Transforming Healthcare Information Technology with Intel® SOA Expressway

White Paper

Intel® SOA Expressway for Healthcare

Transforming Healthcare Information Technology

Abstract

Intel® SOA Expressway for Healthcare is an Intel® software product designed to reduce the cost and complexity of healthcare semantic data interoperability. Within health information networks, there often is significant cost in custom software development for the exchange of healthcare information. Most of this cost has been represented in significant spend for systems integration. This cost is prohibitive due to the N^2 legacy interface problem that is characteristic of the healthcare domain. Solutions based on adaptors or Enterprise Service Bus (ESB)-style solutions, while they help, only serve to mitigate the complexity rather than transform the nature of the problem. A new architecture, based on a healthcare service network and an XML canonical form is possible with Intel® SOA Expressway for Healthcare.

Intel® SOA Expressway for Healthcare is an Intel soft-appliance built on core technology known as a SOA Expressway that offers XML acceleration, codeless design, and increased manageability. Intel® SOA Expressway for Healthcare attacks the problem of establishing healthcare service networks by providing specific pre-built services, a standardized informatics model and a robust Validated Ecosystem for common healthcare services found in health information exchange. The ultimate goal of Intel® SOA Expressway for Healthcare is to accelerate the adoption of Health Information Exchanges (HIEs) worldwide by shifting the cost calculation from proprietary work to a repeatable product-based solution.

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Revision History

Revision	Description	Release Date
1.0	White Paper Document	April 2008

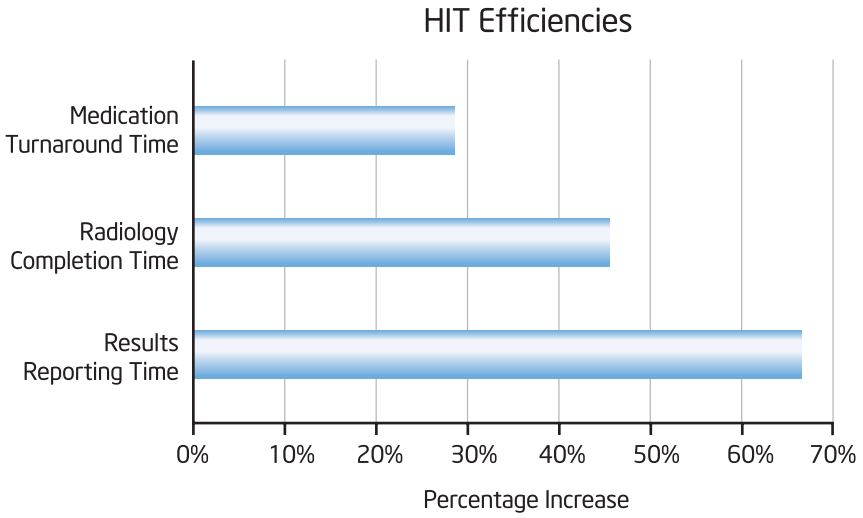
Technology in Health Care

Widespread adoption of information technology in healthcare has been limited largely to systems that provide administrative or financial transactions. The wholesale adoption of HIE frameworks that focus on improving clinical care at the patient point-of-care have also been limited globally - even though the benefits of these systems and their value are widely recognized.

In fact, worldwide healthcare information exchange studies have highlighted significant opportunities and myriad of benefits from healthcare interoperability in various markets around the globe. Some examples include the following: The HIE opportunity in the United States alone has been valued at $77.8 billion. Canada has saved an estimated $3.6 billion by eliminating duplicate radiological procedures, $10.4 billion in duplicate lab tests, and over $48 billion adverse drug events. Additionally, it is estimated that Australia can save approximately $300 million per year through improvements in healthcare interoperability.

While each of these disparate markets has unique requirements, the value propositions for improvements in healthcare information exchange is largely the same: providing the patient's electronic health record (EHR) - the right data, to the right clinical personnel, at the right time - at the point of care increases both the quality and efficiency of care. HIE systems contribute to increased quality of care by providing improved guideline and protocol based care, EHR data screening and aggregation, identification of adverse drug events, as well as support for enhanced preventative care and medication dosing.

Efficiency Increases after deploying Healthcare Information Technology (HIT)



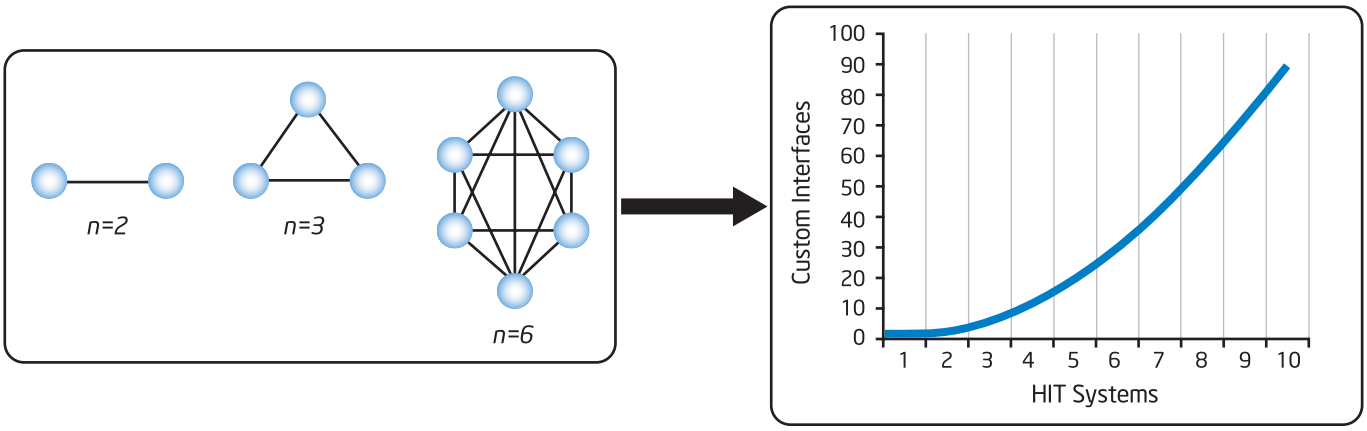
With such significant opportunities for health care interoperability, the concept of the HIE is realized. Yet, low adoption rates for HIEs persist throughout the global healthcare community. Central to this disconnect between theory and practice is the cost of integrating, participating in, and scaling HIE systems. In other words, existing solutions fail to address the reality and complexity of technology in health care today. Hospital systems within the same network will often not interoperate which contributes to data repositories and silos of disaggregated information. As a result, these healthcare facilities are only able to build a patchwork view of patient health or are forced to rely on labor-intensive and error-prone searches through available hardcopy. In other instances where a hospital network may have a working solution, the system may not be flexible enough to address changes in rules for compliance, reimbursement, or other operational needs in a timely and cost-effective way.

Health Information Exchange Integration Challenges

We find that because of integration issues, translating the vision of HIEs into reality is more difficult than ever. In part, the complexity in the healthcare industry contributes to these problems. The industry represents a unique and challenging landscape of fragmented systems with a diverse mix of paper-based systems, custom-built proprietary systems, and vendor systems. Integration issues among systems is further compounded by the diversity of the data exchange format and semantics. With the large disparity among providers and their technology environments, widespread adoption of EHR and integration of information networks has become even more challenging. To date, many healthcare organizations have found it to be too costly to integrate or scale their networks in a meaningful way whether within an individual hospital, a group network, or across organizations.

As importantly, the fragmentation in the healthcare industry has also created problems of network scalability. This is referred to as the N^2 problem among networks, which is a primary technical limitation to successfully scaling networks. This problem is largely a result of the lack of uniform application of HIE standards across healthcare systems and between individual clinical vendor adaptations. As the number of applications and network complexity increase, the development and maintenance costs grow geometrically, which causes a barrier to adoption as costs become prohibitive. Point-to-point interface costs are incurred not only during start-up but each time anything in the network changes.

The N^2 problem

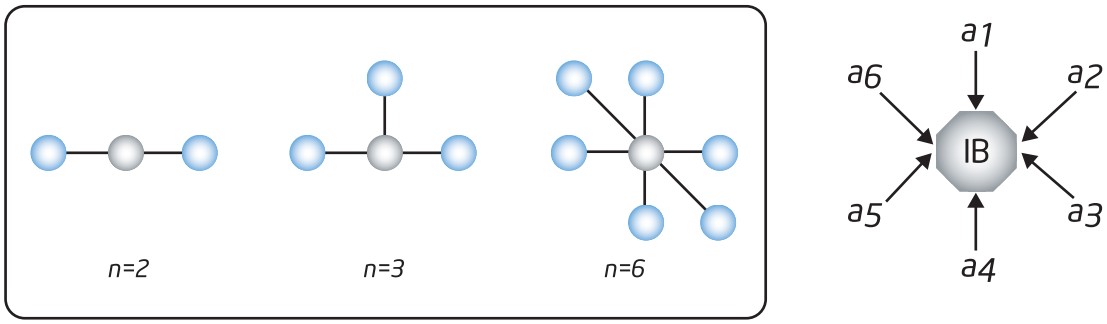


This problem persists within HIE environments. In healthcare, the N^2 problem is manifest by the expression "every HL7 v2 interface is a new v2 interface" – because no two implementations are the same, everything is custom. Expensive to build and maintain, point-to-point integration requires ongoing complex change management, and costs rise exponentially as the number of network participants (applications) increase.

However, the introduction of an Integration Broker (IB) moves the integration problem from geometric to linear. IBs are responsible for mediating communication between systems and the exchange network.

The IB moves the problem of writing adaptors to the Broker itself, reducing the cost of custom adaptor development for each new entrant into the health network. The barrier to entry in this model becomes the maintenance of the IB itself, with a central hub responsible for all data mapping and protocol translation. In technology terms, the category of product used for this type of integration problem is known as Enterprise Application Integration (EAI) Broker.

Integration Broker Solution



In the Intgration Broker solution, a broker (shown in the middle) mediates communication between elements of the HIT

With an EAI (or ESB) type solution, the total number of interfaces to write has been reduced, but additional costs to maintain the ESB solution itself offset any gains realized by the broker architecture. Further, this model, known as hub-and-spoke, is brittle and difficult to scale. For each new participant in the HIE network, a new adaptor must be written and integrated into the IB itself. Moreover, there are multiple vendors offering largely incompatible ESB solutions, including open source. This implies that if IBs are used throughout healthcare for HIT deployments, the end result will be broker heterogeneity. Instead of islands of unconnected healthcare systems, the result will be islands of unconnected brokers. While the ESB approach looks promising, it still fails to reduce costs significantly, instead shifting the expenditure from one area to another.

Solving the Health Information Exchange Integration Issue

With this understanding of the integration challenges of existing systems, there are a number of solutions and approaches that can be used with HIEs to integrate participants. Healthcare providers must evaluate the option of "ripping and replacing" their legacy solutions or finding a way to leverage their existing IT assets.

A growing number of vendors provide 'integration stacks' which are intended to provide a single source solution for hospitals and healthcare networks. Some companies benefit from buying a suite from a large vendor who has a proven healthcare solution because they are: (1) dealing with a single vendor – possibly one that they are already working with; (2) working with a highly integrated stack where all components interoperate; and (3) fewer resources are required to set up the environment. When buying into a vendor 'stack', companies also often have access to valuable product support and consulting services.

There are also, however, a number of drawbacks to purchasing a full technology suite. Vendor lock-in is a real investment risk to hospitals that need to connect disparate systems in a single location, across a network, or as a result of acquisitions. In addition, it is unlikely that a single suite can provide the functionality, performance, and flexibility required to build a fully capable HIE. Additionally, to achieve full functionality, each component is dependent on the others in the suite; therefore, it is impractical to replace components that provide a better fit with local requirements. As a result, hospitals can wind up paying for redundant functionality or for a component with inferior performance or feature set. Technology stacks typically are not 'plug and play' solutions so the time-to-value can be lengthy. Each of these issues has significant implications on the healthcare IT organization, and its ability to develop, deploy, or integrate into a HIE.

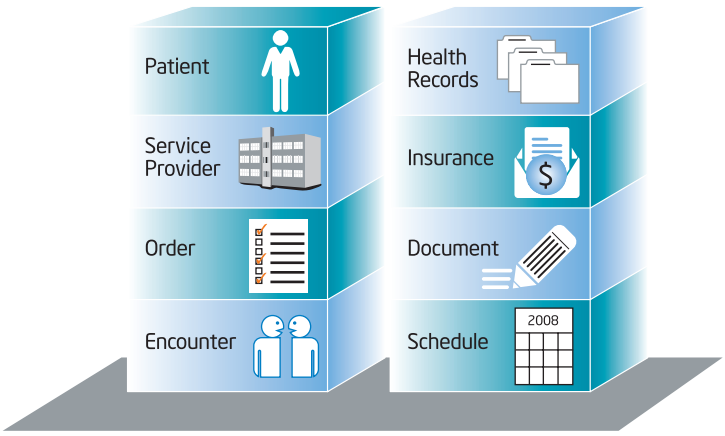
In addition, as companies continue to incrementally add to their existing IT infrastructure, they become increasingly dependent on their platform or vendor, which has long-term implications on an organization's IT investment strategy. As a result, ripping and replacing older applications becomes unfeasible economically as the level of investment in legacy systems increases.

Instead, healthcare providers increasingly seek to extract additional value from existing IT assets and minimize their investment risk in new IT assets. This has created a shift to a service based model and has increased the importance and enhanced the role of the ESB in Service Oriented Architecture (SOA) environments. In a standards-based services model, information can be extracted from legacy systems as easily as from modern applications built on structured, standardized technologies. A service-oriented architecture is fundamental to the development and deployment of a successful HIE.

Creating the Health Information Exchange

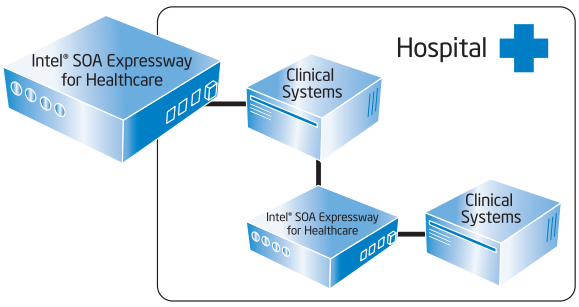
When considering the possible choices for a HIE, we must also identify the ideal characteristics or requirements for such exchanges. That is, given integration technology today, what should we expect in the best healthcare environments? Rather than stagnate with proprietary solutions and point-to-point coding, we should look to the best model for software integration that copes with change, SOA. In other words, what should be a straightforward problem in software architecture has been mired in brittle, ad hoc, data silos that are highly resistant to flexibility and scale. The key capabilities to look for in deploying a health information sharing environment are:

Common Information Model



Healthcare "dial-tone" – The best model for HIEs will utilize the network model where participant's systems (providers, payers, labs, clinics, pharmacy) can join using a common healthcare "dial-tone" by paying a one-time integration cost rather than building custom interfaces for each participant end-point. This model in turn produces the network effect where each new participant gains access to all services on the network; also, the additional cost to add new systems is linear rather than geometric. However, not every HIE will standardize on the same network format. Further, the best model should be flexible rather than dictate the "best" on-the-wire network form. It also should be robust enough to translate to and from a given network form to a participant's required form as dictated by their internal EHR and other hospital systems.

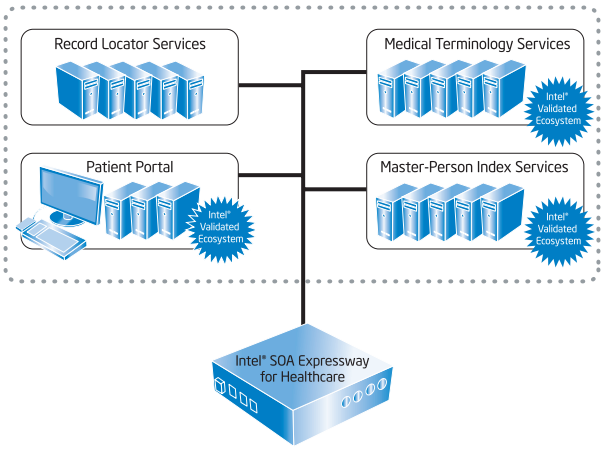
Integrate and Scale "Everywhere"



Integrate and scale "everywhere" – The best model for HIEs should be able to handle integration with systems inside the hospital, across hospitals in a group or Integrated Delivery Networks (IDN), or across regional and even national networks and should provide a means to scale out in each of these environments. One model should be flexible enough to adapt to the specific requirements in each of these scenarios, including performance, security, privacy, audit, and patient consent services within a local domain network or a cross-domain scenario.

Robust SOA enablement – The best model for HIEs will have the capability for robust content level processing in the form of workflow orchestration, security, audit and content-based routing, especially for XML along with the ability to handle any legacy data or transport mechanisms required to get data to and from the provider applications. This is the true foundation for a HIE based on SOA – the capability to expose, share and process the rich, descriptive XML while virtualizing the legacy environment. Without this sort of high-performance requirement, any HIE based on SOA would remain a "paper" exercise.

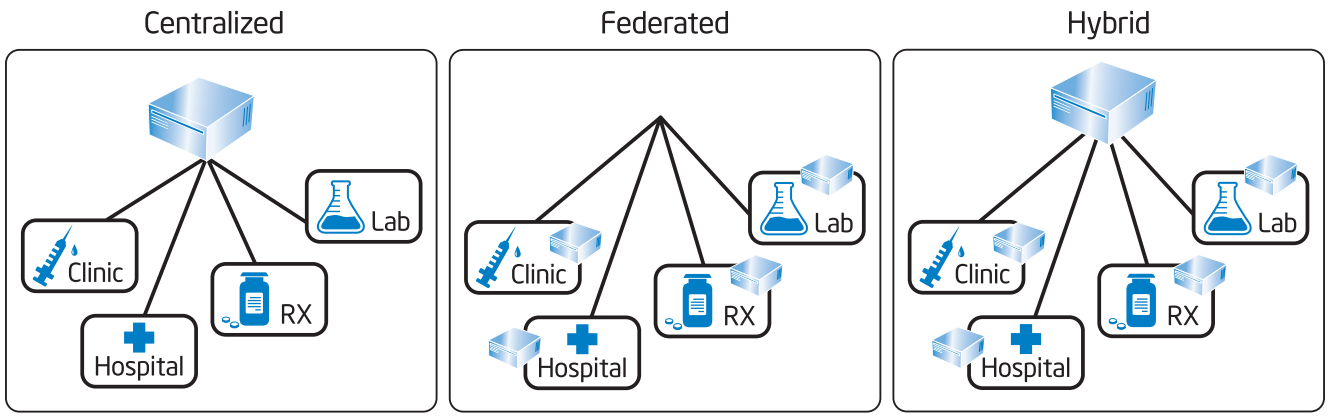
Pluggable Network Services



Pluggable "Healthcare services in the cloud" – Key services such as controlled medical vocabulary translation (CMVT), record location and audit (RLS), enterprise-master-patient index (EMPI), clinical data repository (CDR), and patient portal should be pluggable in the HIE. That is, rather than hard-wiring systems together, each participant should be able to leverage Services in the cloud regardless of where they exist with minimal integration effort. Finally, if certain services aren't required (such as controlled medical vocabulary in a local domain), the architecture should be flexible enough to omit them as needed.

Agnostic to Healthcare information sharing architecture – The best model for HIEs should be agnostic to where healthcare data is physically located. That is, it shouldn't matter whether patient data is located in one place (centrally), at each provider (federated) or mixed (hybrid). Moreover, the architectural model should be adaptable to a change in data origin as well – for instance, an army of developers shouldn't be required to re-architect the overall model should things change.

Data Origin Flexibility



Healthcare data and services are *centralized*

Healthcare data is locally stored and queried via an *index* mechanism

Some healthcare data is centrally stored and some managed locally

The ideal HIE architecture shouldn't be coupled to a fixed deployment model for healthcare data and services. That is, all three possibilities should be supported.

Inside Intel® SOA Expressway for Healthcare

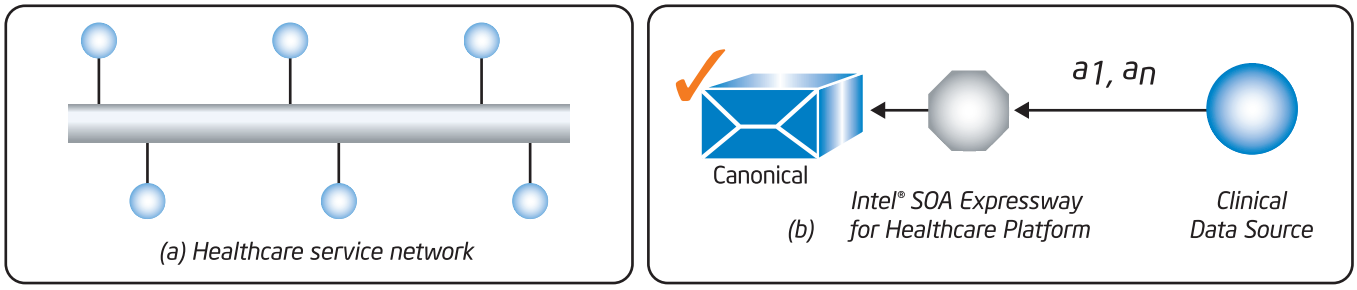
The healthcare market is a strategic focus for Intel and is supported by corporate investment in technology, products, and solution delivery. Intel understands the complexity of the healthcare community, and the challenges integrating disparate networks and technologies. Intel® SOA Expressway for Healthcare is the product of Intel's commitment to addressing the needs of the healthcare community by leveraging SOA principals to help make HIEs a reality.

Intel® SOA Expressway for Healthcare is an Intel soft-appliance built on core technology known as a SOA Expressway that offers XML acceleration, codeless design, and increased manageability. Intel® SOA Expressway for Healthcare attacks the problem of establishing healthcare service networks by providing specific pre-built services, a standardized informatics model and a robust Validated Ecosystem for common healthcare services found in HIEs. The ultimate goal of Intel® SOA Expressway for Healthcare is to accelerate the adoption of HIEs worldwide by shifting the cost calculation from proprietary work to a repeatable product-based solution.

Intel® SOA Expressway for Healthcare is an Intel software product designed especially to solve the N^2 problem through the use of an XML-based canonical form. Intel® SOA Expressway for Healthcare supports healthcare specific adaptors designed especially to provide connectivity for legacy healthcare data formats, such as HL7 2.x, EDI and X12. The core Intel® SOA Expressway platform is a high-performance workflow and routing engine designed especially for XML routing applications. Intel® SOA Expressway offers high-performance local services such as XML parsing, transformation (XSLT), schema validation, security services (XML Security), and content-based routing. The high-performance XML processing engine used by Intel® SOA Expressway is generally 2x to 10x faster than other software-based XML processing solutions and is comparable with current hardware-based XML acceleration appliances. In addition to high-speed XML processing, Intel® SOA Expressway utilizes a BPEL-based workflow engine that allows local services to be placed into a workflow with external services.

Furthermore, Intel® SOA Expressway for Healthcare is designed to connect legacy clinical data systems to the healthcare information utility. In this respect, it acts as a network on-ramp. Through the use of the "on-ramp", the clinical data source gains access to all services offered by the network. This changes the cost model drastically, as new clinical systems require a one-time mapping to the canonical form with no further 'adaptor' maintenance as new clinical systems, network applications or shared services join the service network. It should be noted that this type of service network architecture is ideal for large health networks with regional or national scope. In the figure below, the overall network concept is shown, with each clinical data source node connected to a healthcare service network, and the Intel® SOA Expressway for Healthcare platform is detailed and highlights pre-built adaptors to handle network "on-ramp" and "off-ramp" integration at the edge of the network (denoted a_1 through a_n).

(a) The Healthcare Service Network; (b) Intel® SOA Expressway for Healthcare platform



In the service network architecture, systems map once to the canonical form and gain access to all services offered by the network.

What are the Key Components of Intel® SOA Expressway for Healthcare?

The Intel® SOA Expressway for Healthcare platform is designed to support the most demanding healthcare networks. The architecture has the flexibility to accommodate the diversity of healthcare environments. The key elements of the design and architecture of Intel® SOA Expressway for Healthcare are:

Hyper-ESB Architecture.

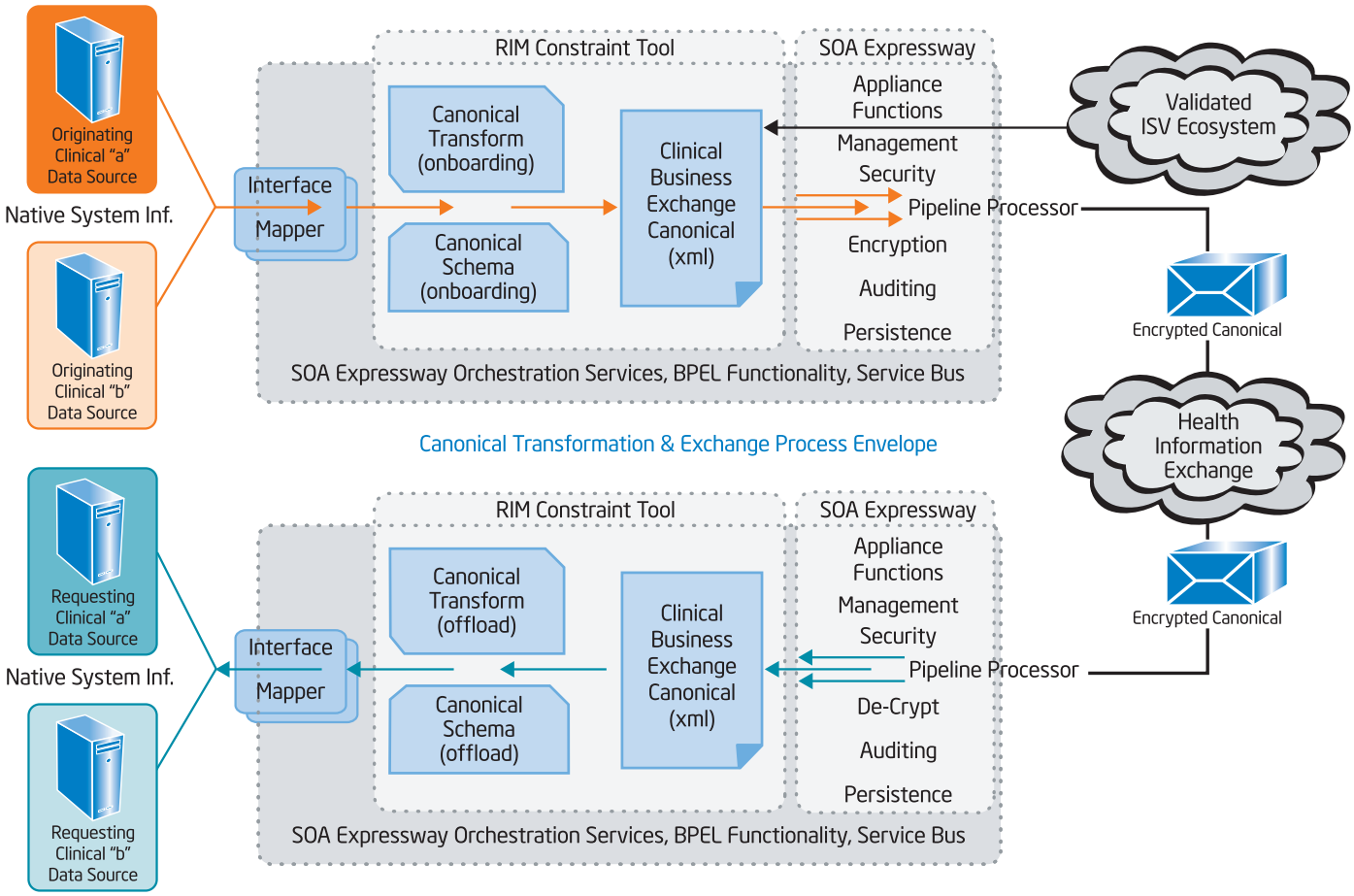
Intel® SOA Expressway for Healthcare is built on a hyper-ESB style architecture. A hyper-ESB is distinguished from a full ESB by its emphasis on performance, simplicity and manageability. It contrasts a typical ESB solution by providing benefits such as codeless design, XML acceleration, and simplified workflow. It shares functionality with an ESB such as standards support (especially XML, WS-* and SOA standards), as well as transformation, validation, and routing services. A hyper-ESB also shares extensibility with a typical ESB, but generally contains a 'fast-path' architecture rather than a full Java-based JBI style architecture for performance reasons.

Intel® SOA Expressway for Healthcare Development Kit: Canonical Building Blocks.

Every exchange of health information undergoes the same common set of interactions, to ensure data interoperability, to enrich and ensure data quality, to fully audit and qualify the message as it passes through the service network. Intel® SOA Expressway for Healthcare scales this solution by validating and constraining these interactions to a single instantiation – a repeatable set of operations in a productized form-factor – instead of the costly one-off implementations which have become the status quo for healthcare worldwide.

The canonical form represents a standardized information model, a subset of the HL7 v3 Reference Information Model (RIM), exposed as XML business objects in fine-grained and composite web services. It encompasses both syntactic transformation from the various legacy implementations of HL7, NCPDP, x12 messaging formats, as well as semantic transformation to terminology standards including SNOMED CT, LOINC, CPT, ICD9 & 10, etc.

Intel® SOA Expressway for Healthcare Canonical Process Flow



The canonical form can be represented in the HL7 Clinical Document Architecture (CDA) R2, the ASTM Critical Care Record (CCR) or the harmonized CCD. The form itself and the RIM implementations, are constrained by; 1) applying an information modeling tool during the development and generation of the canonical, 2) it's sibling schema, transforms and constraint controls on the informatics model against the standard, and 3) how legacy data mapping interfaces are applied to the overall envelope. The package of healthcare usage models utilizes these transformations along with pre-validated BPEL workflows to:

- Entity Identification Service (EIS) for patient and provider identification.
- RLS for record, location and update services.
- A set of terminology services & semantic tooling/mapping.
- Standard authentication and authorization mechanisms.
- Audit, traceability, persistence and management of the canonical.
- Patient Consent & Authorization (PCA) services.

The value of the canonical model in any Intel® SOA Expressway for Healthcare deployment is clear; canonical models properly constrain the RIM object model in such a way as to create value-added business exchange objects, which are constructible and de-constructible at runtime. They provide a way to syntactically and semantically build, normalize and deliver clinical healthcare data – in a cost-controlled fashion – across a wide array of network end points and constituents. Intel® SOA Expressway for Healthcare's canonical representations are built by Intel and other key Validated Ecosystem integrators, application and service providers – against industry standard document exchange models such as HL7 CDA R2 and CCD, in order to provide the widest array of informatics application in the network.

Validated Ecosystem.
The Intel® SOA Expressway for Healthcare Validated Ecosystem represents critical domain expertise and industry leading capabilities which are required for each and every exchange of health information – providing strategic value to the dial tone in the network. These capabilities are exposed through standardized web service interfaces, pre-orchestrated and pre-validated for common healthcare workflows across multiple healthcare segments.

The Intel® SOA Expressway for Healthcare Validated Ecosystem expands and scales by working with both the standards community to create standardized web service definitions, and the Open Source development community to expand upon the initial set of canonical business objects. Intel is working with distinguished group of highly valued and experienced Validated Ecosystem Partners, representing each of the core capabilities required for health information exchange – MPI/RLS, CTS, CDR, PCA, EMR ISVs and healthcare Integration Engines.

To complete the Intel® SOA Expressway for Healthcare Validated Ecosystem, Intel works with key System Integrators across various geographies, who are experts in the design and deployment of more complex HIE architectures. The Validated Ecosystem will expand over time to include additional industry leaders in core healthcare areas.

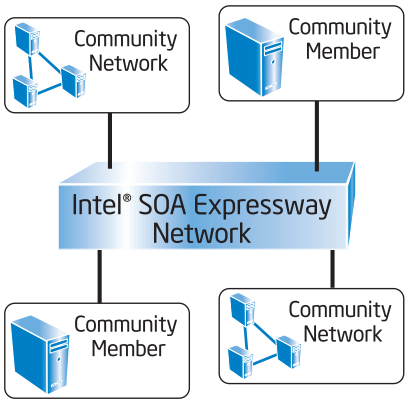
Soft-Appliance Form-Factor.
Intel® SOA Expressway for Healthcare is intended to be configured and not coded; this means that it contains pre-built adaptors for most current legacy formats. Intel® SOA Expressway also supports a rich protocol brokering framework that supports many different protocols such as HTTP, MLLP, JMS and others. Finally, Intel® SOA Expressway is designed to be administered and managed like a hard-appliance, which gives the software the look and feel of a rack-mounted appliance, but the core code is running in software. The 'soft-appliance' with appliance-like performance and manageability provides additional flexibility for Intel® SOA Expressway to run on virtualized systems, which ultimately reduces the operational costs while maintaining performance.

Intel® SOA Expressway for Healthcare: Value Propositions for Providers, HIEs, and System Integrators

Intel® SOA Expressway for Healthcare is a healthcare-specific interoperability platform designed to reduce the cost and complexity of HIEs. Intel® SOA Expressway for Healthcare supports legacy implementations at the edge, reducing the level of effort required to integrate and participate in advanced, high performance service networks. The Intel® SOA Expressway for Healthcare platform addresses a number of challenges and issues in deploying an interoperability solution. Some of the key value propositions of Intel® SOA Expressway for Healthcare are:

- **Reduced Complexity:**
  In order to reduce integration costs and time to implementation for HIEs, interoperability must be simplified. Intel® SOA Expressway for Healthcare achieves this by providing a platform-based solution which creates system-level ingredients and network-level services and applications to address data translation (semantic interoperability) for all segments in the market.

- **Comprehensive Architecture, Infrastructure, Software and Services:**
  Intel® SOA Expressway for Healthcare provides a solution which allows for fast and flexible connectivity & evolution of legacy platforms over time. The platform handles 70% of the system integration plumbing, enabling quick creation of network participants, consumption of value-add services, and a blending of for-profit, private network services with non-profit and public network data consumers.



- Trusted Interoperable Exchange Networks:
  Since all Intel® SOA Expressway for Healthcare platform-level transactions are encrypted, audited, and use certified payload exchange models (XML canonicals), all appliance-level peers can semantically validate payload data at either (or both) ends of the transaction - using Validated Ecosystem peer services.

- Extensible Edge Solutions:
  Extending the platform to inside the provider, payer or physician organization, Intel along with other Intel integration systems vendors provide comprehensive solutions to the interoperability challenge both within and across healthcare organizations.

- Scalable from Small-to-Large Healthcare Environments:
  Intel® SOA Expressway for Healthcare preserves existing investment, scales with the growth of the organization, and supports the evolution of legacy systems over time, while accelerating the adoption of the latest healthcare standards.

- High Performance Appliance for SOA:
  Intel® SOA Expressway for Healthcare provides SOA, Web Services and XML acceleration, security and routing coupled with a high performance BPEL-style workflow. It combines the manageability of a hard appliance with the flexibility and virtualization capabilities of software for an overall lower TCO (Total Cost of Ownership) as compared to a hard appliance.

In addition to the overall value propositions, Intel® SOA Expressway for Healthcare provides a number of other unique benefits to systems integrators.

- Business Scalability.
  Systems Integrators can leverage their experience with a proven, viable solution in the marketplace to create additional business opportunities and be recognized as leading solution provider to HIEs.

- Improved Staff Retention.
  Intel® SOA Expressway addresses approximately 40% of the required mundane mapping activities 'out of the box' that allow systems integrators to focus on higher value tasks. As a result, employees tend to be more productive and satisfied in their jobs, which reduces costly turnover.

- Shorter Implementation Schedules.
  Intel® SOA Expressway is designed for rapid deployment, which not only benefits the participants in a health information exchange, but also Systems Integrators. SIs are better able to leverage their resources by quickly and efficiently completing integration projects. This allows them to turnover their assets more frequently – from one project to the next.

- Competitive Bidding.
  Intel® SOA Expressway also enables Systems Integrators to be more competitive in the bidding process because they are able to offer the same or better functionality as others for a lower cost.

Intel® SOA Expressway for Healthcare: Value Propositions for the ISV Community

Much of the code in existing healthcare integration projects is based on dated architectural principles, products, and code. This 'spaghetti code' requires intensive hand coding interfaces such as HL7 2.x, which increases the complexity, time, and resources required to successfully integrate the technologies. The technology is simply outdated. However, growing business and capabilities in healthcare software often comes through acquisition. The challenges of legacy integration technology stacks and architectures make it extremely difficult or impossible to tie these acquisitions into a fully interoperable product suite. This dynamic has resulted in relatively flat business growth in the ISV community as they have struggled to scale their businesses and products beyond projects within hospitals.

To remain viable and competitive, ISVs need an integration engine based on SOA principles to overcome issues associated with integrating legacy systems, outdated architectures, and disparate applications. This would provide them with the capability to scale their products from within a hospital to across a network of hospitals. This will also expand significantly the market and competitiveness for ISVs.

Intel® SOA Expressway for Healthcare is the integration engine ISVs need to remain viable and competitive in the healthcare market. Intel® SOA Expressway for Healthcare enables ISVs to:

- **Power the rapid delivery of next generation architecture** that scales outward with a **high-performance SOA integration engine** married to off-the-shelf general purpose servers.
- **Reduce developer costs** with a p**owerful visual data mapping and process orchestration engine** with robust legacy health care data support rather than hand-coding of interfaces.
- **Reduce capital costs** for healthcare that puts **shared services** in the network using SOA principles rather than duplicating services throughout the architecture and provides flexible, configurable deployments for various clinical settings.
- **Reduce total cost of ownership (TCO) of the health environment** by utilizing a common platform to deliver integration capabilities across EMR modules (acquired or developed), within a single clinical environment and across a community of care network.

Intel® SOA Expressway for Healthcare: Technology Highlights

Intel® SOA Expressway for Healthcare provides visual, reconfigurable information building blocks that enable development of healthcare data flow to support virtual patient-centric information needs. This visual capability greatly reduces integration costs by automating and standardizing data sharing between applications and organization. Users can further extend and enhance their healthcare data services by adding services provided by Intel's robust, Validated ISV Partner Ecosystem. These features enhance the value of Intel® SOA Expressway for Healthcare among HIEs.

- **Fast-Path for Building Business Information Networks.**
  Intel® SOA Expressway combines a high performance workflow engine, native XML acceleration, appliance manageability and codeless design for high-volume, high-throughput SOA architectures. The end goal of Intel® SOA Expressway is to simplify application development for SOA applications that cross domain boundaries in large -scale, high-value SOA architectures and to augment existing SOA architectures to create an integration fast-path for mission-critical applications.
- **Soft-Appliance: Software Manageability and Appliance-like Performance.**
  At its core, Intel® SOA Expressway is designed to reduce the processing complexity and overhead of expensive XML operations including parsing, transformation, routing, validation, and security, and to reduce the cost of developing high-volume data processing business networks. By combining core XML acceleration capabilities with a visual BPEL-style workflow designer, high performance XML-based applications have never been easier to create and manage.
- **Unmatched Price-Performance in Integration and Communications.**
  Intel® SOA Expressway isn't a large suite of separate products that need to be purchased together to address your needs. It is a highly tuned, best-of-breed solution designed for rapid integration and communications that leverages Intel expertise in getting maximum performance out of software, hardware, and operating system technologies. When it comes to creating and operating business information networks, Intel® SOA Expressway provides everything enterprises need – and nothing they don't.

- Unmatched Time-To-Value Realization.
  Using Intel® SOA Expressway, many common integration problems can be addressed entirely within a visual environment. Extensibility features ensure that complex integration is easily addressed and further compression of time-to-value comes from familiar BPEL design-time environment and SOA manageability tooling.
- "Lights Out" Manageability.
  Turn it on, map your data, set up your workflows, configure how you want to communicate, and then go live. Intel® SOA Expressway is built to be fast, reliable, and administration-free in operation – like the best appliance solutions but on industry-standard hardware and OS platforms.
- Partner Compatible.
  In support of SOA principals, Intel® SOA Expressway is stack independent, meaning it does not require any other products to operate effectively yet is delivered with the SDK and hooks to create easy integration with important vertical and horizontal applications, such as eBusiness, ERP, CRM, supply chain, healthcare, and financial systems.
- Rapid Implementation.
  Intel® SOA Expressway can be up and running in 60 days or less – even in complex network and data center environments. Its "codeless" design means that organizations can leverage built-in Services Design tools to map and manage outgoing and inbound content without the assistance of expensive and scarce software development resources, and can connect to networks through multiple, open, standards-based communications protocols.
- Built on SOA Principles.
  Intel® SOA Expressway can integrate into, and operate successfully in legacy, J2EE, or .Net environments and its extensible protocol brokering framework also allows mediation between HTTP, FTP, JMS, MLLP and even custom built socket-based protocols.
- Standards Compliance.
  Intel® SOA Expressway supports the ubiquitous WSDL service model, including all major architectural, business process, and security-related standards, as well as specific standards for multiple vertical mar

Summary

Intel® SOA Expressway for Healthcare is designed to reduce the cost and complexity of deploying HIEs. Historically, there has been significant cost in custom software development for the exchange of healthcare system data. Most of this cost has been represented in significant spend for SI (systems integrators) type solutions. This cost is prohibitive due to the N^2 problem that is characteristic of the healthcare domain. Solutions based on adaptors or EAI broker style solutions, while they help, only serve to mitigate the complexity rather than transform the nature of the problem. A new architecture, based on a healthcare service network and an XML canonical data form is possible with Intel® SOA Expressway for Healthcare.

Intel® SOA Expressway for Healthcare is an Intel soft-appliance built on core technology known as Intel® SOA Expressway that offers XML acceleration, codeless design, and increased manageability. Intel® SOA Expressway for Healthcare addresses directly the problem of forming and joining HIEs by providing specific pre-built services and ecosystem adaptors for common healthcare services found in an HIE. The ultimate goal of Intel® SOA Expressway for Healthcare is to accelerate the adoption of HIEs worldwide by moving the cost calculation from proprietary work to a repeatable product-based solution.

For more information on
Intel® SOA Expressway
for Healthcare, visit
www.intel.com/healthcare

Americas: 1-410-263-3616
UK and Ireland: 44 (0)7919 303 236
All other Geographies: 1-905-681-8768

E-mail: intelsoainfo@intel.com

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