicians reduces the provision of redundant or inappropriate care, improves patient care and safety, and reduces the cost of care.
- Rapid development environments, ease of use, product reliability, and vendor stability were key attributes for evaluating new interface platform options.
- The integration platform selected by the four industry leaders interviewed was InterSystems Ensemble<sup>®</sup>.

## SITUATION OVERVIEW

In hospitals, physician practices, and other healthcare provider organizations, IT usage has historically lagged that of other U.S. industries. But this is changing due to several factors: pressure from consumers, health plans and the government; increasingly stringent compliance and regulatory reporting requirements; and a growing recognition by the industry that IT is a critical component of strategies to improve care quality and patient safety. All of these factors have combined to accelerate the adoption of IT, particularly in support of clinical processes and workflows.

In recent years, the focus of this increased IT investment has shifted from financial and administrative applications to the clinical information systems that are the essential foundation of an electronic health record (EHR). Building an EHR typically involves the need to aggregate data from multiple, specialized applications. Typically, multiple vendors supply these applications, and as the number of applications and the diversity of data increase, the effective integration of that data becomes crucial to the success of these clinical information system deployment initiatives.

Furthermore, large provider organizations are seeking to integrate data sources across their health systems by creating longitudinal care records often referred to as clinical data repositories (CDRs). The goals of this integration are twofold: (1) to create electronic health records (EHRs) that make individual patient clinical data accessible to

caregivers across the continuum of care and (2) to provide an aggregated, rich source of population data to support operational and clinical research.

Additionally, the "virtual" enterprise is fast becoming the norm in the healthcare provider market, as the demand for digital data exchange increases due to mergers, acquisitions, affiliations, and connectivity to external organizations. The latter include owned and affiliated hospitals, home care programs, subacute care facilities, commercial laboratories, physician practices, health plans and health information exchanges (HIEs), as well as government and other regulatory agencies. In turn, these entities are also accelerating their own use of IT, placing further integration demands on their trading partners, principally hospitals and physician groups.

Even hospitals that have had data integration products in place for many years are reviewing their current technology platforms with an eye toward these changing requirements. Hospital IT staffs are seeking a new generation of tools to facilitate this growing demand in the most productive, least invasive manner possible, while ensuring high standards of security, availability, and compliance with their internal technical standards. They are also looking to reduce the development time and technical complexities traditionally associated with interface development and maintenance.

## RESEARCH FINDINGS

Common themes that emerged during the interview process are discussed in this section.

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### Challenges

The executives shared many of the same critical IT and business challenges that led them to seek a new integration platform solution:

- IT platforms were heterogeneous due in part to growth, primarily through mergers and acquisitions, as well as best-in-breed strategies.
- A recognition that IT is a strategic enabler, especially when data from multiple clinical and administrative sources is aggregated to support enterprise-wide applications and business intelligence. Solid, nimble integration platforms are required to achieve strategic, enterprise-wide process and organizational integration goals and objectives.
- Constrained interface development teams could not keep up with the sheer volume of interface activity to connect both internal and external systems.

- Aging, legacy integration engine technology did not provide a sufficiently rapid development environment.
- The product life cycle for an incumbent vendor resulted in too many costly and disruptive product upgrades.

The four integrated delivery networks (IDNs) interviewed for this research have used InterSystems Ensemble for one to two years. All had a previous history of using integration engines before they acquired Ensemble. Two replaced their existing commercial interface engines; one migrated from a homegrown interface engine; and one acquired Ensemble to complement its legacy product. All had experienced, and were anticipating, dramatic growth in demand for new and enhanced application interfaces.

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## Profiles

### *Cedars-Sinai Health System*

Cedars-Sinai Health System is one of the largest nonprofit hospitals in the western United States with 952 inpatient beds and a multitude of ambulatory care and related programs. In 2007, Cedars provided approximately 56,000 inpatient admissions; 340,000 outpatient visits; and 77,000 emergency department visits.

Cedars has aggressive plans to integrate process and information flows across all ambulatory and inpatient components of the enterprise. It currently supports an IT portfolio which consists of approximately 450 applications, each with multiple interfaces, and many of which are running on the InterSystems Caché<sup>®</sup> database.

The current inventory of interfaces generates approximately 2.7 million inbound and 1.7 million outbound HL7 transactions per day, or 31 messages per second. Cedars purchased Ensemble one and a half years ago to replace an existing integration engine. The organization recognized that it was facing a need to tightly integrate care processes across the continuum, and thus the demand for the interface inventory was also dramatically increasing. To date, about 65% of the inventory has been converted to Ensemble. When conversion is complete Cedars-Sinai expects to be one of the largest Ensemble customers, by message volume, in the world.

Company and product stability, InterSystems' reputation and experience in healthcare, technical support services, and system performance/reliability were key selection criteria for Cedars. To date, it has reported excellent, reliable, and stable performance, with near zero unplanned downtime after almost one year of production operation. InterSystems' technical support was also cited as excellent. Cedars estimates that interface development with Ensemble is roughly twice as fast as development in its previous environment. Ease of reuse

and modification of existing objects were cited as key selection factors.

### *Partners HealthCare*

Partners HealthCare is one of the largest private, nonprofit IDNs in the United States. Founded in 1994 by the merger of Brigham and Women's Hospital and Massachusetts General Hospital, Partners now includes six other acute care hospitals in the greater metropolitan Boston area, along with numerous rehabilitation facilities, community health centers, a home care and hospice program, and two physician organizations (POs).

Partners' approach to the development of interfaces was typical of most large hospitals. Application development and support teams defined their interface requirements and a centralized group of technical integration specialists designed and implemented them. But the sheer volume of IT activity at Partners placed such high demands on this group that its resource constraints represented a barrier to rapid application deployment.

In 2005, as part of the High Performance Medicine program, one of the IT-related initiatives was to provide connectivity between Partners' proprietary clinical data repository, the Longitudinal Medical Record (LMR), and the offices of community-based physician practices associated with Partners Community Healthcare Inc. (PCHI). The first production deployment of Ensemble was to provide connectivity between the practice management system applications in these practices and the LMR, in order to provide a consolidated view of patients' clinical records across all LMR care sites.

PCHI physician practices have implemented a variety of practice management systems. Despite this complexity, Ensemble has proven to provide a rapid development environment, enabling Partners to develop interfaces to and from hundreds of PCHI physician practices. Partners has found the development of new interfaces with Ensemble to be easier, and adding new practices has become essentially "plug and play" in many cases.

Partners reports that developing interfaces to a new practice management system requires significantly less time now. In addition, the reusability of Ensemble software objects has proven to be beneficial to the overall development and time-to-market of new interfaces. To date, over 200 practices have been connected, with hundreds more planned. Interfaces to and from the LMR, and five different laboratory information systems have also been developed. Currently, the PCHI interfaces are generating approximately 30,000 messages per day.

Partners' most recent success was to utilize Ensemble to electronically submit lab reports from six different sites to the Massachusetts Department of Public Health. This has added an additional 75,000 to 100,000 messages daily. Despite this added traffic, neither performance nor reliability has been impacted. In almost three years of production operation, Partners reports no incidents of unscheduled downtime.

#### *Metropolitan Health Corporation*

Metropolitan Health Corporation (Metro Health) is an IDN that includes: Metro Health Hospital, a 208-bed, full-service, multispecialty hospital in Grand Rapids, Michigan; multiple physician organizations; 11 Metro Health Neighborhood Outpatient Centers; the charitable Metro Health Hospital Foundation; and joint ventures with other healthcare providers.

The acquisition of Ensemble was timed to coincide with an effort to convert Metro Health's current inpatient environment to the suite of inpatient clinical, patient management, and patient accounting products offered by its incumbent outpatient vendor.

Ensemble replaced a legacy HL7 messaging product that Metro Health used for eight years. Metro Health's IT staff conducted an evaluation process that included development of five test interfaces and execution of a volume test, the results of which convinced it to select Ensemble. The IT staff documented development effort benchmarks at one-third the time associated with the legacy product. Documentation and testing tasks showed comparable productivity gains. In its performance benchmark test, the IT staff reported that Ensemble throughput outperformed the legacy product by almost 3:1 (831 transactions per minute versus 355).

Interface needs have grown considerably in the past two years. At the time of cutover, Metro Health had 40 interfaces between 18 applications. Today, there are 170 interfaces between 35 applications.

When asked about their selection criteria for an integration platform, Metro Health cited ease of learning, development productivity, system performance, zero unscheduled downtime, and excellence of technical support as key factors.

#### *University of Maryland Medical System*

The University of Maryland Medical System (UMMS) was created in 1984 when the state-owned University Hospital became a private, nonprofit organization. It has evolved into a multihospital system with academic, community, and specialty service missions reaching every part of the state and beyond.

The hospitals and health systems that make up UMMS include: the University of Maryland Medical Center, a 669-bed academic medical center located in downtown Baltimore; the Baltimore Washington Medical Center (formerly North Arundel Hospital), a 286-bed community hospital; Maryland General Hospital, a 238-bed teaching hospital; Kernan Hospital, a 133-bed facility located in Woodlawn, Maryland; the University Specialty Hospital, a 180-bed chronic care hospital, located in downtown Baltimore; the Mt. Washington Pediatric Hospital, a 102-bed pediatric and rehabilitation hospital, located in northwest Baltimore; and the Shore Health System, a 191-bed system comprising Dorchester General Hospital and Memorial Hospital.

Until recently, most of the hospitals had their own IT departments, IT strategies, and a diversity of HIT platforms. While the community hospitals were mostly served by integrated HIS products with minimal interfaces, the main campus had evolved its own homegrown messaging system.

Process and organizational integration had become a strategic imperative for the health system, and IT was seen as a critical enabler. Rather than incur the time and expense of a "rip and replace" strategy, UMMS' approach was to create a health information exchange (HIE) serving all of its sites. The HIE's patient data repository sits atop each institution's individual IT environment and uses a common interface engine to create an enterprise master patient index (EMPI) and EHR.

UMMS conducted a rigorous evaluation of three commercial integration products along with its own proprietary engine. They developed a comprehensive evaluation methodology that included onsite, scripted demonstrations by each vendor, as well as an independent third party evaluation covering nine dimensions:

- Technology
- Usability
- Functionality
- Development time
- Ease of conversion, operation, and maintenance
- Testing facilities
- Documentation
- Cost
- Company reputation and stability

UMMS is currently building out its HIE capabilities using Epic's EpicCare Ambulatory EMR as the clinical data repository to standardize data availability and delivery. UMMS implemented its first Ensemble interfaces for patient registration/EMPI integration in mid-2007. Ultimately, it is expected that between 500 and 600 individual interfaces will be implemented using Ensemble.

UMMS reports that the Ensemble project has met or exceeded expectations. Key qualities cited include ease of learning, development productivity, system performance, reliability, availability, and technical support. Technical support was rated as excellent, and no unplanned downtime has been experienced to date.

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## Integration Platform Selection Rationale

Common themes emerged that were consistently cited when the institutions described why they selected InterSystems Ensemble. Key selection factors included the following:

- Excellence and responsiveness of technical support
- A rapid development environment
- An intuitive developer interface
- Reusable objects that accelerated development time and improved developer productivity
- Excellent performance
- A high degree of reliability (all reported no unplanned downtime attributable to Ensemble)
- Sophisticated backup and recovery capabilities
- The availability of a real-time "dashboard" to monitor system throughput, workload, and performance
- InterSystems' reputation and experience in the healthcare industry, its excellent and enduring support of its products, and its responsiveness to customer feedback

## FUTURE OUTLOOK

Today, more than ever before, the use of integration engines is an essential component of the IT strategy of leading-edge healthcare providers. The need for this technology is being driven by the overall growth in IT adoption throughout the entire healthcare "ecosystem" to meet the need for real-time information exchange—not only between

departments within hospitals—but also with other provider organizations, payers, government agencies, suppliers, and various types of HIEs.

Despite the trend toward acquiring application portfolios from a single supplier, or from a limited number of suppliers, few hospitals are able to meet all of their application portfolio requirements using a single source. Heterogeneous IT portfolios are, and will remain, the norm. Mergers, acquisitions, affiliations, and other governance changes to provider organizations will only accelerate this trend. Strong information management capabilities will be critical to the continued deployment of EHRs and other related HIE initiatives. Flexible integration platforms are essential if providers are to connect disparate data sources that reside on diverse technical platforms.

This is a period of great change in the structure of the healthcare industry, as new business models, regulatory changes, and cost and quality improvement initiatives are fundamentally restructuring traditional business and clinical processes and organizational models. These changes are accelerating IT adoption throughout the industry while adding complexity to the IT environment. Timely and accurate information sharing is a vital component of these changes. Selecting technology that improves staff productivity while also reducing technical complexity is critical if providers hope to take advantage of these IT-enabled efficiencies.

## ESSENTIAL GUIDANCE

Integration platforms are a vital component of a hospital's IT environment. They are essential to the efficiency, timeliness, and accuracy of critical interdepartmental and, increasingly, external communication processes. The role of this technology continues to grow in importance as hospitals shift their IT investment focus—from administrative and financial applications to clinical applications—and from an episodic, encounter-specific view to a more recurrent, longitudinal view of patient data.

Providers should seek products that provide not only the necessary functionality but also ease of use, flexibility, reliability, low total cost of ownership (TCO), and high return on investment. In addition, they should look for vendors that provide expert professional services as well as deep healthcare experience. Scripted demos and highly structured vendor evaluations are recommended to enable selection teams to draw "apples to apples" comparisons among their short-listed vendors.

When purchasing an integration platform, hospitals should evaluate products based on the following factors:

**Technology.** Smaller institutions should look for products that execute on Wintel platforms to reduce the TCO. The integration platform should also be scalable. Hospitals are advised to project their expected transaction volume growth to evaluate whether the solution will meet not only their current needs but also their future needs. Hospitals that initially implement their integration platform on Wintel platforms should consider the ease with which they can migrate to a more robust platform (e.g., Unix), if warranted.

**Testing and development.** The platform infrastructure should include robust, isolated testing and development partitions that support both online and offline testing.

**Documentation.** Technical documentation should be complete and online. Integrated, contextual documentation facilitates interface development, especially for the casual or less experienced user. Users should be able to generate documentation about the interfaces they create and embed that commentary with the source code of the interface. The documentation format and content ideally should be automatically produced to ensure accuracy, completeness, and consistency.

**Ease of implementation.** The product should facilitate development across all types of interfaces and should maximize a developer's ability to reuse components (objects) previously developed for other interfaces. Ease of use is enhanced by a graphical user interface that enables users with minimal programming skills to develop message mappings of data to be shared between systems that use different formatting standards.

**Flexibility.** The integration platform should support a wide variety of data exchange standards and message formats, including EDI, XML, HL7 versions 2 and 3, custom message formats, as well as CDA attachments.

**Application experience.** Hospitals should look for a vendor that has prior experience with their installed HIT applications. This will facilitate the efficient development of interfaces and reduce support costs.

**Performance.** Simulated load testing should be an essential part of product evaluation. Candidate products should exhibit satisfactory performance benchmarks not only at a hospital's anticipated transaction volumes but also at significantly higher throughputs to ensure that future growth can be accommodated at acceptable performance levels. Hospitals should expect vendors to provide benchmark data and reference operational clients where workloads are comparable to both their current and anticipated future transaction volumes.

**Reliability.** The potential for significant operational disruption and adverse effects on patient safety resulting from system failure are key

concerns. Buyers should seek documentation of the system availability experiences of current customers. They should also expect vendors to provide service-level agreements that guarantee acceptable levels of system availability and service response times for technical support when required.

**Audit, security, error management, and recovery.** Audit and security features are important to ensure HIPAA and other regulatory compliance requirements. Robust event logs, journaling capabilities, and automated recovery and restore capabilities provide rapid recovery efforts in the event of a transaction corruption or system failure.

**Monitoring tools.** A hospital's integration platform is one of its most vital systems, and if problems arise, early warnings and a rapid response are mandatory. Buyers should carefully evaluate product features that allow IT operations to monitor system performance in real-time and trigger automated alerts when failures occur or performance falls below user-defined thresholds. Reporting features that allow support staff to analyze key workload statistics and other system management functions are also important to ensure optimal performance.

**Ongoing support and maintenance.** Remote vendor technical support services through a secure link should be available 24 x 7 x 365, with onsite support guaranteed within acceptable time frames.

**Total cost of ownership.** A number of factors combine to optimize TCO. An accessible technology platform such as Wintel reduces acquisition costs. Ease-of-use features and comprehensive support tools help to lower support costs. Straightforward pricing models eliminate hidden surprises. Release cycles and understanding what is involved in upgrading to the latest version of the software should also be taken into consideration when estimating TCO.

Additional considerations include the vendor's financial viability, which impacts its ability to enhance and support the product for the long term. Hospitals cannot afford to repurchase an integration platform because the selected vendor was not truly committed to the product or market and have sunsetted the acquired integration platform, or ceased operations altogether.

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