Scaling Healthcare Applications to Meet Rising Challenges of Healthcare IT

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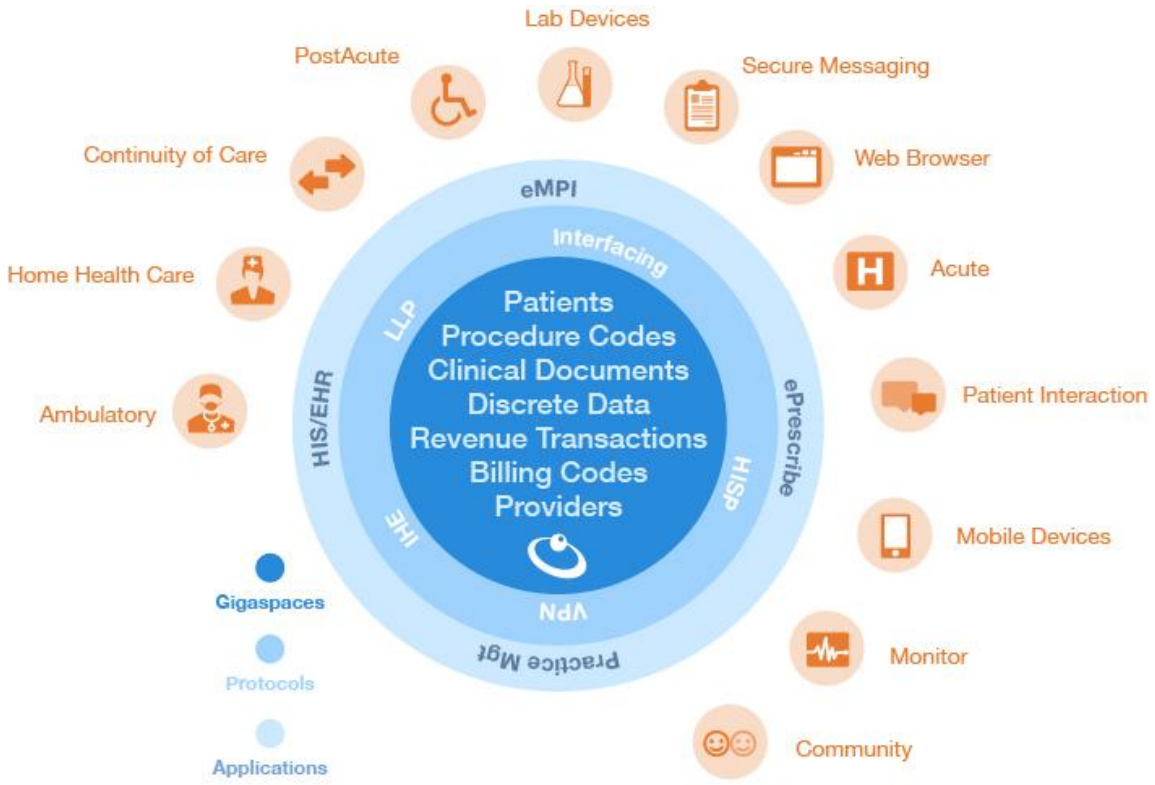
Healthcare IT has entered the era of Big Data. Are your applications rising to meet the challenges?

Healthcare IT is now dealing with an explosion of data sources, as well as the increasing regulatory requirements to integrate systems and turn messages into actionable information.

- **Clinical devices** are sending real-time data (e.g., blood glucose readers, home health monitors, etc.).
- **Messages are being integrated** across all venues of care.
- **"Meaningful Use Stage 2" clinical data sharing** requirements demand more integration points and message processing.
- **Integration models are transitioning** from "point-to-point" to "hub-and-spoke," along with the propagation of new and legacy message and content standards.
- **Patients are demanding "community"** features from their providers (e.g., HIE, HISP, Continuity of care, eReferrals).
- **Patient-centered business models** are putting a strain on existing applications (e.g., Patient-centered Medical Home, Patient Health Record and Medical Record Bank).
- **Cost containment** is critical because it isn't even clear which parties will need to pay for additional integration.

Enterprise healthcare applications are now being required to handle millions of messages per day at lower latency than ever to meet the challenge of processing terabytes of data, from various sources, which must be available to multiple processes, making system management increasingly complex. Moreover, the ability to mitigate risk and improve patient outcomes requires gaining meaningful information from these vast data streams in real time.



How can GigaSpaces help?

Hundreds of organizations worldwide are leveraging GigaSpaces' technology to enhance IT efficiency and performance, among which are Fortune Global 500 companies, including some of the largest and most demanding healthcare companies.

GigaSpaces XAP provides an end-to-end solution for all analytics requirements – functional, scaling, provisioning, and load-balancing – in a single, in-memory platform.

GigaSpaces XAP is built to run real-time, event-driven analytics in memory, co-located with the data. XAP has built-in multi-tenancy support, enabling multiple analytics processes to run on a shared infrastructure while maintaining strict isolation. The result – a more complete solution providing faster results at a lower cost, while preserving transactional integrity.

GigaSpaces is a mature, robust, proven solution deployed in hundrends of enterprises worldwide, running their mission-critical applications.

GigaSpaces helps Healthcare IT tackle the challenges around Big Data:

- **Volume –** the number and size of messages and/or cumulative data
- **Velocity –** the need for real-time response (i.e., low latency) from analytics
- **Variety –** the data sources, and message types and formats

Healthcare Use Cases

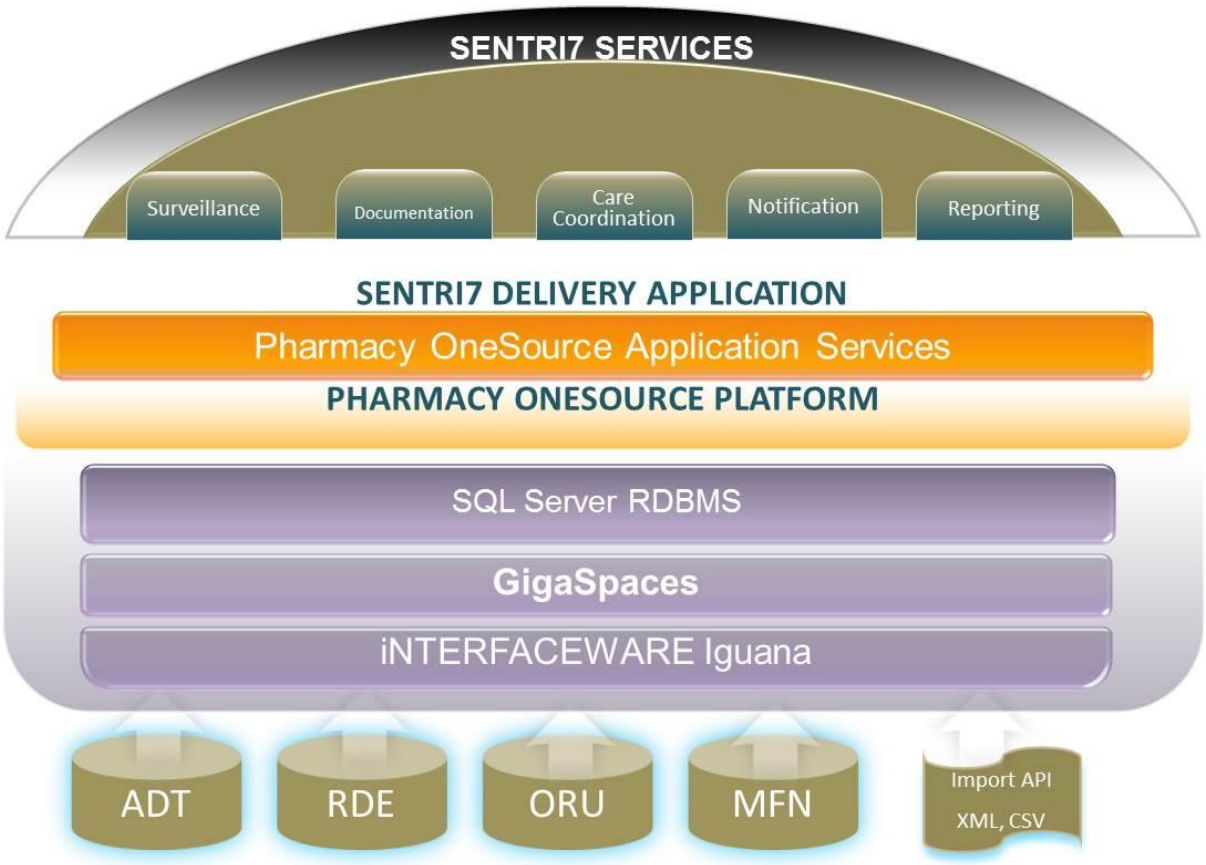
Case 1: Pharmacy OneSource: Large-scale Clinical Decision Support

*Pharmacy OneSource is **saving lives** by providing real-time analytics in less than 5 seconds.*

Pharmacy OneSource is using GigaSpaces XAP to handle over **3 million messages per day** and deliver patient intelligence in **less than 5 seconds**. This is healthcare's #1 Software as a Service (SaaS) provider, with more than 44,000 pharmacy professionals, and is used by more than 1,300 organizations in the U.S. It was acquired by Wolters Kluwer Health in December of 2010, which has 2012 FY revenues of $4.7 billion.

Sentri7

Pharmacy OneSource's application is Sentri7, which provides Clinical Decision Support for over **200,000 active patients**, for **150 hospitals**, and **runs 9000 custom-made rules** in real-time. Their hospital customers are optimizing care in **quality, cost and compliance**. One of the features is trending analysis for each patient's lab results and pharmacy orders, and can notify a provider if immediate attention is required.



Why Pharmacy OneSource chose GigaSpaces XAP

By utilizing GigaSpaces XAP for scaling and high-availability, Pharmacy OneSource was able to double their capacity while **saving over $900,000 in CapEx**.

Case 2: Hub and Spoke Custom Integration

A large healthcare IT vendor uses GigaSpaces XAP to provide custom interfacing in a "hub and spoke" model to its customers in a Platform as a Service. This vendor had revenue exceeding **$2 billion in 2012**, and has a solution for nearly every category in healthcare IT. This solution provides hospitals with help in integration, one of the most costly areas of healthcare IT. While most hospitals' IT staff are stretched thin, the demand for integration continues to climb. The vendor provides hospitals with innovative analytics and semantic normalization that would simply be beyond the capacity of their in-house IT organization.

Why Choose GigaSpaces XAP?

This large vendor chose GigaSpaces XAP because—unlike other in-memory data grids—it scales both data and processing. Since integration requires a **highly-available, highly-reliable, low-latency** solution that is also compute intensive, only GigaSpaces XAP offers the maturity and enterprise features this vendor demanded.

Meeting Healthcare IT Challenges

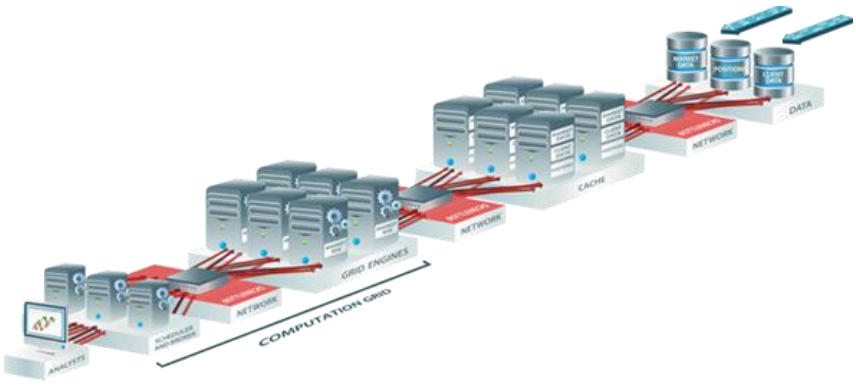
Challenge	How GigaSpaces XAP Meets the Challenge
High throughput message processing of various formats and content from various sources	Hub and spoke integration requires low latency processing of large data sets (e.g., cumulative patient state, eMPI), which goes orders of magnitude beyond RDBMS processing capabilities. **GigaSpaces XAP provides high performance in-memory data management technology optimized for large, complex data sets:** ▪ Data is partitioned to allow for faster parallel processing. ▪ In-memory data grid is co-located with semantic normalization and analytics algorithms, which avoids moving large amounts of data over the network. ▪ High granular control over parallelism and order of message processing. For example, messages for a given patient can be handled in the order received, but each patient is handled in parallel. ▪ SQL Query language leverage Multi-indexing per data type across large complex data model. ▪ XAP is 100% transactional ensuring full data consistency.
Interactive applications need to support more users and different types of users	Your interactive applications – whether Web-based or thick client- are increasingly being accessed by more users than ever before. And quite often the same data sets are now being utilized in different applications that are used by different user communities (e.g., providers at varying levels, administrators, patients). **GigaSpaces XAP can scale your processing for thousands of simultaneous requests:** ▪ XAP can scale the load balancer and application server (e.g., Tomcat, WebLogic, WebSphere) tiers to ensure each application has only the computing resources its users are demanding at that moment. ▪ Services can "live in the grid", and be called by a variety of protocols (Web services, JMX, RMI, JMS). Highly-available proxy technology ensures the client can reach the service regardless of where it is running.
Real-time event notification, workflow, secondary processing	Quite often, handling and storing a message is just the first step in processing healthcare data. There are often secondary systems that need to be updated or workflows that need to be advanced. **GigaSpaces XAP provides real-time event notification with complex condition descriptions:** ▪ The in-memory data grid is built on a real-time backbone that propagates state changes throughout the grid. ▪ Simple programming constructs (built on Spring) make it easy to inject functionality on state changes without additional code in the message processing/normalization. ▪ Multiple programming languages (e.g., Java, C++, .Net, Ruby, Groovy) and protocols (e.g., JMX, JMS, Web services) can participate with the data grid.

Regulatory requirements around data integrity and auditing	Healthcare IT systems simply can't lose a message, and communicating message status between systems cannot be compromised – presenting a challenge to maintaining high availability and data integrity. **GigaSpaces XAP guarantees high availability and data intergrity at any volume:** ▪ Built-in linear scalability, real-time replication, and self-healing capabilities. ▪ End-to-end elasticity – all system components scale out as resource requirements increase, ensuring SLAs. ▪ Schema-less data model support allows the system to represent data in multiple formats from multiple data sources.
Cost containment	Building and operating healthcare IT systems in an era of increasing regulatory requirements has budgets stretched to the limit. **GigaSpaces XAP and Cloudify work together to optimize your system with fully dynamic provisioning, in a simple-to-manage production environment:** ▪ Deploy to private, public, or hybrid cloud environments based on the cost structure and regulatory constraints that make the most sense for each application. ▪ Maximize resource utilization with predefined SLA rules that trigger elastic resource allocation, even "bursting" into the public cloud, if needed. ▪ Save cost of expensive RDBMS and storage HW/SW/middleware. ▪ Advanced end-to-end service management and monitoring capabilities ensure quick error detection and fault resolution. ▪ Hot deployment for agile application evolution and transparent upgrade.

Solution Architecture

Traditional Message Processing Today – RDBMS and Network are your Bottleneck!

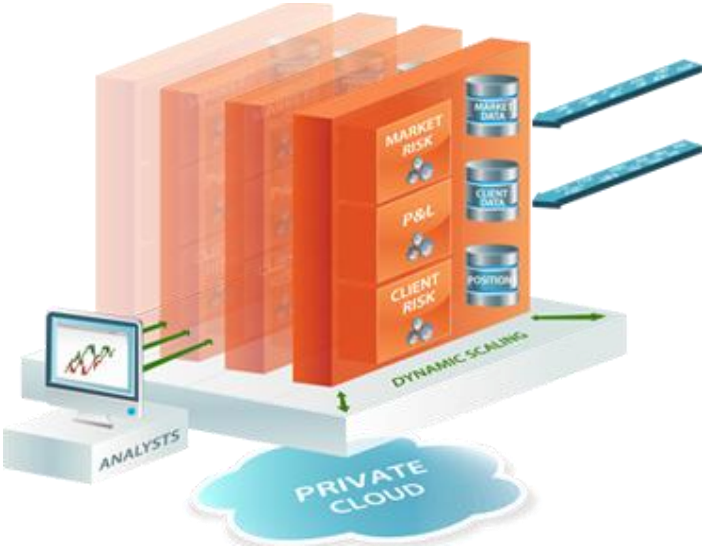
Traditional Healthcare IT applications running on mainframe or commodity hardware generally require centralized relational databases management systems (RDBMS). For the incoming messages you may have validation, normalization, consolidation and data distribution processes that interact with the database almost constantly. And persistent queuing, message status, and auditing add another layer of complexity and overhead.



Such complex systems require separate management of hardware, middleware, database and the network. Running the system as separate layers—each residing on a different platform—makes scaling complex, if not impossible: Each layer has its own clustering model and H/A scheme, making it difficult to coordinate among them. With constant processing of real-time clinical or revenue messages, centralized database architecture presents a bottleneck that is preventing the system from scaling on demand.

Real-Time Healthcare IT with GigaSpaces XAP

With GigaSpaces XAP, the message processing components (validation, normalization, etc.) are fused with their data and integrated onto a single platform. Co-located data, messaging, and processing mean that all the data is immediately available, no matter how complex, with no network hops, vastly speeding up processing. End-to-end elasticity enables all system components to scale as resource requirements increase.

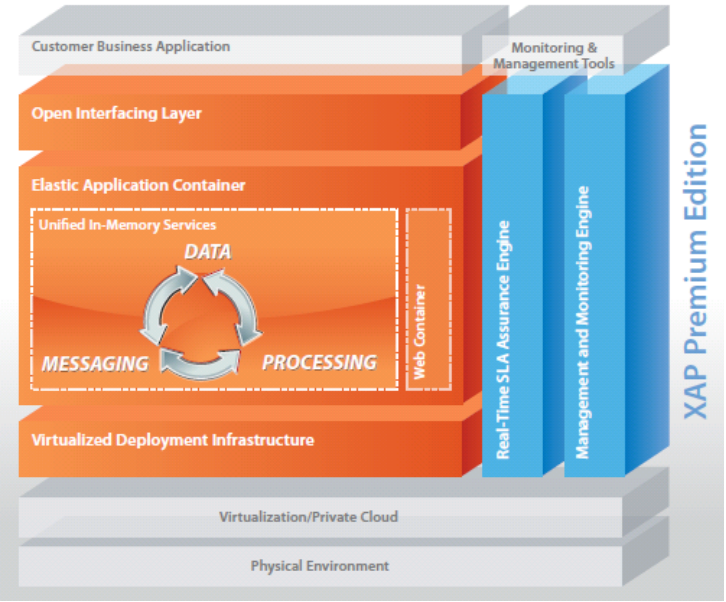


All these benefits delivered while providing full data consistency, high-availability and data integrity. You may leverage GigaSpaces with physical hardware, or to further optimize TCO, GigaSpaces can fully integrate with any private cloud management mechanism, enabling dynamic provisioning of the underlying infrastructure, using a single point of management.

GigaSpaces XAP Product Architecture

Comprehensive, mature application platform that provides the simplest path to production:

- All the building blocks for extreme application scalability in the processing stack.
- Operational readiness that enables faster time-to-market, zero-downtime, and maximum resource utilization.
- Complementary suite of robust, enterprise-grade management and monitoring tools.



Open Interfacing Layer
Supports any language, any platform, any API.
Elastic Application Container
End-to-end-scalable execution environment with elastic deployment to meet extreme throughput requirements.
Unified In-Memory Services
Data access, messaging, parallel processing services, to speed up your app.
Web Container
Host your Java web modules on GigaSpaces XAP for end-to-end management and scaling of your application.
Virtualized Deployment Infrastructure
Any environment, anytime, anywhere – traditional data center, public/private cloud, or hybrid.
Real-Time SLA Assurance Engine
Optimize IT resource utilization.
Management & Monitoring Engine
Production-grade control and visibility.

About GigaSpaces

GigaSpaces Technologies provides software middleware for deployment, management and scaling of mission-critical applications on cloud environments through two main product lines, XAP In-Memory Computing and Cloudify. Hundreds of Tier-1 organizations worldwide are leveraging GigaSpaces' technology to enhance IT efficiency and performance, from top financial firms, e-commerce companies, online gaming providers, healthcare organizations and telecom carriers.

GigaSpaces was founded in 2000 and has offices in the US, Europe and Asia. For more information, please visit www.gigaspaces.com or our blog at blog.gigaspaces.com.

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