Explaining the Technical Architecture of Health Information Exchange

HIMSS Health Information Exchange Toolkit Task Force Technical Architecture Workgroup (2011)
The HIMSS Definition of Health Information Exchange

A Health Information Exchange (HIE) assists with the transfer and sharing of health-related information that is typically stored in multiple organizations, while maintaining the context and integrity of the information being exchanged.¹ An HIE provides access and retrieval of patient information to authorized users in order to provide safe, efficient, effective, and timely patient care. Formal organizations have been created in a number of states and regions that provide technology, governance, and support for HIE efforts. Those formal organizations are termed Health Information Organizations (HIOs) or Regional Health Information Organizations (RHIOs).

HIEs are formed by a collective group of stakeholders from a specific area or region to facilitate the electronic exchange of health-related information for the purpose of improving healthcare for a defined population. Thus, the HIE provides the ability for participating organizations to safely and securely share health information with authorized providers to improve and expedite the clinical decision making process. An HIE is not an information system within a single organization, nor is it one that has a single directional flow of information. A true HIE involves multi-directional flow of information electronically between providers (hospitals, physicians, clinics, labs) and other sources of administrative or clinical information provided by consumers, health plans, employers, local, state or national organizations.

¹ Please refer to the endnotes for additional information.
According to Wikipedia...

Health Information Exchange (HIE) is defined as:\(^2\)

The *mobilization* of healthcare information

electronically

distributed across organizations

within a *region*, *community*, or *hospital system*.

* The “region” could be city, county, state, nation, or global
In More Technical Terms…

Adapted from Claude Shannon’s Mathematical Model of Communication
Health Information Exchange

1. Somebody has a piece of health information.
2. Somebody transports that piece of health information from Point A to Point B.
3. Somebody needs that piece of health information.

Point A  Point B
Choke Points

While the process may appear simple, there are many choke points along the health information exchange highway.

These choke points can come in many forms such as roadblocks, obstacles, and other things that become obstacles in moving forward.

*Choke points can also be called Health Information Exchange Stop Lights.*
Electronic health information is stored in many different ways (and software languages).

Communicating (exchanging) health information requires shared understanding of what information will be shared and what it means.

Distances are not a barrier for health information exchange, BUT ensuring that the information is secure along the HIEway requires diligence and compliance with HIPAA and privacy laws, regulations, policies, and procedures – at all points from A to B and anywhere that health information may stop, detour, or otherwise travel.
Overcoming Choke Points

Overcoming the choke points is relatively easy. The hard part is **COMMUNICATION:**

- **WHAT** will be communicated
- **HOW** it will be communicated
- **WHERE** it will be communicated
- **WHEN** it will be communicated
- **WHY** it will be communicated

**EXCHANGE = COMMUNICATION**
Exploring the Stop Lights (Choke Points)

Electronic health information is stored in many different ways (and software languages).

- Proprietary or custom code and applications
  - Multiple languages: Java, MUMPS, XML, HTML, C++, C#
- Databases (rarely are two ever the same) or data sets
  - Different types: RDBMS, SQL, Oracle, SAP, Java
- Encounters, notes, images, labs, medications, referrals, and allergies may not be stored in the same location(s), software language, or data types.

We are assuming current health information is stored electronically, even in an “office” file, but paper records and paper-based data (such as fax) is widely used.
Exploring the Stop Lights (Choke Points)

Communicating (exchanging) health information requires shared understanding of what information will be shared and what it means.

- Health Information Exchange begins with “knowing” the patient (in the computer systems)
  - Master Patient Index, sharing basic personal and demographic data
- Agreeing on format, method, and techniques for exchanging health information
  - E.g., common standards for names of things (medications, lab tests, lab results)
- The mechanisms for exchanging health information (secure electronic mail, Web services, etc.)
Exploring the Stop Lights (Choke Points)

Distances are not a barrier for health information exchange, BUT ensuring that the information is secure along the HIEway requires diligence and compliance with HIPAA and privacy laws, regulations, policies, and procedures – at all points from A to B and anywhere that health information may stop, detour, or otherwise travel.

- HIPAA standards for privacy are really only the beginning.
- Maintaining secure information processing standards (and meeting those standards) protects everyone in the health information exchange.
- Creating a “fabric of trust” is the basis for a meaningful health information exchange.
HEALTH INFORMATION EXCHANGE IS HARD
Introducing the Players

PATIENTS

Healthcare customers and consumers.

VENDORS

Technology firms that connect doctors and other healthcare providers with patients. While there is some overlap with the other vendors group below, these are two distinct groups and do not always include the same type of vendors with similar vendor products.

PROVIDERS

Doctors, hospitals, clinics – the people or organizations that actually provide healthcare to patients.

VENDORS

Technology people that connect the payers (insurance, government, etc.) with the providers.

PAYERS

Patients rarely pay directly for the majority of their healthcare services. Payers, or more accurately payer groups, pay the providers for the healthcare services rendered to the patient. Essentially, PATIENTS pay PAYERS and PAYERS pay PROVIDERS – and at some point they all must “talk” to each other.
Communication Transactions

Claude Shannon’s mathematical model of communication can help to explain the complexity in health information exchanges:

\[
N = \frac{n(n-1)}{2}
\]

“\(n\)” is the number of participants in the communication transaction (or health information exchange)

“\(N\)” is the total number of communication channels.

Derived from Shannon’s influential *Mathematical Theory of Communication*³
Communication Transactions within the HIE Environment

According to the formula

\[ n = 5 \text{ (participants in the communication exchange)} \]

\[ N = \frac{5(5-1)}{2} \]

Answer: 10 total communication channels

*This does not work as neatly with Healthcare and Information Exchanges*
Communication Considerations

**PATIENTS**
May equal 1, but there’s likely a spouse, parent, next of kin, or significant other.

**VENDORS**
On average, there may be 4 to 5 information systems and health information systems connecting patients with providers, including electronic mail, Internet access, and other “office” systems.

Providers may use 3 to 4 different health information systems in the typical electronic health record.

Connecting the providers to the payers (if not the patients) may include another 3 to 5 information and health information systems.

Payer information and health information systems add another 4 to 5 systems to the process.

*The total number of information and health information systems in this example could easily be twenty (20) without taking into account the external channels within HIE initiatives.*
Systems

**System**:\(^4\) (n) a collection of components organized to accomplish a specific function or set of functions.

For example, the Department of Defense’s EHR (AHLTA) is made up of modules (lab, pharm, rad, etc.). Those modules, or components, are the “systems” that must communicate with each other to provide documentation and clinical decision support (more components, modules, “systems”) for providing the actual healthcare.

So in the previous counting exercise, what we’re really talking about are the COMPONENTS within a system – just calling them systems keeps things simpler.
New Math

\[
N = \frac{20(20-1)}{2}
\]

190 (or more) communication channels in a health information exchange – and that’s still within one “closed” internal exchange system, not sharing with other external or third party providers, healthcare organizations or trading partners.
What It Really Looks Like

- Electronic Health Record (EHR)
- Electronic Medical Record (EMR)
- Personal Health Record (PHR)
- Computerized Practitioner Order Entry (CPOE)
- ePrescribing & Pharmacy Applications
- Ancillary Systems (lab, imaging, etc.)
- Master Patient Index (MPI)
- Master Provider Index (MPI)
- Clinical Decision Support Systems (CDSS)

GOVERNMENT

- Financial Management Systems
- Enterprise Resource Planning (ERP)
- Earned Value Management
- Decision Support Systems (DSS)

PATIENTS

VENDORS

PROVIDERS

VENDORS

PAYERS

© 2011 HIMSS
Health Information Exchange

A Graphic Example
New Math (revised for HIE)

Now we have 780 communication channels… and we still haven’t included the inner workings of the actual health information exchange.

**Point:** HIE will have many connections that will increase over time as the business, customers, and trading partners expand.
Health Information Exchange

TECHNICAL ARCHITECTURE(s)
What do you want to do?

• **Simple**
  Send or receive “simple” health information (e.g., e-prescribing*).

• **Complex**
  Send, receive, and update more “complex” health information (e.g., consults,* referrals,* diagnostic imaging*).

*NOTE:* These are still pretty complicated processes, and the key differentiator is whether you want to make the health information computable (editable) on both ends.
Usable Examples

• The Direct Project
  Simple
  Best for small practices, clinics
  You likely already have the hardware in place to do this *(for the most part)*

• The Connect Project
  Complex
  Best for larger clinics, hospitals
  Definitely requires some new hardware, software, and a lot of cooperation
  (and communication)
Hidden Costs

Actual costs will vary, and while this list is certainly not comprehensive, these are some “hidden” costs that may not be immediately obvious:

- Design
- Implementation
- Change Management
- Maintenance
Costs (hidden or otherwise)

- **Design**: Software, hardware, and making it all work together

- **Implementation**: Making things actually happen

- **Change Management**: Workflow, processes, policies and procedures that impact both organizational management and processes. The scope of these changes can be traumatic (even in a Level III facility).

- **Maintenance**: Anticipating, planning, and budgeting to keep the health information exchange going needs to begin at the time you decide to kick-off the project (don’t wait until the end of initial development to consider this).
THE NATIONWIDE HEALTH INFORMATION NETWORK (NwHIN)
Community → Regional → State → Nationwide → Global

Community Health Information Network (CHIN)
Early (1990s) series of initiatives linking health organizations within a “community” (city).

Regional Health Information Organizations (RHIOs)
The basic building blocks of health information exchange, RHIOs are regional (local to each other) health organizations that share or exchange health information.

**Local:** Expands the CHIN-type with a better governance structure

**Statewide:** Typically a government-sponsored initiative to implement RHIOs in a state

Nationwide Health Information Network (NwHIN)
HHS/ONC effort to bring together the RHIOs and other health information networks into a more manageable, more sustainable, and better organized health information exchange network.
The Spectrum of Exchange (Basic Steps)

• Simple → Direct
  • Less Simple → RHIO
    • Really Complex → Connect
Basic Steps

Simple (Direct)

Direct: Secure electronic email used as the transport for health information exchange
Intermediate Level Steps

Less Simple (RHIO)

**RHIO**: begins the path to creating more sophisticated health information exchanges at a local or regional level.
Basic to Complex Steps

Really Complex (Connect)

**Connect**: complex “network of networks” using push-pull model of health information exchange within a trusted community (also configurable so that you don’t have to “trust” everyone – just who you want to, and can, Connect with).
Direct Summary

- **Direct** is simply a “push” or sending of health information from a sender to a receiver.
- The focus is on the secure transport of the health information (from Point A to Point B).
- Feedback would be another “push,” so there is not a continuous loop or bidirectional exchange of health information.
- That’s it!
HISPs

Health Information Service Provider(s) (n):
Think of these as similar to your Internet Service Provider. HISPs are the people, services, and technology that make health information exchanges possible (i.e., the vendors, but sometimes more than that).
RHIO Summary

Regional Health Information Organizations are the basic building blocks of a larger health information exchange.
Connect Summary

- **Connect** is a gateway to the Nationwide Health Information Network.
- Helps healthcare entities **connect** their existing healthcare information systems to the Nationwide Health Information Network.
- Fully functional out-of-the-box but allows customization in order to meet the organizational needs and uniqueness of different healthcare information systems.
- Based on service-oriented architecture design principles and Web-services interfaces.
- Individual components can be replaced by custom software that adheres to the Web services interfaces.
- Hosted on different hardware and software platforms, as well as different programming languages.
Push / Pull

Push (a.k.a. “publish”)
Send health information to an external health information recipient (another provider, a payer, etc.)

Pull (a.k.a. “subscribe”)
Requesting health information for a patient as either a provider or payer

NwHIN (and health information exchange) supports push and pull activities
Summary

- **Connect** is a specific solution for exchanging health information (policies and standards).
- Allows individual providers, payers, and potentially patients to “Connect” to one another.
- Using Web services (simply, exposing computer capabilities over the Internet), **Connect** implements a Service-Oriented Architecture (SOA).
  - SOA allows for a modular and evolutionary “system of systems” to plug into other modular and evolutionary “systems of systems” using a common, shared, and open source set of standards.
  - SOA creates a “network of networks.”
An Overview

SERVICE-ORIENTED ARCHITECTURE (SOAs)
What Is SOA?

Service-Oriented Architecture:\(^5\)

- SOA is a *medium for exchange of value between independently acting participants*;
- Participants (and stakeholders in general) have legitimate claims to *ownership of resources* that are made available via the SOA; and
- The behavior and performance of the participants are subject to *rules of engagement* which are captured in a series of policies and contracts.
And...

- SOA is a set of standards and practices for exchanging health information – emphasis on the *exchange*.
- Patient information remains the property of the patient – consent determines how and with whom the information may be exchanged.
- SOA really orchestrates many different systems (computers, applications, etc.) to act like a single “system of systems” – governance, policies, and procedures enforce how all this communication occurs.
HEALTH INFORMATION EXCHANGE as SOA
Connect Core Services⁶ (An SOA “Stack”)

Consumer Services

- Consumer Preferences Profile
- Query Audit Log

Information Exchange Services

- Patient Discovery
- Query for Documents
- Retrieve Documents
- Health Information Event Messaging
- Authorized Case Follow-up

Infrastructure Services

- NHIE Services Registry
- Authorization Framework
- Messaging Platform
Consumer Services

- **Consumer Preferences Profile**
  - Acknowledge HIPAA rights
  - Consent for health information exchange (and any limits)

- **Query Audit Log**
  - A mechanism to track who’s looking for what in someone’s records (where, when, how, and maybe why, too)
Information Exchange Services

- **Patient Discovery**
  Keeping the right patients with the right data

- **Query for Documents**
  Search protocols, and how those searches are done and recorded

- **Retrieve Documents**
  How documents and records will be returned from those searches done in “Query for Documents”

- **Health Information Event Messaging**
  A “publish / subscribe” mechanism to send or retrieve health information

- **Authorized Case Follow-Up**
  The processes of reidentifying pseudomized data or records
Infrastructure Services

- **NHIE Services Registry**
  The list (registry) of connected participants in a Health Information Exchange – this is what allows you to find other “players,” and for them to find you

- **Authorization Framework**
  The patient’s parameters for health information exchange (what they’ll share and what they won’t), similar to but more comprehensive than HIPAA

- **Messaging Platform**
  The systems or components that permit health information exchange
The Core Services\(^7\) Come Together

**Transaction Profiles**
Utilize exchange patterns for specific transactions

- CMS CARE Doc Submission
- CDC GIPSE HIEM
- MITA Eligibility Verification

**Discovery and Information Exchange Services**
Rely on foundations to enable exchange patterns

- Discovery
  - Patient Discovery
  - Services Registry
- Pull
  - Query & Retrieve Docs
  - Eligibility Verification
- Push
  - Doc Submission
- Pub/Sub
  - HIEM

**Messaging, Security, & Privacy Foundations**
Enable private, secure, and interoperable communication of health information

- Messaging Platform
- Authorization Framework

---

Designates Pilot Use

© 2011 HIMSS
An SOA Is Born!

- Transaction Profiles
  Utilize exchange patterns for specific transactions
  - CMS CARE Doc Submission
  - CDC GIPSE HiEM
  - MITA Eligibility Verification

- Discovery and Information Exchange Services
  Rely on foundations to enable exchange patterns
  - Discovery
  - Pull
  - Push
  - Pub/Sub
  - Patient Discovery
  - Services Registry
  - Query & Retrieve Docs
  - Eligibility Verification
  - Doc Submission
  - HiEM

- Messaging, Security, & Privacy Foundations
  Enable private, secure, and interoperable communication of health information
  - Messaging Platform
  - Authorization Framework

- Connect Gateway

- Adapter
  - Patient Identity
  - Health Data
  - Exchange Decision
  - Disclosure History
  - Future Services
    - Terminology Mapping
    - Document Viewers
    - Clinical Decision Support
    - Other

- Your Existing Health Information System
  - Master Patient Index
  - Health Information
  - Exchange Policies
  - Audit Logs
Connect On-ramps to the NwHIN®

Other Health Organizations

- Locate Patients
- Locate/Retrieve Health Documents
- Publish/Subscribe to Data Feed
- Retrieve Disclosure History
- Locate Health Systems/Services

NHIN Conventions
Framework for Authorization, Security, Privacy

- Patient Identity
- Health Data
- Exchange Decision
- Disclosure History
- Future Services

Future Services

- Terminology Mapping
- Document Viewers
- Clinical Decision Support
- Other

Your Existing Health Information System

- Master Patient Index
- Health Information
- Exchange Policies
- Audit Logs

External NHIN API
Internal Connect API
Proprietary/Custom Interface

© 2011 HIMSS
A Deep Dive into the Basics of Health Information Exchange
(the Verb)

ARCHITECTURAL DETAILS
Searching for Patients

Integrating the Healthcare Enterprise (IHE) Profile: PDQ⁹, Patient Demographics Query¹⁰
Patients – Finding the **Right Patient**

Integrating the Healthcare Enterprise (IHE) Profile: PIX, Patient Identifier Cross-Referencing

© 2011 HIMSS
Found a Patient...Share a Patient?

Using the IHE profiles PDQ and PIX, it is possible to search within “networks of networks” (RHIO, NwHIN, etc.) to select and prepare a patient’s health information for exchange – send the data from Point A to Point B.
Finding a Patient in a Health Information Exchange (XCPD - Cross Community Patient Discovery)

**Act Inbound – Receive XCPD message**

- **Responding Gateway**
  - Receives XCPD request
  - Invoke audit log (Yes → Service enabled?)
  - Establish Patient Correlation (Yes → Patient ID in request message?)
  - Send demographics and patient id (Yes → Single match found?)
  - Send empty msg

- **Requesting Gateway**
  - Send request message
  - Receive response message

**Adapter I/F**

- Pass-through mode (No → Invoke Policy Engine?)
  - Query MPI (Yes)
  - No

© 2011 HIMSS
Sending Patient Information Through the Health Information Exchange (XDR - “Push”)

**Act Outbound**

- **Activity Initial**
  - Initiate XDR request message
    - Receive XDR request message
      - Invoke audit log
        - Create XDR message
          - Yes: Receive XDR request
            - Get Connection info from Connection manager
              - Invoke policy engine
                - No: Send XDR request
                  - Send XDR request to log request
                    - Send XDR request
                      - Receive XDR request
                        - Send Ack to initiating gateway
                          - Activity Final
                            - Policy check passed?
                              - Yes: Receive XDR request
                                - Get Connection info from Connection manager
                                  - Invoke policy engine
                                    - No: Send XDR request
                                      - Send XDR request to log request
                                        - Send XDR request
                                          - Receive XDR request
                                            - Send Ack to initiating gateway
                                              - Activity Final
Who, What, Where, When, Why, and How…as technical architecture

THE JOURNALISM OF HIEs AND DIRECT PROJECT
Communication

Let’s explore this in a little more detail:

**WHAT** will be communicated

**HOW** it will be communicated

**WHERE** it will be communicated

**WHEN** it will be communicated

**WHY** it will be communicated
Who? (Examples\textsuperscript{11})

<table>
<thead>
<tr>
<th>EHR VENDORS</th>
<th>ONC-APPROVED STATE PLANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4Medica</td>
<td>Alabama</td>
</tr>
<tr>
<td>Aprima Medical Software, Inc.</td>
<td>California</td>
</tr>
<tr>
<td>Allscripts</td>
<td>Florida</td>
</tr>
<tr>
<td>Care360</td>
<td>Illinois</td>
</tr>
<tr>
<td>Cerner Corporation</td>
<td>Iowa</td>
</tr>
<tr>
<td>CPSI</td>
<td>Kentucky</td>
</tr>
<tr>
<td>eClinicalWorks</td>
<td>Minnesota</td>
</tr>
<tr>
<td>e-MDs</td>
<td>Missouri</td>
</tr>
<tr>
<td>Epic</td>
<td>Montana</td>
</tr>
<tr>
<td>GE Healthcare</td>
<td>New Hampshire</td>
</tr>
<tr>
<td>Greenway</td>
<td>New Jersey</td>
</tr>
<tr>
<td>HealthyCircles</td>
<td>North Carolina</td>
</tr>
<tr>
<td>MD-IT</td>
<td>Ohio</td>
</tr>
<tr>
<td>Med3000</td>
<td>Oregon</td>
</tr>
<tr>
<td>MEDgile</td>
<td>Rhode Island</td>
</tr>
<tr>
<td>NextGen</td>
<td>South Carolina</td>
</tr>
<tr>
<td>OpenEMR</td>
<td>Texas</td>
</tr>
<tr>
<td>Polaris</td>
<td>Vermont</td>
</tr>
<tr>
<td>RelayHealth</td>
<td>West Virginia</td>
</tr>
<tr>
<td>Sage Healthcare Division</td>
<td>Wisconsin</td>
</tr>
<tr>
<td>Siemens</td>
<td></td>
</tr>
<tr>
<td>Sunquest Information Systems, Inc.</td>
<td></td>
</tr>
<tr>
<td>WorldVistA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HIEs and HIOS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indiana Health Information Exchange</td>
<td>MedVa</td>
</tr>
<tr>
<td>Delaware Health Information Network</td>
<td>Utah Health Information Network</td>
</tr>
<tr>
<td>Health Information Network of South</td>
<td>SEMH</td>
</tr>
<tr>
<td>Texas (HINST)</td>
<td>Colorado Health Information Exchange</td>
</tr>
<tr>
<td>RedwoodMedNet</td>
<td>Northeast Kentucky RHIO</td>
</tr>
<tr>
<td>The Bronx RHIO</td>
<td>Rochester RHIO</td>
</tr>
<tr>
<td></td>
<td>SAFEHealth</td>
</tr>
<tr>
<td></td>
<td>MiHIN Shared Services</td>
</tr>
<tr>
<td></td>
<td>LCF Research/NMHIC</td>
</tr>
<tr>
<td></td>
<td>NEHII</td>
</tr>
<tr>
<td></td>
<td>SFHEX</td>
</tr>
<tr>
<td></td>
<td>Michigan Health Connect</td>
</tr>
</tbody>
</table>
What?

DIRECT Reference Implementation\textsuperscript{12}
Where?

2010 – 2011 Direct Project Pilot Sites

Private Practices → Hospitals → State/Federal Agencies

- Minneapolis – Hennepin County Medical Center
- New York – Hudson Valley
- Rhode Island – Rhode Island Quality Institute
- Tennessee – CareSpark and Dept of Veterans Affairs
- California – Redwood MedNet
- Connecticut – Middlesex Hospital and Community Health Center, Inc.
- Texas – South Texas (a lot of players in this one)
- Missouri – Heartland Regional Medical Center (St. Joseph)
When?

**IMPORTANT**: before health information can be exchanged, patient consent must be obtained. There are two models in use today:

- “opt in” – requires patient consent before health information may be used in the health information exchange
- “opt out” – requires patient consent to limit or restrict health information within the health information exchange

- **Push (publish)**: Direct essentially sends health information from Point A to Point B
- **Pull (subscribe)**: Within an HIE Point, can look for pertinent health information for its patients; then once health information is pushed out or published, the subscribing participant pulls it in
- **Together**: Complex pushing and pulling of health information
Why?

- Health Insurance Portability and Accountability Act (1996)
- Consumer Credit Act (2006)
  Subtitle D of the Health Information Technology for Economic and Clinical Health Act (HITECH)

While there are many studies that question the efficiencies and effectiveness of electronic health records (and by caveat health information exchange), health information exchange supports evidence-based clinical practices, as well as improved clinical decision support.
How?
Any Questions?

Healthcare Information and Management Systems Society (HIMSS)
Health Information Exchange Toolkit Task Force
Technical Architecture Workgroup (2011)
References

1. HIMSS HIE Wiki: https://himsshie.pbworks.com/w/page/4775490/HIEDefinition
7. NHIN-Connect briefing to HIMSS (1-3 Mar 2010), NHIN Specifications.
8. Connect Overview for HIMSS (1-3 Mar 2010).
11. The Direct Project: http://directproject.org/content.php?key=getstarted
Figure Sources


Slides 29-32 Adapted from HHS/ONC briefing at HIMSS 2010 (1-3 Mar 2010), *NHIN and Connect at a Glance*


Slide 35 Shutterstock: http://www.faqsys.org/photo-dict/photofiles/original/457/833building_blocks.jpg

HIMSS website, HIE Wiki: https://himsshie.pbworks.com/w/page/4775490/HIEDefinition


Slides 53, 55-56 Adapted from *Connect Architecture* presented at HIMSS 2010 (1-3 Mar 2010)


Slide 64 Adapted from CONNECT v2.2: http://mita-tac.wikispaces.com/file/view/CONNECT%2BRelease%2B2.2%2BSoftware%2BArchitecture_100309.pdf

Resources

HIMSS HIE Tools and Resources
http://www.himss.org/ASP/topics_rhio.asp

Department of Health & Human Services, Office of the National Coordinator, Federal Health Architecture
http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__federal_health_architecture/1181

The Connect Project
http://www.connectopensource.org/

The Direct Project
http://directproject.org/

Integrating the Healthcare Enterprise
http://www.ihe.net/
Disclaimer

The inclusion of an organization name, product or service in this slide presentation should not be construed as a HIMSS endorsement of such organization, product or service, nor is the failure to include an organization name, product or service to be construed as disapproval.