



Establishing a Scalable Health Information Exchange

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White Paper

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Health Information
Exchange

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Revision History

Revision	Description	Release Date
1.0	White Paper Document	October 2008

1 Introduction

Today's ever-increasing volume of healthcare information – combined with the growing interest in large, regional healthcare information exchanges (HIEs) – have resulted in cost-effective, high-performance healthcare data platforms becoming an industry-imperative requirement. Intel® and Oracle are jointly addressing this need with a newly-assembled, scalable architecture that enables organizations to rapidly implement and cost-effectively scale a healthcare data exchange deployment. Healthcare-specific software components from Oracle and Intel are able to scale from small community organizations on up to the largest regional delivery networks, as well as support incremental additions in scale over time.

This joint solution is the integration of Intel® SOA Expressway for Healthcare (SOAE-H) and Oracle Healthcare Transaction Base (HTB), and delivers the below capabilities:

- Pre-built interface between SOAE-H and HTB accelerating time to implementation.
- Hundreds of pre-built HL7 data maps in SOAE-H to rapidly integrate a diversity of clinical data sources into the rich HTB clinical data repository.
- Deep support for IHE integration profiles providing a standards-based foundation upon which to deliver an interoperable health information exchange.
- Highly scalable and high performance architecture to effectively share longitudinal patient histories, execute electronic orders, exchange lab results, and support clinical analytics without undue or unpredictable processing time.

The integration supports using SOAE-H in exchanging data to and from Oracle HTB in the following forms:

- Unstructured data (such as PDFs)
- Structured clinical documents with meta-data (such as converting HL7 2.x messages into CDA XML documents)
- Converting HL7 2.x messages into HL7 3.x message structures

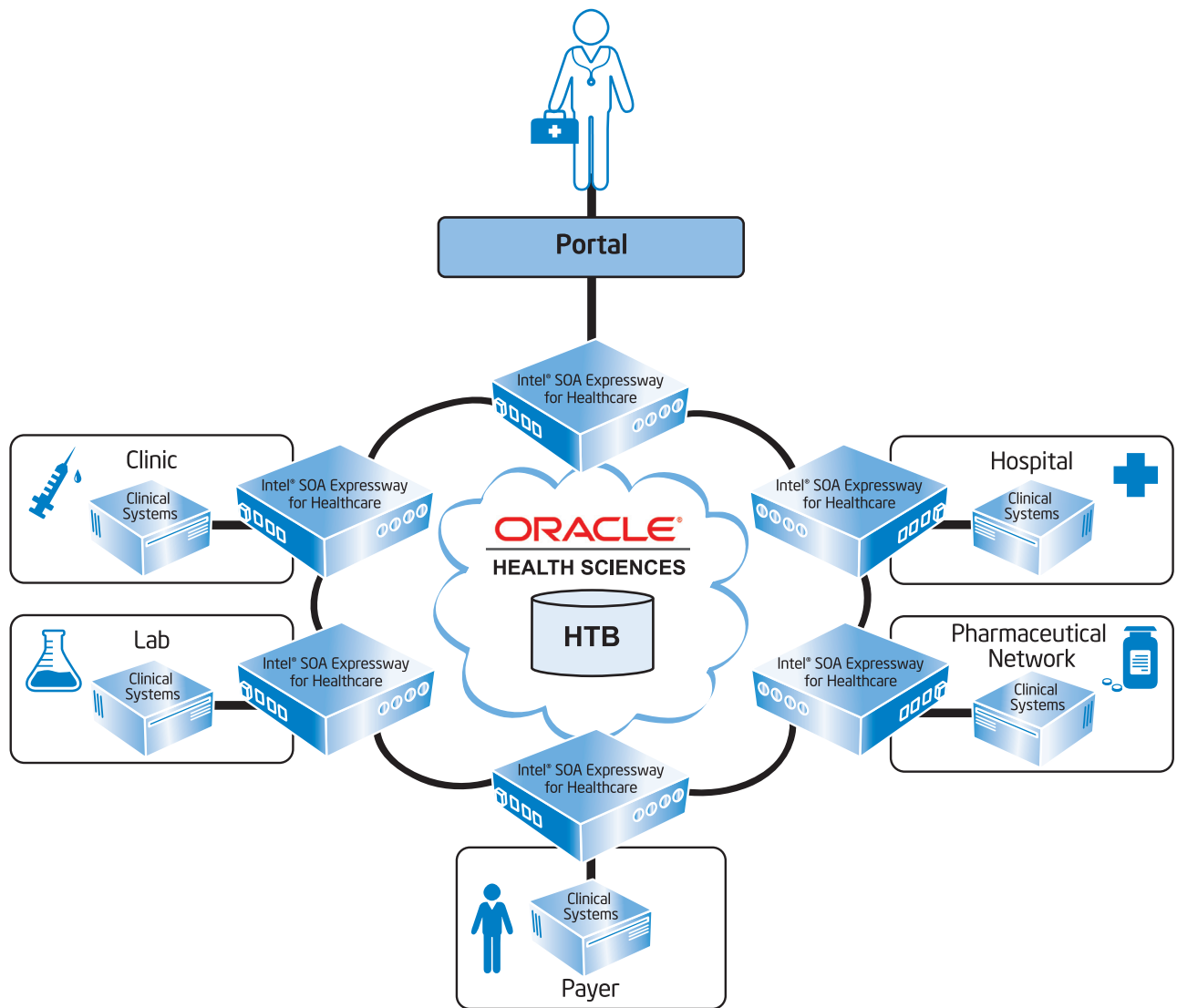
This document presents architectural, performance, and other joint solution details of particular interest to architects, system administrators, and CIOs who are seeking to implement a scalable data platform as the foundation for their health information exchanges.

2 Components of a Scalable Healthcare Information Exchange (HIE)

This section outlines the integration between Intel SOA Expressway for Healthcare (SOAE-H) and Oracle HTB in delivering a high-performance and scalable data foundation for a health information exchange.

2.1 Architecture

In the joint solution architecture, Intel SOAE-H performs the function of a high-speed data “on-ramp” and “off-ramp” between clinical applications and the scalable Oracle HTB clinical data repository. SOAE-H has a robust data map library to support a diversity of data sources both into and out of the rich Oracle HTB clinical data model.



2.2 Intel SOA Expressway Performance Summary

On a modest server configuration, Intel SOA Expressway for Healthcare can process thousands of clinical messages per second to enable accelerated real-time exchange of key clinical information at the point of care and in other business processes where data timeliness matters most. Below is a recent performance benchmark summary administered by a third party in June 2008.

<p>Intel SOAE-H Servers (Total of 4 CPUs)</p>	<p>2 Servers, Model: HP Proliant DL 140 CPU: Intel dual core, dual socket CPUs at 3GHz Memory: 8Gb RAM Hard-Disk: 21 GB disk (6 percent usage) Operating System: Red Hat AS 4, 32-bit</p>
<p>H7 Message Processing</p>	<p>Sustained rate of 950 messages per second for an average size of 2.5k per message</p>
<p>XML Message Processing</p>	<p>Sustained rate of 5,000 messages per second for an average size of 1k per message Sustained rate of 3,000 messages per second for an average size of 10k per message</p>
<p>Total Throughput</p>	<p>75 megabytes per second for an average size of 500k per message</p>
<p>Linearity of Performance</p>	<p>Performance scales linearly as more cores, CPUs, and servers are added: ~ +125 HL7 messages per second per core ~ + 625 XML messages per second per core</p>

The full performance report outlining all of the use cases, benchmark parameters, and performance characteristics is available by request through contacting: intelsoainfo@intel.com

2.3 Oracle Healthcare Transaction Base (HTB) Performance Summary

Oracle HTB is optimized as a scalable clinical data repository, capable of handling millions of patient histories over many years and processing transactions of various complexities at high speed. Below is a summary of a recent scalability benchmark completed in August 2008.

Oracle Database Servers (Total of 16 CPUs)	IBM x3950 with 16 sockets using NUMA architecture with (4) 4-socket chassis (supporting one 64-bit database instance) with Dual-Core Intel® Xeon® processor 4-way 3.6 GHz, 32 GB RAM Red Hat Enterprise 64-bit Linux* 4 U4 2.6.9-42.ELlargesmp
Oracle Application Servers (Total of 32 CPUs)	Eight IBM x3850 servers (supporting 32-bit software) with Dual-Core Intel Xeon processor 4-way 3.33 GHz, 8 GB RAM Red Hat Enterprise 32-bit Linux 4 U4 2.6.9-42.ELhugemem
Storage	12 TB SAN available (about 65 percent full with about 8 TB of data files)
Unique Patients	8 million
Data per Patient	1.0 MB
Years of Data	Dates ranged over 3 years (one inpatient encounter plus five outpatient encounters in 3 years)
Encounters	48 million (inpatient encounter = 360 clinical acts; outpatient encounter = 24 clinical acts)
Total Act Instance Count	3,888,000,000 acts
Average Message Load	50,000 HL7 messages/hour (average message size 25 KB with messages ranging up to 1 MB)

The full benchmark report can be obtained by contacting: <http://www.oracle.com/industries/healthcare/collateral.html>

2.4 Intel SOAE-H and Oracle HTB Integration Testing

Several integration test scenarios between Intel SOA Expressway for Healthcare and Oracle HTB were performed during 2008 in Intel laboratories in Chicago, IL and presented at the 2008 Australia IHE Connectathon and 2008 RSNA conference. These integration test scenarios included:

- IHE XDS.a Profile Testing
- Storing unstructured PDF document payloads with XDS registry meta-data into Oracle HTB
- Transforming HL7 v.2.x messages of ADTs, Orders, and Observations into XML v.3 documents with XDS registry meta-data into Oracle HTB
- Measuring performance of source document generation for consumption by Oracle HTB

The testing platform consisted of standard, low-cost Intel 4-socket, 2-core servers with 3 Ghz processors and with 6 GB of RAM running RedHat Linux. The servers included:

- 2 servers in a cluster running Intel SOA Expressway
- 1 server running Oracle HTB on a VMware Server configuration

2.5 Integration Test Results

The lab integration testing results successfully produced a reusable IHE XDS profile implementation and demonstrated the functional interoperability between Intel SOA Expressway for Healthcare and Oracle HTB using the architecture listed in section 2.1. The combined solution set transformed HL7 2.x source messages into HL7 v.3 XML documents and then persisted the documents in HTB. Based on its successful integration test results, this solution set is now available for use in larger scale deployments worldwide.

3 For More Information

Intel® SOA Expressway for Healthcare provides the most efficient way to get computable healthcare information from one place to another – across departmental systems, among providers, and to a regional or national group supporting a healthcare community

Key benefits include:

- Broad support for SOA, OMG, HL7, EDI, and IHE standards
- Plug & Play or OEM architecture
- High-velocity processing
- Secure, lights-out operations
- Comprehensive communications support
- Robust, validated ISV partner ecosystem

For more information visit: <http://www.intel.com/healthcare/ps/soa>

Oracle Healthcare Transaction Base (HTB) is a platform for the integration, development, and operation of healthcare applications across the healthcare continuum. It consists of a comprehensive, healthcare-specific data repository and standards-based information model coupled with a set of integrated services for enterprise terminology, data normalization, security and auditing, and business process and workflow. The platform is designed specifically for the healthcare industry and supports meaningful data consolidation, rapid application development, and genuine interoperability across different systems. With Oracle HTB, organizations in the business of healthcare – from hospitals and insurers to government bodies and public health agencies – can more effectively integrate, manage, deliver, and display information through the entire process of providing services.

For more information visit: <http://www.oracle.com/industries/healthcare/htb.html>.

For more information on
Intel® SOA Expressway, visit
www.intel.com/software/soae

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