Oracle White Paper
October 2013

Oracle SOA Suite for Healthcare Integration

Connecting Clinical and Administrative Processes
with Service Oriented Architecture
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Executive Summary

One of the biggest IT challenges facing today’s health care industry is the difficulty finding reliable, secure, and cost-effective ways to exchange information. Payers and providers need versatile platforms for enterprise-wide information sharing. Clinicians require accurate information to provide quality care to patients while administrators need integrated information for all facets of the business operation. Both sides of the organization must be able to access information from research and development systems, practice management systems, claims systems, financial systems, and many others. Externally, these organizations must share claims data, patient records, pharmaceutical data, lab reports, and diagnostic information among third party entities—all while complying with emerging standards for formatting, processing, and storing electronic health records (EHR).

Service-oriented architecture (SOA) enables developers to integrate many types of software applications, databases and computing platforms within a particular health network as well as with community, state, and national health information exchanges. The Oracle SOA Suite for healthcare integration is designed to provide healthcare organizations with comprehensive integration capabilities within a unified middleware platform, as well as with healthcare libraries and templates for streamlining healthcare IT projects. Through the use of Oracle SOA Suite and the Oracle Healthcare Adapter, Oracle helps these organizations to reliably exchange information while adhering to important industry standards and initiatives. As part of the Oracle Fusion Middleware family, these technologies enable healthcare organizations to lower operating costs and accelerate time-to-market by delivering a consistent user interface, security architecture, management console, and monitoring environment.

Oracle helps health care organizations to improve information sharing processes—both internally and with business partners—by enabling simple, secure and scalable methods for sending authenticated and encrypted information directly to trusted recipients. Oracle’s proven SOA tools reduce costs and minimize complexity by utilizing a secure, flexible, and standards-based middleware platform. Based on popular industry standards, Oracle SOA
Oracle SOA Suite for Healthcare Integration

Suite for healthcare integration reduces the need for specialized skills and enforces an enterprise-wide view of critical healthcare data.

Health plans, health care providers, and accountable care organizations (ACOs) are gathering an escalating volume of information from systems handling eligibility, enrollment, billing, diagnostics, and claims. Having accurate data in a consistent format is the foundation for streamlining the associated business processes such as intake, assessment, referrals, appeals management, investigations, eligibility determination, and case management. Oracle’s SOA solution helps healthcare organizations simplify interactions among many types of business processes and information systems.

Introduction: Sizing Up the Problem

Being able to exchange data among internal applications as well as with external partners and government agencies has always been a difficult task. Lacking a comprehensive integration strategy, many organizations find themselves creating new or customized solutions for each new business challenge. This splintered approach invariably leads to a heterogeneous environment that is difficult to manage and costly to operate—which is why a large percentage of IT budgets are spent on interoperability-related projects. According to one recent Gartner report:

- By 2016, midsize to large companies will spend 33% more on application integrations than in 2013.
- By 2016, the integration of data on mobile devices will represent 20% of integration spending.
- By 2017, over two-thirds of all new integration flows will extend outside the enterprise firewall.
- By 2018, more than 50% of the cost of implementing large systems will be spent on integration.¹

In the healthcare arena, one of the reasons for these difficulties stems from increasingly stringent regulations. Federal data initiatives arising from the Patient Protection and Affordable Care Act, Health Insurance Portability and Accountability Act (HIPAA), Public Health Information Network (PHIN), and the National Health Information Network (NHIN) all dictate how data must be formatted, archived and exchanged throughout its lifecycle. The Medicare Modernization Act and the Medicare Information Technology Architecture (MMA and MITA), Regional Health Information Organization (RHIO) initiatives, Health Information Exchanges (HIE), and continually evolving FDA safety laws also influence the way organizations in this dynamic industry must exchange data—adding additional confusion and complexity for health care organizations.

¹ “Predicts 2013: Application Integration,” 14 November 2012 (ID:G00245227).
Some of these standards are based on XML, others on Web services. Some are mandated, such as those stemming from emerging Health Information Exchanges and EMR implementations. And nearly all of them imply new requirements for sharing data in common industry formats.

Fortunately, there are sizable incentives for complying with these federal requirements. For example, in order to ensure that each person in the United States has an electronic health record by 2014, congress passed the Health Information Technology Economic and Clinical Health (HITECH) Act in 2009 and allocated $36 billion in funds over six years for HITECH adoption. These funds provide sizeable assistance to health care organizations as they implement Electronic Health Records (EHR) systems that enhance the exchange of health information and enforce policies for protecting the privacy and security of health information. All providers need to demonstrate “meaningful use” of EHR by 2015 to qualify for Medicare and Medicaid incentive payments. In exchange, each hospital will receive between $3 million and $11 million over four years, with the threat of penalties to providers that cannot prove that they are compliant. Other regulations stipulate that providers should upgrade to HIPAA 5010 and ICD standards for electronic data interchange while encouraging an upgrade to HL7 v3.

According to its advocates, the benefits of EHRs far outweigh the costs. Common motivations include the following:

- Improving quality and convenience of patient care
- Increasing patient participation in their care
- Improving accuracy of diagnoses and health outcomes
- Improving care coordination
- Increasing practice efficiencies and cost savings
- Minimizing medical errors
- Increasing the security and efficiency of healthcare administration
- Minimizing difficulty integrating backend information systems

Interoperability is the key, as yesterday’s “siloed” departmental and hospital systems are integrated into community-based collaborative platforms. Ultimately the biggest beneficiaries are the patients as the longitudinal health management of each citizen becomes as important as point-of-care treatment.

A Targeted SOA Solution for Healthcare

Oracle SOA Suite for healthcare integration is part of a comprehensive middleware environment designed to correlate data points, link applications, and comply with the myriad challenges of this highly regulated, data-intensive industry. Smoothing data interchange helps streamline every phase of the healthcare lifecycle—from initiation, eligibility, and enrollment to service delivery, program analysis, and reporting.

Oracle’s mature middleware tools help providers to interface clinical and administrative systems as they share information, both internally among departments as well as externally with other providers and
insurers. This level of automation makes it easier to respond to citizens, to meet federal requirements, and to adhere to popular industry standards such as HL7 and data models such as the National Information Exchange Model (NIEM).

Leveraging SOA, Oracle provides a complete technology platform for sharing information among packaged healthcare applications, Enterprise Resource Planning (ERP) systems, custom-developed information systems, and legacy systems from dozens of technology vendors. Because the solution is part of the Oracle Fusion Middleware family, it is also compatible with broadly accepted tools for Java and Web services development.

Oracle built this solution on three broadly accepted tenets of best practices in integration services. Such services must be:

- Extensible, reusable, and maintainable
- Implemented in a loosely coupled manner
- Orchestrated with standards-based languages

Oracle has merged specialized health care integration capabilities into an enterprise platform to empower health care organizations to streamline their integration initiatives. Oracle SOA Suite for healthcare integration simplifies two important aspects of healthcare IT operations: messaging and data collaboration. It accomplishes these important goals with a unified application infrastructure and support for key industry data standards. This domain-specific application includes simplified dashboards and advanced monitoring tools. Using the dashboards, health care organizations can easily track documents and messages from administrators and clinicians throughout the care-delivery lifecycle.

Oracle’s proven healthcare solution builds on Oracle SOA Suite, a middleware application that helps organizations to design, assemble, deploy, and manage business applications with reusable components. It simplifies collaboration between health information systems and enforces pervasive messaging standards such as Health Level Seven International (HL7) and X12N. HL7 is a standard for interoperability of health care information, and X12N is an insurance standard governed by the Accredited Standards Committee (ASC X12).

Oracle SOA Suite for healthcare integration also supports important data exchange standards: TCP/IP, Minimal Lower Level Protocol (MLLP—a protocol for transferring HL7 messages over TCP/IP), and Applicability Statement 2 (AS2), which provides guidelines on how to transfer data over the Internet. And, of course, it upholds popular Web services standards such as WSDL, SOAP, HTTP, and XML.

Overview of Capabilities

Oracle SOA Suite for healthcare integration provides essential capabilities for doctors, hospitals, laboratories, pharmacies, and all types of clinical and administrative personnel involved in the circle of care. The suite connects the information systems that these professionals depend on so that they can share information in a standard way, thus promoting better quality at a lower cost. It is based on Oracle’s proven and broadly accepted Oracle SOA Suite, a general-purpose middleware environment.
that simplifies the real-time exchange of information across information systems, computing platforms, and data centers—both on-premise and in the cloud.

**Oracle SOA Suite for healthcare integration**

![Diagram](image)

Figure 1. A high level architectural view of the Oracle SOA Suite Healthcare Integration solution.

Services created with Oracle SOA Suite are scalable across multiple lines of business, departments, and organizations. This scalability facilitates the exchange of healthcare information during everything from routine office visits to lengthy hospital stays to emergency situations. By transposing dissimilar data formats and supporting popular industry standards, Oracle SOA Suite for healthcare integration minimizes the complexity, simplifies the management, and lowers the cost of local interfaces between payers and providers.

**Robust Tools for Developers**

Oracle SOA Suite for healthcare integration accelerates integration initiatives with robust support for healthcare standards governing messaging and data exchange. IT pros can collaborate and share resources efficiently and at a low overall cost, increasing the benefits of EHR and all types of digitized information.

SOA encourages the deployment of highly adaptable, cross-entity business applications that can share information, orchestrate services and workflows, and deliver information services in a unified way. For healthcare organizations this type of versatile IT architecture permits transparent access to multiple applications and services, so caregivers can complete complex workflows via a single application interface. For example, payers and providers can securely exchange HL7 and HIPAA standard documents as developers utilize the suite to design, create and manage applications that process these documents.

Oracle has designed a web-based interface that allows for creation and monitoring of endpoints within a health information network. The Suite includes automated processes to monitor enterprise events.
Real time notifications and alerts are displayed on dashboards so system administrators can stay abreast of IT issues and rapidly resolve inter-application communication problems.

![Figure 2, a graphical user interface for configuring, managing, and monitoring the SOA environment.](image)

**Intuitive Visual Development Environment**

Oracle SOA Suite for healthcare integration includes a Healthcare Adapter Wizard that enables developers to create composite applications using drag-and-drop techniques. This intuitive healthcare console makes it easy to create endpoints, associate healthcare messages (such as HL7) with endpoints, and use the same GUI interface to manage and monitor the healthcare composites. Users can create endpoints through this GUI interface with a few clicks simply by specifying name, transport protocol, connection mode, host name, and port, as shown in the figure below.
Oracle SOA Suite for Healthcare Integration also includes an Oracle document editor that simplifies the process of mapping and transforming messages among various message types and formats. This editor facilitates information exchange and guarantees integrity as data moves from one system to another. For example, it can transpose message structures using standard message types such as HL7, X12, HIPAA, NCPDP, and CDR. Message structure libraries are included for HL7 v2 and v3. Guidelines can be created from the supplied standards and Z-Segments can be easily added through customized guidelines.

Figure 3, Configuring SOA endpoints is easy with the healthcare console.
Oracle SOA Suite for Healthcare Integration

Figure 4. Oracle Document Editor makes it easy to build messages from standard healthcare protocols, formats, and standards.

Embedded Tools for Administrators

Having a dashboard to monitor SOA services is critical since it allows system administrators to ensure that quality of service is being maintained and messages are being delivered without errors. Oracle SOA Suite for healthcare integration includes a series of dashboards that allow administrators to drill down to precise information and timeframes governing all messages sent and received. Color-coded status profiles can be interrogated for a more detailed view. Standard information includes the rate at which messages are being processed, the average message size, the number of messages sent or received, and the number of errors.
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Figure 5, A visual dashboard makes it easy to keep an eye on the status of messages and endpoints.

These dashboards also include a wide variety of reports. For example, one popular configuration report displays bar graphs depicting the message flow. This report lets administrators visually monitor endpoint status along with details about running, idle, and disabled services, as well as any errors.
Interactive reports let administrators keep track of wire messages, business messages, and application messages.

Robust Auditing and Security

SOA administrators can run audit reports to set and view policies for healthcare system components and events. Oracle’s comprehensive security architecture allows senior administrators to control who monitors and administers the system, protecting access to sensitive healthcare data according to HIPAA guidelines. For example, Message Level Security leverages the robust Oracle Security Infrastructure and Key Store Management technology to ensure confidentiality and verify “Non Repudiation of Origin” and “Non Repudiation of Receipt” at both the exchange level and transport level.

Built-in Integration Adapters

The Oracle Healthcare Adapter allows senders and receivers to securely trade information using standard document protocols such as HL7 v2 & v3, HIPAA X12 (4010/5010), CCR/CCD, and several other industry standards. For the U.S. market, Oracle SOA Suite supports National Information Exchange Model (NIEM) processes to facilitate reuse, interoperability, security, and reliability with regards to implementing information exchanges.
Case in Point: a Healthcare Provider

To illustrate the potential of Oracle SOA Suite for healthcare integration, consider the case of a midsize provider that offers care to persons living in poverty and community benefit programs. This nonprofit organization includes 150,000 associates serving in more than 1,500 locations in 23 states and the District of Columbia. Its IT department is one of the largest healthcare IT services organizations in North America, with more than 2,200 associates in applications, infrastructure and program management roles.

In recent years this provider has added numerous hospitals and health facilities to its network, resulting in a disparate IT infrastructure and many unique IT departments. The majority of its clinical interfaces and many of its administrative interfaces are supported by an experienced integration team and run in a centralized data center. Over time this heterogeneous infrastructure complicated development, support, and maintenance activities for the organization’s application developers and systems integration staff. To simplify this environment, this healthcare provider deployed Oracle SOA Suite based on its established reputation for integration excellence and its leadership position in the Gartner Magic Quadrant for SOA Technologies.

Oracle provided a standards-based integration platform that enables consistency and uniformity in application connectivity, data transport, data transformation, and data interchange across hundreds of systems and dozens of healthcare facilities. Leveraging this infrastructure, the integration team identified approximately 70 use cases, including the following:

• MLLP inbound/outbound connectivity with HL7 message and HL7 ACK/NAK
• Multiple HL7 message types and event types over the same inbound port
• MLLP end-to-end FIFO including exception scenarios
• MLLP outbound connectivity with HL7 message and hybrid ACK flow composed of single byte ACK/NAK and HL7 ACK/NAK (separate port)
• SNA inbound/outbound connectivity with HL7 payload
• MLLP inbound connectivity with HL7 messages

The new Oracle-based infrastructure lays the foundation for future service improvement and cost containment based on interface development standards and best practices. The central component of this solution is SOA Suite for healthcare integration, which ensures high availability at the hardware and application levels along with dashboards and customized reports, end-to-end healthcare message tracking, plugins for component versioning, and automated build software.

Conclusion

In order to stay abreast of new industry developments related to electronic medical records, health insurance exchanges, and fee-for-performance care models, healthcare organizations need to build, buy and integrate many types of software applications. Having a consistent SOA infrastructure helps
these organizations to leverage essential business processes so that these software applications can interact and exchange information in a consistent way.

As the standards governing healthcare practices mature and the implementation of EHR systems becomes more ubiquitous, the benefits of having an interoperable infrastructure will become progressively more important. Oracle SOA Suite for healthcare integration provides essential capabilities required for doctors, hospitals, laboratories, pharmacies, and other entities by facilitating the sharing of information in a secure and standards-based way.

Health industry organizations need an enterprise-wide, information-sharing platform that is based on standards, flexible enough to co-exist with existing systems, secure enough to provide data integrity and protect patient privacy, and reliable enough to meet the rigorous demands of the healthcare industry. Such a platform enables organizations throughout the industry to reduce costs, improve efficiency, and make better medical decisions at the time and place of care.

Oracle has the technology, applications, partnerships and experience to help healthcare organizations adopt and use this technology while adhering to the standards and specifications being set forth by federal and state regulatory bodies. The SOA Suite for healthcare integration also offers clear benefits to citizens by improving patient health quality through the provision of appropriate information.

Oracle’s proven middleware solutions has proven its ability to coordinate care among hospitals, laboratories, physician offices, and other health care entities by constructing a pervasive IT infrastructure for the secure and authorized exchange of critical information. Flexible connections among systems serve to boost efficiency, reduce medical errors, and facilitate insight via complete and up to date medical records.