

# **HIT Standards Committee**

## **NwHIN Power Team**

### **Final Recommendations**

**September 28, 2011**

**Dixie Baker, Chair**

## NwHIN Power Team

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# NwHIN Power Team Context and Tasking

- The ONC has defined the Nationwide Health Information Network (NwHIN) as “the set of standards, services and policies that enable secure health information exchange over the Internet”
- The NwHIN Power Team was tasked to assist the ONC in defining this set of standards, services, and policies by:
  1. Evaluating the specifications developed for the Exchange and Direct pilots with respect to their usability and scalability to support nationwide health information exchange
  2. Recommending those specifications that could be integrated and deployed to support the secure transport and exchange of electronic health information at a national scale, and identifying where further work may be needed
- Outputs from this work are intended to help inform ONC decisions regarding future investments in additional NwHIN pilots and specification development

## NwHIN Power Team Scope

- The focus of this work is at the national level – we did not address the use of these specifications within enterprises or among partners within a regional health information exchange, or for community use
- The Power Team evaluated each Exchange and Direct specification independently against a number of defined criteria
- No “comparison” or “selection” between the specification sets for Exchange and Direct is implied – we recognize that each of these specification sets was designed for a different use case and to fulfill different needs

# Specifications Included in This Analysis

- Exchange Specifications

(available from [http://healthit.hhs.gov/portal/server.pt/community/healthit\\_hhs\\_gov\\_nhin\\_inventory/1486](http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov_nhin_inventory/1486))

- NHIN Messaging Platform Specification
- NHIN Web Services Registry Specification
- NHIN Authorization Framework Specification
- NHIN Patient Discovery Specification
- NHIN Query for Documents Specification
- NHIN Retrieve Documents Specification
- NHIN Access Consent Policies Specification
- NHIN Health Information Event Messaging (HIEM) Specification
- NHIN Document Submission Specification
- NHIN Administrative Distribution Specification

- Direct Specifications

(available from <http://wiki.directproject.org/Documentation+Library>)

- Applicability Statement for Secure Health Transport
- XDR and XDM for Direct Messaging

# Methodology (1 of 2)

1. Evaluate specifications generated by Exchange and Direct pilots on the following factors (defined in the Glossary at the end of this presentation):
  - Need for specified capability
  - Maturity of the specification
  - Maturity of the underlying technology used in the specification
  - Deployment and Operational Complexity
  - Industry adoption
  - Availability of alternatives

Scores recommended by the ONC, with inputs from the NwHIN Exchange Coordinating Committee and the National Institute of Standards and Technology (NIST), with review inputs from the NwHIN Power Team
2. Identify specifications that provide capabilities for which the business need is “Low”
3. Identify specifications that are in early or moderate stages of development, and that use technologies in the declining phase of their life-cycle

## Methodology (2 of 2)

4. Identify specifications that introduce significant deployment, operational, and administrative complexity, and that have low industry adoption
5. Consider availability of alternatives
  - Sources used
    - NwHIN Power Team identification of standards and solutions that have been broadly adopted by healthcare, other than the Exchange and Direct specifications
    - Other industry standards
  - In considering suitability of alternatives, use the same criteria as those used for Exchange and Direct specifications
6. Subjectively assess whether any gaps remain that may be addressed with new specifications
7. Formulate recommendations for consideration by the HIT Standards Committee

## Scores – Exchange Specifications (1 of 2)

| Specification                                     | Need                                | Maturity of Spec | Maturity of Underlying Technology | Deployment, Operational, and Administrative Complexity              | Industry Adoption | Alternatives  |
|---|-------------------------------------|------------------|-----------------------------------|---|-------------------|---|
| <i>NHIN Messaging Platform Specification</i>      | High                                | High             | Mature                            | Moderate (Mature tools available to deploy and manage the services) | Low               | REST style; Direct Secure Transport                               |
| <i>NHIN Web Services Registry Specification</i>   | Moderate/High                       | Moderate         | Declining                         | High  | Low               | LDAP Provider Directories; DNS look-up for certificates (Direct)  |
| <i>NHIN Authorization Framework Specification</i> | High                                | Moderate/High    | Mature                            | High (Complexity is primarily a reflection of ensuring security)    | Low               | OAuth 2.0 OpenID for SOAP Authentication Framework; TLS over REST |
| <i>NHIN Patient Discovery Specification</i>       | High (high need, spec has problems) | High             | Mature                            | High  | Low               | PCAST model   |
| <i>NHIN Query for Documents Specification</i>     | Moderate                            | High             | Mature                            | Moderate/High   | Low               | REST style  |

## Scores – Exchange Specifications (2 of 2)

| Specification  | Need     | Maturity of Spec | Maturity of Underlying Technology | Deployment, Operational, and Administrative Complexity | Industry Adoption | Alternatives   |
|--|----------|------------------|-----------------------------------|--|-------------------|--|
| <i>NHIN Retrieve Documents Specification</i>                         | Moderate | High             | Mature                            | Moderate   | Low               | REST style   |
| <i>NHIN Access Consent Policies Specification</i>                    | Low      | Low              | Emerging                          | High   | Low               | Metadata Power Team recommendation (HL7 CDA R2 with HL7, LOINC, and new vocab) |
| <i>NHIN Health Information Event Management (HIEM) Specification</i> | Low      | Moderate         | Mature                            | Not enough knowledge                                   | Low               |  |
| <i>NHIN Document Submission Specification</i>                        | Moderate | High             | Maturing                          | Low  | Low               | REST style   |
| <i>NHIN Administrative Distribution Specification</i>                | Moderate | Moderate         | Maturing                          | Low  | Low               | REST style or other push solution  |

# Scores – Direct Specifications

| Specification  | Need | Maturity of Spec | Maturity of Underlying Technology | Deployment, Operational, and Administrative Complexity     | Industry Adoption | Alternatives               |
|--|------|------------------|-----------------------------------|--|-------------------|----------------------------|
| <i>Applicability Statement for Secure Health Transport</i> | High | High             | Mature                            | Moderate/High (mainly due to encryption, certificate mgmt) | Low               | SOAP Transport, REST style |
| <i>XDR &amp; XDM for Direct Messaging</i>                  | High | High             | Mature                            | Moderate   | Low               | Direct to email inbox      |

# Evaluation Criterion: Need

- **Need**

Subjective judgment (low, moderate, high) from ONC, focused on whether the specification is needed for meaningful-use, federal agencies, or to meet other national needs, plus review inputs from Power Team. Factors considered include:

- Lacks specific, compelling needs (low)
- Needed for meaningful use (moderate-high, considering other 3 factors)
- Federal agency need
- Other National HIT needs, etc.

## Specifications for Which Business Need is “Low”

- *NHIN Access Consent Policies Specification*
- *NHIN Health Information Event Management (HIEM) Specification*

# Evaluation Criteria: Maturity of Specification x Maturity of Underlying Technology

- **Maturity of Specification**

Subjective assessment (low, moderate, high) from survey conducted by NwHIN Exchange Coordinating Committee, plus ONC and NIST inputs, plus review inputs from Power Team.

Factors considered include:

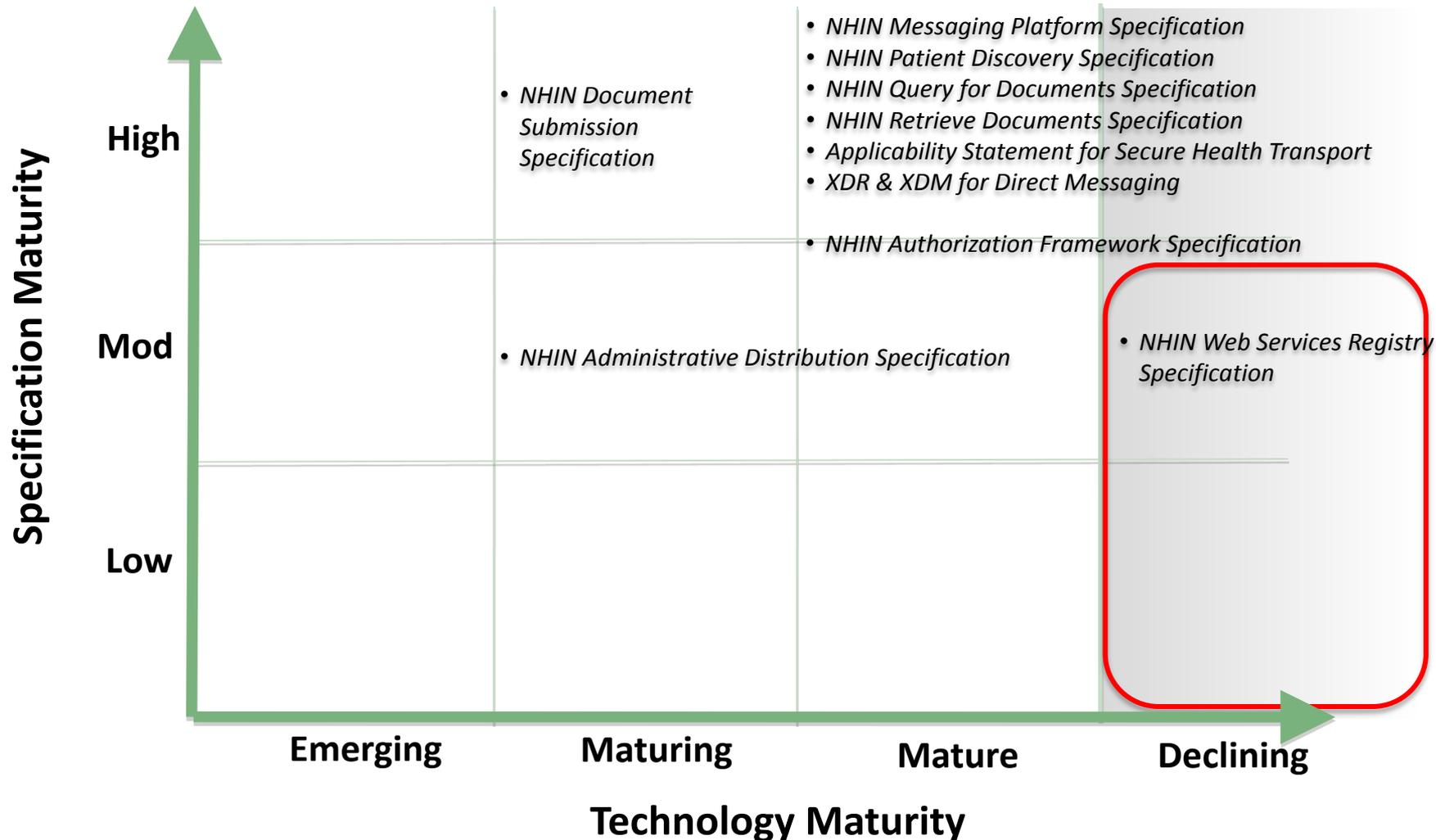
- Specification still in development (low)
- Clear and unambiguous (moderate)
- Testable (moderate-high)
- Maintainable (moderate-high)
- Fully tested and piloted (high)

- **Maturity of Underlying Technology**

Subjective assessment (emerging, maturing, mature, declining) of the maturity of the technologies used in the specification, with respect to the complete technology life-cycle; plus review inputs from Power Team. Factors considered include:

- New unproven standard, building industry support (emerging)
- Gaining market adoption, but less than 30% industry adoption (maturing)
- Mainstream adoption (mature)
- Declining support (declining)

# Maturity of Specification x Maturity of Underlying Technology



# Evaluation Criteria: Deployment, Operational, and Administrative Complexity x Industry Adoption

- **Deployment, Operational, and Administrative Complexity**

Subjective assessment (low, moderate, high) that considers ease of implementation, maintenance throughout on-going operations, and administrative complexity across organizations.

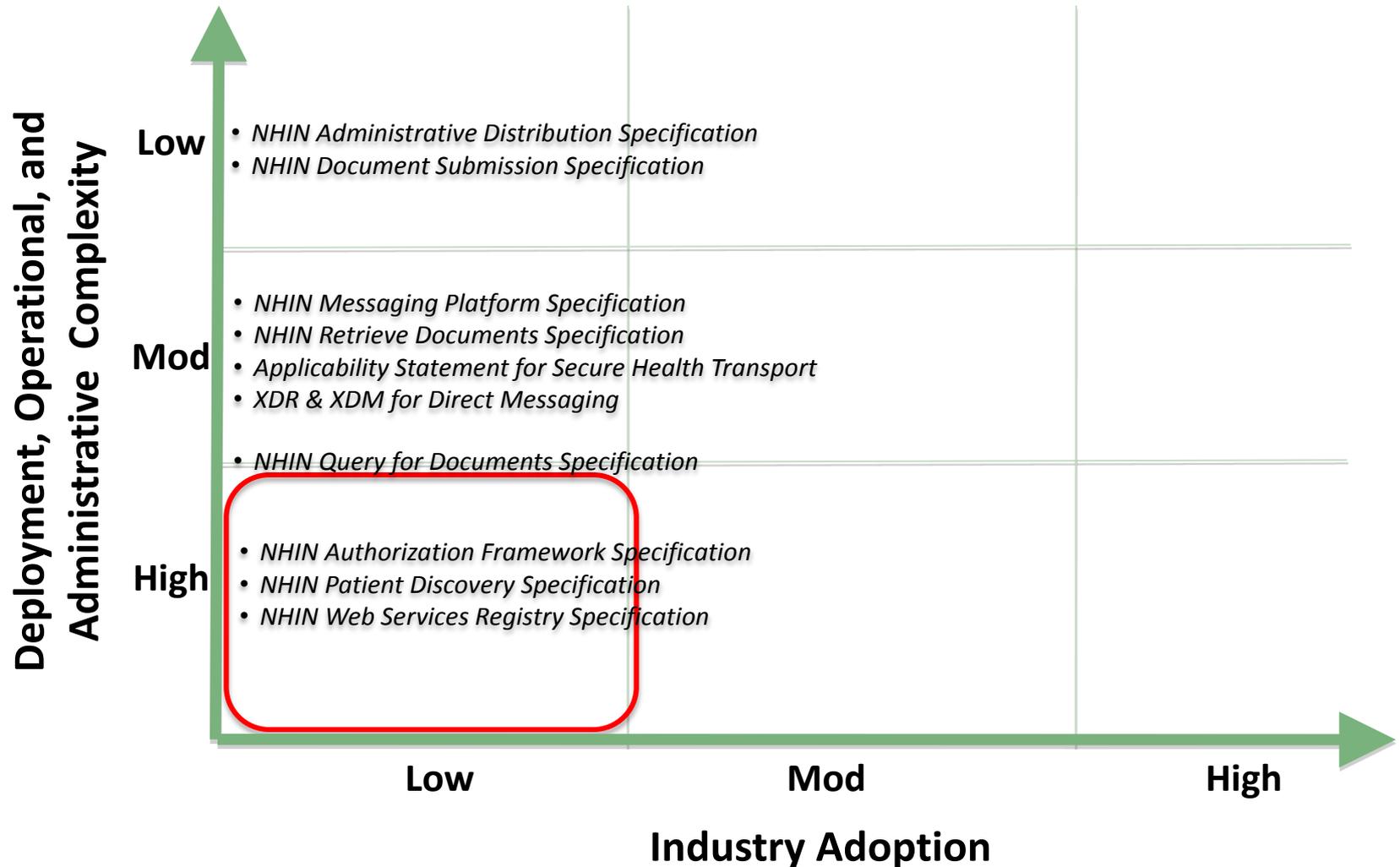
- Can be handled with ease by IT support (Low)
- Need a modest administrative support for deployment and maintenance over time (Moderate)
- Need a substantial on-going IT investment to support the service (High)
- Introduces administrative complexity that spans organizations; requires high degree of federation; project complexity (High)

- **Industry Adoption**

Assessed (low, moderate, high) relative to the market segment for which the specification was developed. Initial scores were derived from responses to objective questions on Exchange usage. Scores were reviewed by the Power Team, who concluded that since neither the Exchange specifications nor the Direct specifications had been broadly deployed beyond the ONC pilots, all should be judged “low.” Factors considered include:

- Currently deployed as production offering by “x” number / percentage of vendors
- Significant volume potential (e.g. within 12 months; full deployment, etc.)

# Deployment, Operational, and Administrative Complexity x Industry Adoption



# **Conclusions and Recommendations**

# Conclusions and Recommendations

1. Architecture is important. The set of standards, services, and policies that comprise the Nationwide Health Information Network (NwHIN) must be deployable within an architectural framework capable of supporting the secure exchange of health information at a national scale.
  - Standards, services, and policies need to address transport, security, and clinical content, including standards for clinical documents and controlled vocabulary. Structured clinical documents and controlled vocabulary should be equally valuable regardless of the NwHIN secure transport used; and any NwHIN secure transport should support the full range of health information exchange, from unstructured (and perhaps incomplete) data to structured, coded data.

## Conclusions and Recommendations

2. Neither the Exchange specifications nor the Direct specifications have been proven at large scale, in production environments, across a broad range of healthcare organizations. The scalability of the underlying architectures, and inherent impacts on workflow, need to be better understood. Once these specifications have been deployed at much larger scale, across a broader spectrum of healthcare users, they should be re-assessed against the criteria used in this exercise to determine suitability as a nationwide standard.

# Conclusions and Recommendations

3. The Exchange specifications are highly complex, and designed to support a complex architecture that may not be appropriate for all healthcare organizations, and that may not scale to nationwide deployment
  - “Too many layers ... debugging is very hard due to the complexity of the layered approach ... all layered protocols have this problem, but this is the most complex we have encountered” (implementer testimony)
  - Version skew among “layered protocols” (externally specified) makes it hard to manage widespread deployments
  - *NHIN Query for Documents Specification* poses operational challenges
    - No agreed-upon way to query for specific item, such as “most recent ECG,” which forces download of large chunks of the patient's record from multiple sites
    - Does not handle images well (largely due to under-constrained specifications on how to handle extremely large files)
    - HITSP C32 (Continuity of Care Document) definitions are not precise enough to allow for seamless importing of external data elements
  - *NHIN Retrieve Documents Specification*'s method of accumulating query results may cause long delays, huge messages, and frequent time-outs
  - *NHIN Patient Discovery Specification* is at risk of being a “show stopper” for nationwide health information exchange – due to serious policy issues that drive an architecture that performs poorly, disrupts provider workflow, and poses a “serious challenge to scalability beyond a limited pilot”

# Conclusions and Recommendations

4. The results from this study present opportunities for simplification
  - Two specifications address needs judged “low” in our analysis
    - *NHIN Access Consent Policies Specification*
    - *NHIN Health Information Event Management (HIEM) Specification*
  - *NHIN Web Services Registry Specification* – a moderately mature specification that uses technology in its declining phase of the life-cycle [Note: The Standards and Interoperability Framework team is already considering alternatives to this specification]
  - *NHIN Authorization Framework Specification* – highly complex, and alternatives exist (e.g., OAuth)
  - *NHIN Patient Discovery Specification* (highly complex, highly needed) and *NHIN Query for Documents Specification* (operational and workflow challenges)
    - Need more scalable architecture to support patient discovery
    - Because the *Query for Documents*, *Patient Discovery*, and *Retrieve Documents* specifications are usually implemented together, any alternatives should be considered within this context

## Conclusions and Recommendations

5. Although the Direct specifications have been in pilot usage for only a short time (starting January this year) and have not been widely deployed beyond the pilot, the underlying transport standard (SMTP) is well-understood, widely deployed, and proven highly scalable, and the security standard (S/MIME) fulfills the EHR certification requirement for an “encrypted and integrity protected link” (45 CFR 170.210(a)(2)). The Direct specifications do introduce some new approaches that have yet to be fully developed and proven beyond the Direct Project itself, particularly around the validation and use of organization-level digital certificates and the use of DNS for certificate discovery. Given current ONC initiatives to address these risks, and recognizing the potential benefit of having a simple, easily implemented solution for exchanging EHR data within the framework of existing standards and certification criteria, we would support and encourage broader deployment and use of the Direct specifications.

# Conclusions and Recommendations

6. Some areas are underspecified in the current specification set
  - Exchange or remote viewing of large images
  - Discovery and retrieval of data elements (e.g., lab results) outside a “document” context
  - More granular query capability for patient records (e.g., “most recent ECG”)

Addressing these needs may present opportunities to consider the PCAST model for data discovery using indexed metadata, combined with retrieval of the desired data element or object (e.g., image) – a model that may be more scalable for patient-discovery as well.

## Conclusions and Recommendations

7. Industry is trending toward widespread use of the REST architectural style in designing networked systems – this presents an opportunity to develop new specification for RESTful exchange of healthcare information
  - REST is not a “standard,” but a “style” that uses the HTTP standard communication protocol to provide a simpler alternative to SOAP for accessing web services – not all “RESTful” implementations are implemented in the same way
  - REST is not inherently secure, but can be secured using standards such as Transport Layer Security (TLS) and Open Authorization (OAuth)
  - Developing specification(s) for “secure RESTful transport for healthcare exchange” would provide healthcare organizations assurance that RESTful implementations built in accordance with the specification(s) would be predictable and secured

# Glossary

| Term   | Definition   |
|--|--|
| <b>Direct Specifications</b>                           | Two (2) specification documents developed and implemented by participants in the Direct pilot; available from <a href="http://wiki.directproject.org/Documentation+Library">http://wiki.directproject.org/Documentation+Library</a>  |
| Applicability Statement for Secure Health Transport    | Describes how to use SMTP, S/MIME and X.509 certificates to securely transport health information over the internet. Standards used include (but not limited to): SMTP, MIME, S/MIME, X.509.   |
| XDR and XDM for Direct Messaging                       | Describes the use of XDR and XDM zipped packages in email in the context of directed messaging for Direct Project <ul style="list-style-type: none"> <li>• XDR supports a direct push model from sender to receiver using Web Services transport</li> <li>• XDM supports a direct push model of a package of content where one of several optional transports is via SMTP</li> </ul>   |
| <b>Evaluation Criteria</b>                             | Criteria that the NwHIN Power Team and its ONC support used to evaluate the Exchange and Direct specifications.  |
| Deployment, Operational, and Administrative Complexity | Subjective assessment (low, moderate, high) that considers ease of implementation, maintenance throughout on-going operations, and administrative complexity across organizations. <ul style="list-style-type: none"> <li>• Can be handled with ease by IT support (Low)</li> <li>• Need a modest administrative support for deployment and maintenance over time (Moderate)</li> <li>• Need a substantial on-going IT investment to support the service (High)</li> <li>• Introduces administrative complexity that spans organizations; requires high degree of federation; project complexity (High)</li> </ul> |

# Glossary

| Term                              | Definition  |
|-----------------------------------|---|
| Evaluation Criteria (cont.)       |   |
| Industry Adoption                 | <p>Assessed (low, moderate, high) relative to the market segment for which the specification was developed. Initial scores were derived from responses to objective questions on Exchange usage. Scores were reviewed by the Power Team, who concluded that since neither the Exchange specifications nor the Direct specifications had been broadly deployed beyond the ONC pilots, all should be judged “low.” Factors considered include:</p> <ul style="list-style-type: none"> <li>• Currently deployed as production offering by “x” number / percentage of vendors</li> <li>• Significant volume potential (e.g. within 12 months; full deployment, etc.)</li> </ul> |
| Maturity of Specification         | <p>Subjective assessment (low, moderate, high) from survey conducted by NWHIN Exchange Coordinating Committee, plus ONC and NIST inputs, plus review inputs from Power Team. Factors considered include:</p> <ul style="list-style-type: none"> <li>• Specification still in development (low)</li> <li>• Clear and unambiguous (moderate)</li> <li>• Testable (moderate-high)</li> <li>• Maintainable (moderate-high)</li> <li>• Fully tested and piloted (high)</li> </ul>  |
| Maturity of Underlying Technology | <p>Subjective assessment (emerging, maturing, mature, declining) of the maturity of the technologies used in the specification, with respect to the complete technology life-cycle; plus review inputs from Power Team. Factors considered include:</p> <ul style="list-style-type: none"> <li>• New unproven standard, building industry support (emerging)</li> <li>• Gaining market adoption, but less than 30% industry adoption (maturing)</li> <li>• Mainstream adoption (mature)</li> <li>• Declining support (declining)</li> </ul>   |

# Glossary

| Term   | Definition  |
|--|---|
| Evaluation Criteria (cont.)                    |   |
| Need   | Subjective judgment (low, moderate, high) from ONC, focused on whether the specification is needed for meaningful-use, federal agencies, or to meet other national needs, plus review inputs from Power Team. Factors considered include: <ul style="list-style-type: none"> <li>• Lacks specific, compelling needs (low)</li> <li>• Needed for meaningful use (moderate-high, considering other 3 factors)</li> <li>• Federal agency need</li> <li>• Other National HIT needs, etc.</li> </ul> |
| <b>Exchange Specifications</b>                 | Ten (10) specification documents implemented by participants in the Exchange pilot; available from <a href="http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov_nhin_inventory/1486">http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov_nhin_inventory/1486</a>  |
| NHIN Access Consent Policies Specification     | Describes the content and format of access content policies covering the electronic exchange of health information between nodes and also describes how access consent policies may be exchanged among nodes. Standards used include (but not limited to): HITSP TP-20, HITSP TP-30, HITSP C80, XACML, XSPA Profile of XACML.   |
| NHIN Administrative Distribution Specification | Describes specification to provide the ability to submit non-patient specific data including document based reports or discrete data from one node to another node using a “Push” mechanism. Standards used include (but not limited to): HITSP T63, OASIS EDXL.  |
| NHIN Authorization Framework Specification     | Describes the security and privacy foundations for every SOAP message in Exchange. It defines the exchange of metadata used to characterize the initiator of an Nationwide Health Information Network request so that it may be evaluated by responding node in local authorization decisions. Standards used include (but not limited to): XSPA Profile of SAML 2.0, WS-Security, X.509, TLS.  |

# Glossary

| Term   | Definition   |
|--|--|
| Exchange Specifications (cont.)                              |  |
| NHIN Document Submission Specification                       | Defines specification that allows an initiating Exchange node to send one or more documents for a given patient to a receiving node. Unlike Query/Retrieve and Pub/Sub, this specification does not require a prior request to retrieve a document or to subscribe to content and is categorized as a “push” transaction. Standards used include (but not limited to): IHE XDR TI, HITSP C80, MTOM SOAP Message Transmission Optimization Mechanism. |
| NHIN Health Information Event Messaging (HIEM) Specification | Describes specification which allows a node to request to subscribe or unsubscribe to various classes of content and events, and to notify node when content or events matching a subscription have been created or modified. Standards used include (but not limited to): OASIS WS-BaseNotification, WS-Topics.   |
| NHIN Messaging Platform Specification                        | Describes the common web service protocols that must underlie every message transmitted via SOAP protocol. They represent common transport layer for all messages in Exchange. Standards used include (but not limited to): WS-I Basic Profile 2.0, SOAP 1.2, WS-*, XML Schema.  |
| NHIN Patient Discovery Specification                         | Defines the specification by which one Nationwide Health Information Network Node can query another to determine if it is a source of information for a specific patient. Standards used include (but not limited to): IHE XCPD.   |
| NHIN Query for Documents Specification                       | Defines a query from one Exchange node to another, requesting a list of available patient specific documents meeting query parameters for later retrieval. Standards used include (but not limited to): IHE XCA TI, HITSP TP13, HITSP C80.   |

| Term   | Definition   |
|--|--|
| Exchange Specifications (cont.)                      |  |
| NHIN Retrieve Documents Specification                | Defines specification which allows an initiating Exchange node to retrieve one or more documents for a specific patient from a responding node. The document Ids are typically (by not necessarily) obtained using Query specification. Standards used include (but not limited to): IHE XCA TI, HITSP TP13, HITSP C80.                  |
| NHIN Web Services Registry Specification             | Describes the specification that allows nodes on the Nationwide Health Information Network to locate and utilize the appropriate services offered by other nodes in a controlled, secure manner. Standards used include (but not limited to): OASIS UDDI.  |
| <b>IHE</b>   | Integrating the Healthcare Enterprise, an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information  |
| <b>Nationwide Health Information Network (NwHIN)</b> | The set of standards, services and policies that enable secure health information exchange over the Internet (ONC definition); for purposes of this evaluation, “NwHIN” refers to a collective set of specifications including NHIN Exchange, Direct, and other specifications to be defined in the future, including RESTful approaches |
| <b>PCAST</b>   | President’s Council of Advisors on Science and Technology (PCAST) report to the President, “Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward,” published December 2010  |
| <b>REST</b>  | REpresentational State Transfer – a style of system design that uses the Hypertext Transfer Protocol (HTTP) standard for communication, providing a simpler alternative to SOAP for accessing web services   |

| Term          | Definition   |
|---------------|--|
| <b>SMTP</b>   | Simple Mail Transfer Protocol, the widely adopted Internet standard protocol for sending email messages between servers      |
| <b>S/MIME</b> | Secure/Multipurpose Internet Mail Extensions, an Internet standard for securing email messages                               |
| <b>SMTP</b>   | Simple Mail Transfer Protocol, the widely adopted Internet standard protocol for sending email messages between servers      |
| <b>SOAP</b>   | Simple Object Access Protocol – an XML-based protocol for exchanging information in a decentralized, distributed environment |