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| NHIN Direct Overview |

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| --- | --- | --- | --- |
| **Change History** | | | |
| **Change Summary** | **Author** | **Organization** | **Date** |
| Initial Draft | Nagesh Bashyam | Harris Corporation | 7/21/2010 |
| Edits | David Tao & others | Siemens | 7/22/2010 |
| Edits | Will Ross | Redwood MedNet | 7/23/2010 |
| Edits | Rich Elmore | Allscripts | 7/24/2010 |
| Edits & formatting | Will Ross | Redwood MedNet | 7/25/2010 |
| Minor edits | David Tao | Siemens | 7/26/2010 |
| Baseline Version A for Document Work Group Review | Nagesh Bashyam | Harris Corporation | 7/27/2010 |

# Introduction: What is NHIN Direct?

Today, communication of health information among providers and patients is most frequently printed to paper that is mailed or faxed. One of the initial goals of NHIN Direct is to benefit patients and providers by communicating more quickly, securely, inexpensively, and “greenly” than paper.

NHIN Direct is a project to create specifications and service descriptions that, when implemented within a strong policy framework, enables simple, secure point-to-point electronic messages between health care participants. The project was initiated and sponsored by the United States Office of the National Coordinator for Healthcare Information Technology (ONC). NHIN Direct is a core component in the development of the Nationwide Health Information Network (NHIN).

***The Crux of NHIN Direct*: NHIN Direct specifies a *simple, secure, scalable, standards-based* way for participants (care providers, EHRs, etc.) to send encrypted health information *directly to known, trusted recipients (including patients) over the Internet*. NHIN Direct participants will be able to communicate securely via e-mail and via more comprehensive NHIN related standards.**

NHIN Direct enables standards-based point-to-point messaging in support of Stage 1 Meaningful Use (MU) measures.[[1]](#footnote-1) Examples include communication of summary care records such as HL7 Continuity of Care Document (CCD) or ASTM Continuity of Care Record (CCR), discharge summaries and other content[[2]](#footnote-2) in support of coordination of care and patient engagement. NHIN Direct focuses on the technical mechanisms (standards and services) to transport content from point A to point B, which is the meaning of the term “Direct” in its name. NHIN Direct, by itself, does not satisfy any Meaningful Use measures. When NHIN Direct is used by providers to transport and share qualifying EHR content, the combination of clinical content plus NHIN Direct transport may satisfy “meaningful use” requirements.

NHIN Direct is based on simplifying assumptions. It allows the secure communication of health data among a known set of health care participants who already trust each other. NHIN Direct inherits the patient consent that was obtained by the participants prior to transferring information using NHIN Direct standards and services.

In contrast to other standards and services such as NHIN Exchange, NHIN Direct is **not** targeted at complex scenarios, such as an unconscious patient brought by ambulance to an Emergency Department. Unlike the simple point to point NHIN Direct communication pattern, a provider in the ED must “search and discover” whether this patient has records available from any clinical source. This type of broad query is not a simple and direct communication pattern, but rather requires a more robust set of health information exchange tools and services.

NHIN Direct is an open government initiative started by the ONC, and is an integral component in a broader national strategy to have an interconnected health system through a Nationwide Health Information Network (NHIN). The NHIN is a set of communication conventions that provide the foundation for the secure exchange of health information including technical, policy, data use and service level agreements and other requirements that enable secure health information exchange over the Internet, with the following key attributes:

* Ability to find and access patient information among multiple providers;
* Support for the electronic exchange of information using common standards; and
* Documented understanding enabling trust among participants, such as the Data Use and Reciprocal Support Agreement (DURSA).

# How was NHIN Direct Started?

The NHIN Work Group, part of the federal Health IT Policy Committee (HITPC), has been developing recommendations to extend secure health information exchange using NHIN standards to the broadest possible audience. Potential NHIN adopters include organizations and individuals with varying levels of health information exchange requirements as shown in Figure 1.

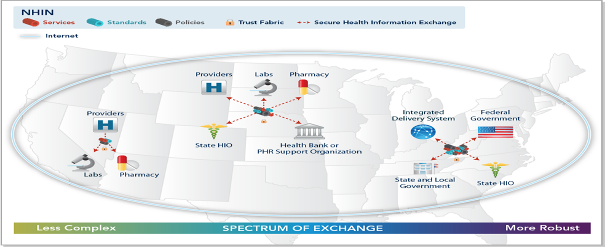


Figure 1: Spectrum of health information exchange to be supported by the NHIN

The NHIN Exchange[[3]](#footnote-3) standards and services developed under recent federal contracts were designed for a robust type of health information exchange. Analysis of the NHIN Exchange standards by Wes Rishel and David McCallie in 2009 highlighted the need for “simple interoperability” among healthcare providers. To enable simpler point to point communication, the NHIN Work Group recommended the creation of additional NHIN specifications to include *simple, direct, secure standards for point-to-point messages*. The Implementation and Adoption Workgroup of the Health IT Standards Committee (HITSC) expressed support for the idea of “simple interoperability” by noting that “one size does not necessarily fit all.” There are standards in NHIN Exchange that support less complex information exchange, but the Workgroup was concerned that these standards were complex and difficult to adopt rapidly by all health care providers. For this reason, NHIN Direct was started to complement NHIN Exchange with a simpler electronic communication option.

Meaningful Use (MU) includes financial incentives for eligible providers (physicians) and hospitals to adopt Electronic Health Records (EHRs). NHIN Direct recognizes that the majority of physicians and hospitals have not yet implemented EHRs, and that it is important to “meet them where they are” to help them take steps to exchange information, even as they gradually “ramp up” to adopt EHRs. NHIN Direct aims to reduce the barriers to entry for all stakeholders, including providers who have EHRs, providers who do not, vendors, service providers, and patients. Thus NHIN Direct focuses primarily, but not exclusively, on the left side of the “Spectrum of Exchange” (Figure 1) while also recognizing that exchanges are not limited to “simple to simple.” For instance, a small physician practice may currently have little or no EHR technology and may need to communicate with an integrated delivery network that has robust EHR technology. NHIN Direct aims to facilitate communication across the entire spectrum, in either direction, between less complex and more robust health care settings.

# Who will use NHIN Direct?

The NHIN Direct standards and services can be adopted by any organization or person (such as a physician or a patient) trying to implement simple direct point-to-point electronic communications. For some providers, these communications are part of satisfying Stage 1 Meaningful Use (MU) criteria through electronic health records or EHR modules. NHIN Direct can also help improve business processes or patient and family empowerment by efficient exchange of health information. The NHIN Direct project enables these stakeholders to achieve these goals by selecting or developing standards and services that can be implemented using widely available technology. The senders and receivers of NHIN Direct messages can be humans or technology systems. Technology can range from certified comprehensive EHRs or individual EHR modules (as defined by the CMS final rule on meaningful use), to Personal Health Records, or to other technology that is not part of an EHR -- such as a simple e-mail client or web browser – that can communicate health information securely. In some cases, direct human intervention is involved on both ends of the communication, such as a physician composing an e-mail to another physician and attaching a document. A different scenario might involve human intervention on only one end of the communication, such as an EHR automatically generating an e-mail to a patient. Similarly a completely automated scenario might involve one EHR automatically communicating with an HIE or another EHR, automatically routing and/or storing the message: however, the “entirely automated” scenario requires more than the minimum required data to be sent for effective processing within the business workflow.

A sample set of user stories that can be enabled using the NHIN Direct standards and services are listed below. The NHIN Direct project created this set of user stories to facilitate the development of the NHIN Direct standards and services according to the following priorities.

* Priority 1: Supportive of Stage 1 meaningful use. Targeted for implementation in the first version of NHIN Direct.
* Priority 2: Priority for early implementation but have dependencies on additional policy considerations
* Priority 3: Other high priority use cases.

An example of a user story is the **referral** from one provider to another. In this user story, the referring provider has determined that it is clinically and legally appropriate to send a referral and summary of care to a specialist. The referring provider searches for a patient in the practice EHR and initiates a referral message. The referral reason is described in the message. In some cases the referral is directed to a specific specialist, and in other cases to a specialist practice. The referring provider attaches clinical documents as needed for reference, and then sends the referral. The specialist sees the new referral in her local practice EHR. If this is a new patient for the practice, a new patient is created in the EHR. The core referral and the various documents are imported into the new patient's chart. The rest of the user stories along with their priorities are listed below:

|  |  |  |
| --- | --- | --- |
|  | **Story** | **Priority** |
| 1 | Primary care provider refers patient to specialist including summary care record | 1 |
| 2 | Primary care provider refers patient to hospital including summary care record | 1 |
| 3 | Specialist sends summary care information back to referring provider | 1 |
| 4 | Hospital sends discharge information to referring provider | 1 |
| 5 | Laboratory sends lab results to ordering provider | 1 |
| 6 | Transaction sender receives delivery receipt | 1 |
| 7 | Provider sends patient health information to the patient | 1 |
| 8 | Hospital sends patient health information to the patient | 1 |
| 9 | Provider sends a clinical summary of an office visit to the patient | 1 |
| 10 | Hospital sends a clinical summary at discharge to the patient | 1 |
| 11 | Provider sends reminder for preventive or follow-up care to the patient | 1 |
| 12 | Primary care provider sends patient immunization data to public health | 1 |
| 13 | Provider or hospital reports quality measures to CMS | 2 |
| 14 | Provider or hospital reports quality measures to State | 2 |
| 15 | Laboratory reports test results for some specific conditions to public health | 2 |
| 16 | Hospital or provider send chief complaint data to public health | 2 |
| 17 | Provider or hospital sends update to regional or national quality registry | 2 |
| 18 | Pharmacist sends medication therapy management consult to primary care provider | 2 |
| 19 | A patient-designated caregiver monitors and coordinates care among 3 domains | 2 |
| 20 | A Provider EHR orders a test | 2 |
| 21 | A patient sends a message to the provider | 2 |
| 22 | Transaction sender receives read receipt | 3 |
| 23 | State public health agency reports public health data to Centers for Disease Control | 3 |

The details for each of the user stories can be accessed at <http://nhindirect.org/User+Stories>. The analysis of user stories leads to common patterns that would be required to satisfy these user stories. Some of these patterns include

* A need to uniquely identify the sender of the health information
* A need to uniquely identify the recipient of the health information
* A need to deliver health information from the sender
* A way to separate the routing of the health information from the clinical content, which includes formal as well as informal types of content (for example, simple text narrative, or formal structured documents such as a CCD or CCR or a lab test result).
* Security that establishes and verifies trust between the participants and protects the content being transferred.

# NHIN Direct Project Organization and Participation:

The NHIN Direct project is coordinated by [Arien Malec](http://nhindirect.org/Arien+Malec) with the guidance of the [Office of the National Coordinator](http://healthit.hhs.gov/portal/server.pt?open=512&objID=1200&parentname=CommunityPage&parentid=1&mode=2&in_hi_userid=10741&cached=true). The policy direction for NHIN Direct is provided by the NHIN Work Group of the HIT Policy Committee, and oversight related to technology standards is provided by the HIT Standards Committee.

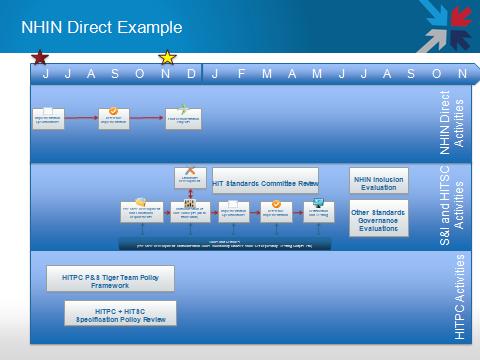


Figure 2: Integration of NHIN Direct in the HITSC and HITPC project calendars

The NHIN Direct project provides multiple avenues for organizations to contribute to the development of standards and services. To facilitate effective coordination and expedited development of standards and services, the NHIN Direct project is organized into multiple work groups, each of which has a dedicated set of goals and timeline.

The work group collaboration is facilitated by use of a wikis[[4]](#footnote-4) (<http://www.nhindirect.org>), by weekly and monthly meetings, and by blogs and discussion lists. Currently more than 200 organizations participate in the NHIN Direct project. These participants include EHR/PHR vendors, Medical Organizations, Systems Integrators, IDN’s, Federal Organizations, State and Regional HIOs, HIE Technology Organizations, and HIT Consultants. Many NHIN Direct participants are also active in standards organizations such as HL7, IHE, ASTM, etc. The participants provide varying level of support the NHIN Direct project. The latest information on the currently active work groups, participation guidelines, meeting times etc. can be found at <http://nhindirect.org/>.

# Implementers (Enablers) of NHIN Direct

Organizations which create initial implementations of the NHIN Direct standards and services via the project’s conformance testing process are the enablers of NHIN Direct. Examples of such organizations include EHR/PHR vendors, Health Internet Service Providers (HISPs), Health Information Exchange organizations, and Integrated Delivery Networks. The implementers can offer NHIN Direct services via multiple delivery models such as

* Subscription based services
* Product offerings that include the NHIN Direct standards, services and other value added services
* Provide IT services to create a custom implementation for the adopting organization.

In addition to these organizations, the NHIN Direct Implementation Geography Work Group is organizing real-world pilots to demonstrate health information exchange using NHIN Direct standards and services. Organizations who are interested in participating in the real-world pilots can sign up at <http://nhindirect.org/Implementation+Geographies>.

To help the NHIN Direct implementers, an open source reference implementation of the NHIN Direct standards and services is being implemented under the guidance of the NHIN Direct project and is available to all organizations from <http://nhindirect.org>.

# Relationship between the NHIN, NHIN Direct and NHIN Exchange:

The NHIN standards and services will ultimately constitute the standards and services developed by both NHIN Direct and NHIN Exchange.

The NHIN Exchange connects a diverse set of Federal Organizations and private entities to securely exchange health information using the robust NHIN Gateway standards and services that exist currently. The NHIN Connect project provides open source software in support of NHIN Exchange. In order to participate and adopt NHIN Exchange services, an organization needs to complete an “On-boarding” process that consists of:

* An application for participation with a sponsoring Federal Agency
* Execute a trust agreement called DURSA (Data Use and Reciprocal Support Agreement)
* Complete required testing and validation of the NHIN Exchange services.
* Organizations have to be accepted by the NHIN Cooperative which operates the NHIN Exchange

Unlike the NHIN Exchange, the NHIN Direct project does not require the adopting organization to participate in a formal federal on-boarding process, and hence lowers the barrier for adoption of electronic health records (EHRs). The NHIN Direct standards and services can be implemented by any organization or community with its own governance body and can communicate with other communities using the standards and services without a central governance structure.

# Technical Discussion

This section discusses the various NHIN Direct specifications, services, and standards. Each of the subsections provides an overview and discusses the key elements that comprise the NHIN Direct specifications.

## NHIN Direct Abstract Model:

The NHIN Direct Abstract Model shown in Figure 3 was created from the analysis of the user stories to capture the various NHIN Direct participants and the messages[[5]](#footnote-5) that are exchanged between the participants. This Abstract Model forms the basis of the various NHIN Direct technical specifications and provides a common framework that can be used by the various stakeholders to discuss NHIN Direct standards and services. The terminology and concepts that are associated with the NHIN Direct Abstract Model is defined in the next section.

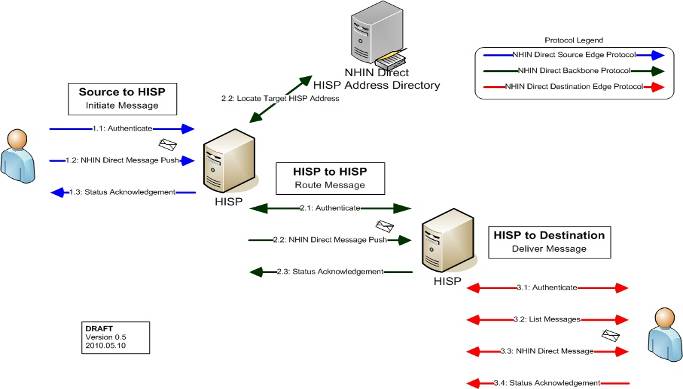


Figure 3: NHIN Direct Abstract Model

## NHIN Direct Terminology and Concepts:

The NHIN Direct Abstract Model is used to define the following concepts which will be used extensively in creating the NHIN Direct standards and services for health information exchange.

### Source and Destination:

The source and destination are concepts that are used to represent the sender and the receiver of information in an NHIN Direct health information exchange.

For example consider a provider (say Dr John Doe) is referring a patient to a specialist (say Dr Mary Jane). In this scenario Dr John Doe would be Source and Dr Mary Jane would be the Destination.

### Health Internet Service Provider (HISP):

The NHIN Direct HISP represents the entity that is responsible for delivering health information messages between senders and receivers over the internet. In the internet world an ISP (Internet Service Provider) provides services that enable people or organization to use in the internet. Similarly a HISP provides services that enable providers or health organizations to exchange health information using the internet.

Another example is to think of the HISP as being similar to a postal delivery service which is responsible for routing packages between a sender and receiver using various transportation methods like trucks, planes, ships etc. One difference, however, is that a HISP does not have to be a large nationwide organization like the US Postal Service, FedEx, or UPS. It can be a local service like a local Internet Service provider, or can be built into EHR,

### NHIN Direct Address:

The NHIN Direct Address represents a unique source or destination or a HISP.

In the real world this is similar to a person having a unique postal address, the post office having a unique name and address.

NHIN Direct Address is composed of 2 parts:

NHIN Direct Address = Health End Point Name + Health Domain Name.

For example Dr John Doe might have an NHIN Direct Address of [john\_doe@google.com](mailto:john_doe@google.com), where google.com represents the unique Health Domain Name and john\_doe represents a unique Health End Point Name assigned by google.com.

Note 1: Google.com is the organization that assigns the unique id of john\_doe to Dr John Doe after verifying the person’s credentials.

Note 2: There can be a second Dr John Doe associated with a different domain name such as [john\_doe@yahoo.com](mailto:john_doe@yahoo.com) and in this case Yahoo.com is the organization assigning the second John Doe a unique end point name.

Note 3: A single doctor (say Dr Mary Jane) who works with multiple organizations can end up having multiple NHIN Direct Addresses such as [mary\_jane@yahoo.com](mailto:mary_jane@yahoo.com) and [mary\_jane@google.com](mailto:mary_jane@google.com). The different end points can be used for different purposes.

In the real world all of the above examples are similar to multiple people having same name but being distinguished by the place where they physically live, or a single person having a personal address to live and a professional address that is used to deliver their professional services.

### NHIN Direct Source Edge Protocol:

The NHIN Direct Source Edge protocol refers to the transport mechanism used to transfer information between the Source and the HISP that is used by the source to send information to the destination.

### NHIN Direct Destination Edge Protocol:

The NHIN Direct Destination Edge protocol refers to the transport mechanism used to transfer information between the HISP and the destination belonging to that HISP.

### NHIN Direct Backbone Protocol:

The NHIN Direct Backbone protocol refers to the transport mechanism used to transfer information between the HISPs.

### NHIN Direct Message:

The NHIN Direct Message refers to the content of the information being transferred from the source to the destination. For example the NHIN Direct Message is similar to a package that is sent from one person to another via the postal service such as a simple post card or a package of materials.

### NHIN Direct HISP Address Directory:

The NHIN Direct HISP Address Directory acts as an authoritative source to identify the address and domain name of a HISP. This is similar to the concept of yellow pages which contains the addresses of various organizations or people.

## NHIN Direct Protocols and Payload:

This section provides the recommended technology choices of NHIN Direct to implement the various NHIN Direct standards and services.

### NHIN Direct Backbone Protocol choices

The NHIN Direct transport specifications for the backbone protocol have two parts:

* A set of specifications based on SMTP providing a common denominator solution encompassing all providers, and intended as a stepping stone to NHIN Exchange
* A set of specifications based on XDR allowing participants in NHIN Exchange to fulfill the user stories

In addition, early implementations are expected to provide combination SMTP and modified-XDR HISPs with service discovery to enable native XDR end-to-end transport. To meet policy requirements, XDR will need to be modified to separate address metadata from content metadata.

The specifications rest on the following assumptions:

* The sender has fulfilled all legal, regulatory and policy requirements such as consent, authorization, accounting of disclosure, privacy notices, data use restrictions incumbent on the receiver, and the like prior to initiating transport
* The sender and receiver have ensured that agents of the sender and receiver (for example, HIO, HISP, intermediary) are authorized to act as such and are authorized to handle PHI according to law and policy.
* Sender intends to send to the receiver and has verified and confirmed the accuracy of receiver's address prior to initiating transport

### NHIN Direct Edge Protocol choices

### Examples using various protocols

### Health Content Container (Multipart MIME Message)

### Multipart Mime with XDM payload

## NHIN Direct Security:

Do we need to discuss both SMTP and XDR security models and protocols ?

NHIN D Security Agent is applicable only to the SMTP backbone..

### Goals of the Security Model

### PKI Infrastructure using X.509 certificates

### Certificate Anchors and circles of Trust:

### Sender Verification:

### Protecting Message content in transit: (S/MIME)

### Certificate Revocation:

## NHIN Direct Reference Implementation:

# Glossary, References and Other Links:

Standards:

The section contains a list of all the standards that are applicable to the various NHIN Direct concepts, standards and services.

|  |  |
| --- | --- |
| **NHIN Direct Concept** | **Standards Applicable** |
| Requirements definition | RFC 2119 |
| Health Domain Name Format | RFC 1034 |
| Health Endpoint Name Format | RFC 5322 |
| Health Content Container | RFC 2045, RFC 2046, RFC 2387 (MIME) |
| Securing the Content in NHIN Direct Messages | RFC 1847, (S/MIME) |
| Secure Point-to-point communication transport | SMTP  SOAP transport governed by IHE XDR and XDD profiles |

## Index of Acronyms

ASTM

CMS

DURSA

EHR

HIE

HIO

HIT

HISP

HITPC

HITSC

HISP

HL7

IDN

IHE

MIME

MU

NHIN

ONC

PHR

1. Meaningful Use as defined in the Final Rule from CMS published in July, 2010, in support of the Health Information Technology (HITECH) sections of the American Recovery and Reinvestment Act (ARRA) economic stimulus legislation passed in 2009 [↑](#footnote-ref-1)
2. “Content” (sometimes called “payload”) generically means the health information being communicated, which is independent of the technical mechanism used to move it. For example, when a person composes a simple e-mail message, the “content” is information that is typed or attached. The authoring of e-mail content is independent of how the e-mail moves across networks. Similar to the transport of common e-mail, NHIN Direct describes the transport of secure health messages, but it does not limit the message content. NHIN Direct defines the structure for sending any content similar to e-mail. [↑](#footnote-ref-2)
3. See Section 6 for more about NHIN Exchange [↑](#footnote-ref-3)
4. A wiki is a website with user maintained content, such as Wikipedia [↑](#footnote-ref-4)
5. Note that “message” in this document is used generically to refer to any communication in NHIN Direct, independent of the content, similar to e-mail messages which can contain a wide variety of information both within the “body” as well as attachments. We do not use “message” to refer to any specific format or standard such as HL7 version 2.x or 3.x messages. [↑](#footnote-ref-5)