Interoperability: Transport

Key Points

- Compatible transport is required for system-to-system interoperability, which requires data trading partners to be in sync with their transport strategies.
- Many transport styles and protocols are in use today, often making it challenging to choose the right strategy.
- PHAs need to narrow their transport options and leverage HIEs and other intermediaries inside and outside of government. Fewer options simplify the technical environment and reduce overall cost of deployment and support.

For health information to be useful, it must be available at the right time, and with the right person, to help make the right decision. As health information increasingly becomes digital, this means that health information systems—whether in healthcare or public health—must be able to communicate digitally in standardized ways. This is what is meant by interoperability, which is, "the ability of two or more systems or components to exchange information and to use the information that has been exchanged."[1] The first challenge of system-to-system interoperability is compatible transport between systems. This is separate and distinct from a transmission's *format,* which represents the *content* that a transport protocol is transmitting.

Different protocols for transport are in use today to support everything from ATM transactions to email to the secure exchange of health information. Even within the health arena, several transport protocols exist to support different types of exchange. Ideally, all senders and receivers of health information, including public health agencies (PHAs), should support just a few nationally-selected protocols for health information exchange. While the national discussion is coalescing around a few choices, PHAs, which often have a long tradition of information exchange, find themselves with many data transport strategies already deployed. This presents a challenge for public health, which needs to plan strategies to simplify and leverage transport protocols. This can mean reducing the number of protocols in play or looking to more efficient

Case Studies

Tennessee is setting up a HISP (Health Information Service Provider) that will enable state agencies to send and receive patient information using Direct secure e-mail. The first use case is to enable the department of health to receive HL7 immunization registry messages using Direct secure e-mail as a transport mechanism.

Rhode Island deployed HTTPS Post a number of years ago to support submission of immunizations to KIDSNET, their integrated child health system. Using CDC interoperability grant funding, RI is implementing SOAP-based web services for both submission and query of immunization data using the CDC/AIRA developed standards.

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[1] See Patricia Gibbons, et al, *Coming to Terms: Scoping Interoperability for Health Care*, Health Level 7 Electronic Health Record Interoperability Work Group, February 2007. < http://www.hl7.org/documentcenter/public/wg/ehr/ComingtoTerms2007-03-22.zip>

channels, such as health information exchanges (HIEs) or public health gateways, through which external transmissions are directed.

Different use cases require different architectures and different styles of data transport, from "push" transactions where the data provider is responsible for pushing the data out, to "pull" transactions whereby the burden of getting the data is on the receiver (Figure 1).

Less Sophisticated   *More Sophisticated*

"Push" Transactions   "Coupled Push" Transactions;   "Pull" Transactions
"Uni-directional"   Publish/Subscribe   "Bi-directional"

Figure 1: HIE Transaction Continuum

For "push" transactions, the sender and receiver are known before the transaction begins. Any content can be sent, and this one-way "push" has no real provision for a response. With "push" strategies, exchange relationships can be established on the fly rather easily within a trusted community of users. For "pull" transactions, the receiver queries a data source (an HIE, a PHA, or some other entity) for records. If data is found, the entity returns records from one or more sources. Often web services are used, and specific data sets must be pre-defined for query and response. Business relationships and technical infrastructure between participating organizations—and even programs within an agency—need to be established before any exchange takes place. More sophisticated transactions require careful planning before a transport protocol is selected; you cannot make decisions about transport without considering the types of interoperability *transactions* you want to support and ensuring that the desired transport technology is compatible.

Many different transport protocols can be used, and they vary in their degree of maturity and in the ease with which they can typically be adopted (see Figure 2 and Table 1).
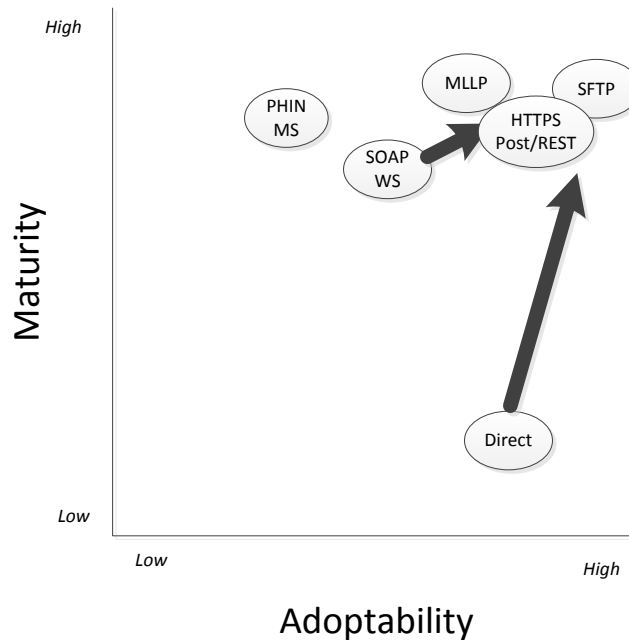
Figure 2: Transport Technology Spectrum

Method	Description
Direct	Simple, secure, scalable, standards-based way for participants to "push" encrypted health information directly to known, trusted recipients over the Internet
HTTPS POST/REST	Common form of transport used by web browsers to send data to web services and receive a response
MLLP	Relatively simple form of message transport over TCP/IP
PHINMS	CDC-created software for public health data exchange that uses a "drop box" approach for sending and receiving messages
SFTP	Internet standard for point-to-point interactive or "batched" secure file transfer
Web Services	SOA-based strategy for enabling systems to send and receive data securely supporting fairly sophisticated options

Table 1: Transport Technologies Defined

In their respective domains, web services ("pull") and Direct ("push") are emerging as the most preferable transport options. Many EHR, HIE, and public health system implementations are leveraging web services as part of a services-oriented architecture[2]– web services are also the basis of

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[2] See Arzt NH, Service-oriented architecture in public health, J Healthc Inf Manag. 2010 Spring;24(2):45-52.

the national eHealth Exchange.[3] The Office of the National Coordinator for Health IT (ONC) has been a strong proponent of Direct as a way to jump start information exchange, especially among participants with less sophisticated technical capabilities.[4]

Many PHAs already contend with too many transport strategies which is unsustainable in the long run, and costly to support in the short run. There is tension between the desire to choose the correct architecture and transport for a particular need, and the risk that an organization will end up with too many different protocols to support. PHAs may be forced to compromise simply to reduce the number of protocols and strategies being used, for example, using a more sophisticated technology for a relatively simple task (e.g., using SOAP-based web services merely to carry a unidirectional data report), or using a simpler technology for a more sophisticated task (e.g., using a pair of asynchronous Direct messages to simulate a query/response).

HIEs have begun to intermediate in public health reporting services. Today, HIEs typically rely on existing means of connectivity which often use proprietary vendor protocols delivered over virtual private network (VPN) connections. Some HIEs provide value-added services (such as semantic coding or message filtering), while others simply transport the data from source to destination. While compatibility with *de facto* or emerging standards is important, HIEs are in a good position to provide the necessary gateways and translations for their members, including PHAs. Many states are also focusing their connectivity options through a single state gateway or portal, providing leveraged connections for simpler, less costly, and less redundant data exchange.

Action Steps for State and Local PHAs

- Inventory the transport protocols currently supported by your agency, the types of exchanges (e.g., electronic laboratory reporting, immunizations, cancer reports), the types of data trading partners involved, and the number of partners. Consider also any legal requirements or restrictions on transport in your jurisdiction.
- Identify which transports are preferred by your data trading partners.
- Regardless of how wedded your agency is to current transport protocols, identify one to two protocols that are likely to deliver the greatest value (support the broadest number of types of exchanges with the most partners) and longevity, limiting the number of data exchange protocols deployed for interoperability to those few.
- Consider the use of health information exchanges (HIEs) to simplify the number of interfaces between the PHA and the community.

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[3] http://healthewayinc.org/

[4] http://www.healthit.gov/policy-researchers-implementers/direct-project. Many public health agencies feel under pressure to support the Direct protocol, in large part because Direct has become the transport most emphasized in Meaningful Use and in the state HIE cooperative agreements from ONC. The main driver and goal for Direct is a simple one: Get as many exchanges going as possible so we can prove it works and so that healthcare improves through more timely and complete patient health information. Public health agencies need to balance any desire to support those goals with support transport protocols that meet their needs and those of their data trading partners.

- Consider the deployment of a single point of interface, or gateway, between public health and outside data trading partners to simplify paths into and out of the agency and reduce costs. HealtheWay provides one such set of services which may increasingly interconnect HIEs to each other and provide a useful connection point for PHAs to the outside world.
- Finally, be sensitive to the needs of individual programs as agency-wide decisions are made. The cost of change can be significant to a program even if overall agency efficiency is increased.

Leadership Steps for National Agencies and Organizations

- Continue to work at the national level to focus and streamline the variation in transport protocols that are supported for interoperability in the larger healthcare ecosystem.
- Provide guidance, direction, and expert consulting to PHAs that require assistance in evaluating their data transport alternatives.

More Information

http://www.hln.com/expertise/hit/hie/hie-standards.php#trans
http://www.syndromic.org/meaningfuluse/IAData/Architecture
http://www.healthit.gov/policy-researchers-implementers/nationwide-health-information-network-nwhin

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