IHE Transport Mechanisms
Specification

Version 1.0

Contents

1 Choosing the Correct "Flavor" for CCD Exchange
1.1 Customized Approach vs. a One-Size-Fits-All Solution

There is a temptation to view the IHE profiles as a ―one-size-fits-all‖ approach to data sharing between one compliant system and another, however, Healthix strongly believes that the clinical and business use cases for health information exchange (HIE) require a customized approach that is informed by the specific, intended functional value of the integration to be developed.

Although it is unlikely that a one-size-fits-all approach will be implemented, it is possible for a ―few sizes‖ to fit all use cases. It should be possible to define the varied ―sizes‖ based upon the type of sender and receiver systems, (e.g., an Outpatient EMR sending information to an HIE system or a Long-term Care EMR sending information to an HIE system). To accurately define the paradigm, each interface must be evaluated on a specific and unidirectional basis to determine the ―flavor‖ of integration.

Healthix envisions CCD exchange in the context of the basic CDA data that must be transmitted.

There are other document payloads and, through additional use cases, adoption of those payloads may gradually increase over time. This discussion considers only the standard CCD payload.

1.1.1 Transport Mechanisms

The transport mechanism is one area where Healthix supports two standard options:

- **XDS.b**, which is commonly supported by vendors but has issues
- **XDR**, which is a newer standard and a better solution that is not commonly supported by vendors.

There is very little difference in the workflows of these standards. For example, the demographics feed, which is the initial requirement, is standardized for both transport mechanisms and the final step of the integration is similar between the two standards. Healthix supports the Provide and Register payloads of both the XDS.b and XDR transport mechanisms. Thus, the contents of both mechanisms are nearly identical and the main difference resides in the middle of these workflows.

Before performing the XDS.b transaction, the HIE requires that the MRN be passed in the header of the XDS.b submission. To accurately acquire this identifier, an extra workflow step is required to immediately query the exchange for the ID prior to submitting the document to the exchange to the change. Most integration partners have coupled this process into a single workflow that both queries for the ID and submits the document. There is the possibility that there are steps within this coupled workflow process where errors can be thrown. The XDR standard emerged as a solution to address this possibility.

Like a standard clinical report posting to the HIE via a common HL7 standard, XDR avoids this additional burden of having to provide the MRN before transmission. Thus, XDR is more favorable than XDS.b for both parties.

CCD exchanges with Healthix require a demographic feed via either a PIX feed or a standard HL7 v2.5 ADT feed, which is Healthix‘s preferred method. ADT remains Healthix‘s preferred standard because of known workflow challenges introduced by the newer PIX standards.

Consider what would happen if an error in a patient registration system were to occur because an encounter was opened for the wrong patient and a practitioner entered clinical data for that incorrect patient. In this instance, the standard ADT A-45 message can easily move the encounter to the correct patient but, how would PIX and CCD accommodate fixing the problem? Fixing the problem via CCD would require a symphony of coordinated transactions between the:
- Patient accounting system
- Clinical system

- Downstream third-party vendor's system.

Healthix understands that most vendors have gradually begun to support CCD and XDS.b. Requesting support for a newer standard —XDR‖ will take more time and, for now, Healthix will continue to support XDS.b transactions but recommends that new development pursue the XDR transport mechanism.

2   Transport Mechanism: XDS.b Solution

The Cross-Enterprise Document Sharing (XDS.b) profile provides a way to implement interoperable systems independent of the underlying technology platform used to develop and deliver each system. This standards-based approach provides the ability to share clinical documents and allows much of the focus to be redirected away from the technology side of implementing a solution which facilitates the registration, distribution and access across health enterprises of patient electronic health records and towards the
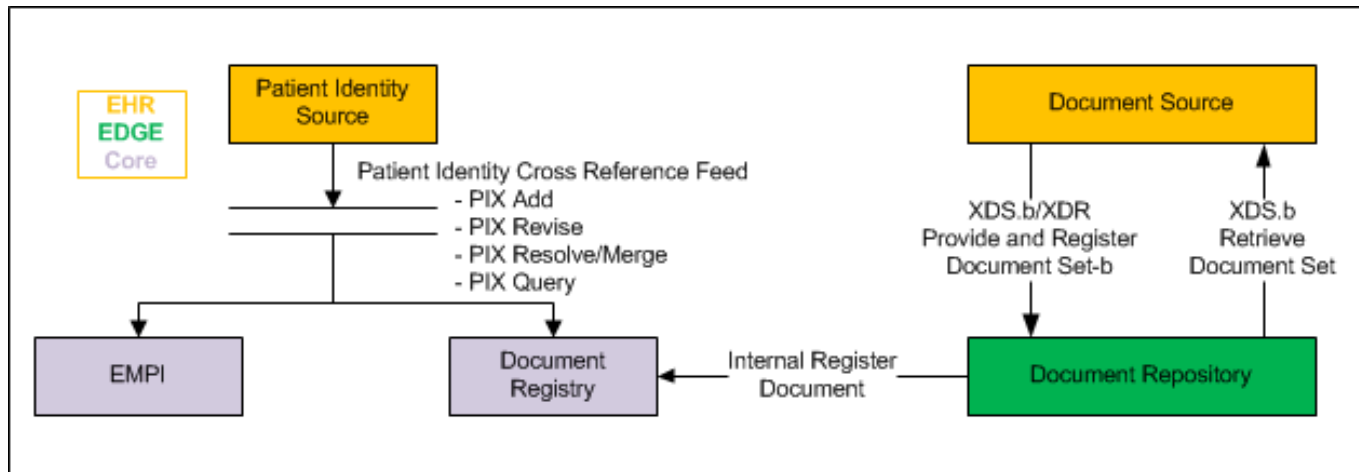
functional use of the integration. The XDS.b profile is based on web services protocols for communication, and the XML [ebXML] Registry / Repository v3.0 standards.

Figure 1. Components involved in the desired integration for ease and consistency of communication.

2.1 XDS.b Use Case Summary Table

Use Case Parameters	Sharing Data with the Exchange
Goal	XDS.b allows EHR to submit clinical data to Healthix using CCD.
Primary Actor(s)	• Patient Identity Cross Reference (PIX) ADD/Revise/Resolve Duplicate Feed- HL7v3 or HL7v2.5 ADT feed • Patient Identity Cross Reference (PIX) Query- HL7v3 • Provide and Register Document Set-b
Trigger Events	• New Patient Added to EHR • Signing of Clinical Document/Note and revisions • End of Encounter/Discharge Summary and revisions • Periodic Batch Submission • On Demand- At the point of Patient Transfer
Main Success Scenario	EHR can send clinical and demographic data for a patient to the exchange, and it is available in subsequent queries of that patient's record.

2.2 IHE Transaction Workflow Summary Table

IHE Transaction Name	Use	From Actor	To Actor
PIX Query Feed - (HL7 v3)	Required	Patient Identity Source	Document Registry
PIX Add/Update - (HL7 v3)	Required (Accommodations for HL7 ADT v2.5 may be used as alternate.)		
ProvideAndRegisterDocumentSet	Required	Document Source	Document Repository

2.2.1   Process Workflow: Registering Patient with Exchange

A new patient must be added to the system. In the system, the patient will be identified by a unique Medical Record Number (MRN).

1. EHR sends a PIX Add/Update message to the PIX manager endpoint of the exchange.
2. The exchange updates the MRN with the PIX message data provided in step 1.
3. The exchange responds to the EHR with a message indicating whether the PIX Add/Update

    succeeded. Or

    HL7 v2.5 feed can be utilized.
    (See Appendix A: ADT Results Inbound Feed Specifications.)

2.2.2   Process Workflow: Sending Clinical Data to Exchange

In this case, the patient is registered within the system. A query on the MRN will successfully retrieve data for that patient.

1. EHR sends a PIX Query to the exchange's PIX manager endpoint containing an MRN from the EHR organization.
2. Exchange responds with the EMPI that is linked to the MRN for that patient.
3. EHR generates CCD to be sent to the exchange.
4. EHR sends XDS.b Provide and Register document Set transaction (PnR) to the proper exchange end point.
5. Exchange responds with a success message (*happy path).

2.2.3 Preferred Business Model

It is the preferred business model for the EHR to send updated CCDs to Healthix at the close of a patient

encounter. The SHIN-NY business requirement is for new clinical data to be sent to the HIE within 24 hours of the encounter.

All notes may not be completed by the practitioner within the 24-hour timeframe. Therefore, to satisfy the SHIN-NY business requirement, many practices may choose to initially send preliminary versions of CCDs followed, at a later time, by the finalized versions.

Replacement CCDs should be identified as such per IHE action codes, which are discussed later in this document.

3 Transport Mechanism: XDR Solution

Cross Enterprise Document Reliability (XDR) enables EHR and Health IT systems to do direct EHR integration in the absence of setting up the normal XDS.b plumbing. This eliminates the need to complete a PIX query.

Given that demographics usually are managed separately from the EHR, Healthix still requires the submitting system to provide either the patient identity PIX v.3 or a HL7 ADT v2.5 feed. This interface supports the tracking of patient encounters during moves of patient data that might occur in response to either errors or merges of patient records.

The only supported transaction using XDR is a Provide and Register document set. The XDR wrapper can be used to send any of the supported HIE documents, however, in this specification, we are focused on C32 documents.

3.1 XDR Use Case Summary Table

Use Case	Sharing Data with the Exchange
Goal	XDR allows EHR to submit clinical data to Healthix using CCD. XDR also allows the registering of documents before a patient is created in the system.
Primary Actor(s)	• Patient Identity Cross Reference (PIX) ADD/Revise/Resolve Duplicate Feed- HL7v3 or HL7v2.5 ADT feed • Provide and Register Document Set-b
Trigger Events	• New Patient Added to EHR • Signing of Clinical Document/Note and revisions • End of Encounter/Discharge Summary and revisions • Periodic Batch Submission • On Demand- At the point of Patient Transfer
Main Success Scenario	EHR can send clinical and demographic data for a patient to the exchange, and it is available in subsequent queries of that patient's record.

3.2 Messaging Workflows

The messaging workflow for Healthix is exactly the same as the workflow for XDS.b without the PIX query.

3.2.1 Process Workflow: Registering Patient with Exchange

Clinical data for a patient must be added to the system. In the system, the patient is identified by a unique Medical Record Number (MRN).

1. EHR sends a PIX Add/Update message to the PIX manager endpoint of the exchange.
2. The exchange updates the MRN with the PIX message data provided in step 1.
3. The exchange responds to the EHR with a message indicating whether the PIX Add/Update succeeded. Or

   HL7 v2.5 feed can be utilized.

(See .)

3.2.2 Process Workflow: Sending Clinical Data to Exchange

In this case, the patient is registered within the system. Note that PIX query is unnecessary in XDR.

1. EHR generates a CCD to be sent to the exchange.
2. EHR sends XDR Provide and Register document Set transaction (PnR) to the proper exchange end point.
3. Exchange responds back with a success message (*happy path).

3.3   Business Requirements

Due to its increased efficiency of exchanging documents, the XDR standard eventually will replace the XDS.b standard. In a perfect world with no errors and appropriately coded CCD updates to blank out data that is not needed, we might, one day, eliminate the patient identity feed, however, the challenge is getting the large players in the industry to support XDR and blank-out messages in occurrence of demographics issues or in case of an error. The migration from XDS.b to XDR should not be significant but consider the length of time it has taken for the industry to begin supporting XDS.b. The trigger events should be the same as XDSb PnR.

4   Payload Definitions

Each transaction described in this document has focused on a few common, XML-based messages, such as:

- PIX, which includes:
  - PIX Query
  - PIX ADD
  - PIX Revise
  - PIX Resolve Duplicates (Merge)
  - See PIX on page 12.

- XDS.b, which includes:
  - Header
  - CDA Specification
  - See XDS.b on page 16.

- XDR, which includes:
  - Header
  - CDA Specification
  - See XDR on page 17.

This section describes the details to implement each of these XML-based messages, including:

- Web service endpoints
- WSDL definitions
- Specific field requirements
- Special caveats to the standard interpreted by the HealthShare application.

4.1 PIX

Generate the transaction using the WSDL specification provided on the IHE ftp site: ftp://ftp.ihe.net/TF_Implementation_Material/ITI/wsdl/PIXManager.wsdl

Once the proxy classes are generated, change the endpoint to the Healthix

endpoints. The entire endpoint will be provided to you by Healthix. For

example:

Development: http://69.18.223.185:57772/csp/healthshare/hub/HS.IHE.PIXv3.Manager.Services.cls

These are password-authenticated endpoints. Please request credentials from Healthix. Healthix can create a userID and password for the organization and send it to the project manager who, in turn, can provide it to the authorized resources.

4.1.1 PIX Query

Many of these sections are not used by the Healthix application but they are required for validation of the system message. The general structure of the PIX query is shown in Table 3. Ultimately, the useful information appears in **boldface text**. Although most of the data fields are not required, all data fields should be passed to Healthix.

Table 3. General Structure of the PIX Query.

	PRPA_IN201309UV02			Comments
1.	ID			
2.	creationTime			
3.		value		YYYYMMDDHHMMSSSSS
4.	interactionId			
5.		root		OID
6.		extension		PRPA_IN201309UV02
7.	processingCode			
8.	processingModeCode			
9.	acceptAckCode			
10.	receiver			
11.	sender			
12.	controlActProcess			
13.		code		
14.		authorOrPerformer		
15.		queryByParameter		
16.			queryId	
17.			StatusCode	
18.			responsePriorityCode	
19.			parameterList	
20.			patientIdentifier	
21.			value	
22.				extension	MRN
23.				root	Facility OID
24.				semantic text	Patient.Id

4.1.1.1 Triggers for a PIX Query

The triggers for a PIX Query are:

4.1.1.1.1 **New Patient**—Always perform a query before a PIX transaction to ensure you have not already created the patient in Healthix

4.1.1.1.2 **New Document**—Each time a document is sent to Healthix, the correct MRN and Facility OID must be passed to Healthix

4.1.1.1.3 **Document Updates**—Each time a document is re-sent to Healthix, the correct MRN and Facility OID must be passed. Remember that Healthix is a third-party system that can dynamically change its EMPI at any time. When a sick patient begins visiting multiple facilities to obtain care, new data sources may begin sending data to Healthix and this can cause new links, merges, and other changes to be made to the EMPI.

4.1.2 PIX Add

For the PIX Add, the majority of meaningful fields are in the controlActProcess section. The relevant fields of useful information appear in **boldface text**. Although most of the data fields are not required, all data fields should be passed to Healthix.

Table 4. General Structure of the PIX Add.

	PRPA_IN201301UV02	Comment
1.	ID	
2.	creationTime	
3.	**value**	YYYYMMDDHHMMSSSSS
4.	interactionId	
5.	**root**	OID
6.	**Extension**	PRPA_IN201301UV02
7.	processingCode	
8.	processingModeCode	
9.	acceptAckCode	
10	receiver	
11	sender	
12	controlActProcess	
13	subject	
14	registration event	
15	ID	
16	status code	
17	subject1	
18	Patient	
19	ID	
20	**assigningAuthority**	Facility code
21	**extension**	MRN
22	**root**	OID
23	status code	
24	**code**	Active/Inactive

25	patientPerson		
26		name	
27			**given**	First name
28			**given**	middle Initial
29			**family**	Family name
30		telecom	
31			**use**	"HP" Home Phone
32			**value**	##########
33		administrativeGende	
34			**code**	"M" or "F" for Male or Female
35		birthTime	
36			**value**	YYYYMMDD
37		addr	
38			**use**	"HP" Home Primary
39			**streetaddresslin**	Address Line
40			**city**	
41			partType	CTY
42			**text**	City Name
43			**state**	2 Letter code
44			**postalCode**	5 Number Code
45		providerOrganization	
46			**ID**	Facility OID
47		contactParty	
48	Author		
49	custodian		
50		assigned Entity	
51		ID	
52			**root**	2.16.840.1.113883.3.176
53		assignedOrganization	
54			classCode	
55			determinerCode	
56			**name**	Long Island Patient Information

4.1.2.1 Triggers for a PIX Add

The trigger for a PIX Add is:

4.1.2.1.1   If a PIX query for both the MRN and Facility OID, returns a null value for a patient, then a PIX Add should be done for that patient.

4.1.3 PIX Revise

For the PIX Revise the majority of meaningful fields are in the controlActProcess section. The relevant fields of useful information appear in **boldface text**. Although most of the data fields are not required, all data fields should be passed to Healthix.

Table 5. General Structure of the PIX Revise.

	PRPA_IN201302UV02		Comme
1.	ID		
2.	creationTime		
3.		**value**	YYYYMMDDHHMMSSSSS
4.	interactionId		
5.		**root**	OID
6.		**Extension**	PRPA_IN201302UV02
7.	processingCode		
8.	processingModeCode		
9.	acceptAckCode		
10.	receiver		
11.	sender		
12.	controlActProcess		
13.	subject		
14.	registration event		
15.	ID		
16.	status code		
17.	Patient		
18.	ID		
19.		**assigningAuthority**	Facility code
20.		**extension**	MRN
21.		**root**	OID
22.	status code		
23.		**code**	Active/Inactive
24.	patientPerson		
25.	name		
26.		**given**	First name
27.		**given**	middle Initial
28.		**family**	Family name
29.	telecom		
30.		**use**	"HP" Home Phone
31.		**value**	##########
32.	administrativeGenderCode		
33.		**code**	"M" or "F" for Male or Female
34.	birthTime		
35.		**value**	YYYYMMDD

36.		addr		
37.			**use**	"HP" Home Primary
38.			**streetaddressline**	Address Line
39.			**city**	City
40.			**state**	2 Letter code
41.			**postalCode**	5 Number Code
42.		providerOrganization		
43.			**ID**	Facility OID
44.	Custodian			
45.		assigned Entity		
46.	ID			
47.			**root**	2.16.840.1.113883.3.176
48.		assignedOrganization		
49.			classCode	
50.			determinerCode	
51.			**name**	Long Island Patient Information

4.1.3.1 Triggers for a PIX Revise

A PIX Revise should be triggered whenever a demographics change is identified in the source EHR system.

4.1.4 PIX ResolveDuplicate: "Merge"

Healthix is still in the Research and Development process of standardizing recommendations for this process.

4.2 XDS.b

Generate the transaction using the WSDL specification provided on the IHE ftp site:

ftp://ftp.ihe.net/TF_Implementation_Material/ITI/wsdl/XDS.b_DocumentRepository.wsdl

Once the proxy classes are generated, change the endpoint to the Healthix endpoints. The entire endpoint will be provided to you by Healthix. For example:

Development:
http://69.18.223.186:57772/csp/healthshare/ABCD/HS.IHE.XDSb.Repository.Services.cls

Note: This link requires valid Intersystems login and password credentials.

In the example endpoint above ―ABCD‖ should be replaced with a code provided by Healthix for your organization. These are password-authenticated endpoints. Please request credentials from Healthix. Healthix can create a userID and password for the organization and send it to the project manager who, in turn, can provide it to the authorized resources.

4.2.1 Triggers for XDS.b

The triggers for a new Provide and Register document set are:

4.2.1.1 Creating a new document/patient/encounter etc.
4.2.1.2 Updating any element in an existing document
      including
      demographics/allergies/encounters/problems/medication
      s
4.2.1.3 Removal of an existing document.

4.2.2 XDS.b Wrapper

We are looking for the following IDs in the appropriate sections of the XBS.b Wrapper:

4.2.2.1 **sourcePatientId:** MRN and the Facility (not the EMPI)
4.2.2.2 **sourcePatientInfo**: MRN and the Facility (not the EMPI)
4.2.2.3 **XDSDocumentEntry.patientId**: EMPI and facility OID
4.2.2.4 **XDSSubmissionSet.sourceId**: Facility OID
4.2.2.5 **XDSSubmissionSet.patientId**: EMPI and facility OID

Note: IdentificationScheme value for the document should be unique for each document.

4.3 XDR

Generate the transaction using the **XDS.b** WSDL specification provided on the IHE ftp site:

ftp://ftp.ihe.net/TF_Implementation_Material/ITI/wsdl/XDS.b_DocumentRepository.wsdl

Once the proxy classes are generated, change the endpoint to the Healthix

endpoints. The entire endpoint will be provided to you by Healthix. For

example:

Development:

http://69.18.223.186:57772/csp/healthshare/ABCD/HS.IHE.XDR.Re

pository.Services.cls Note: This link requires valid Intersystems login

and password credentials..

In the example endpoint above ‑ABCD‖ should be replaced with a code provided by Healthix for your organization. These are password-authenticated endpoints. Please request credentials from Healthix. Healthix can create a userID and password for the organization and send it to the project manager who, in turn, can provide it to the authorized resources.

4.3.1 Triggers for XDR

The triggers for a new Provide and Register document set are:

4.3.1.1 Creating a new document/patient/encounter etc.
4.3.1.2 Updating any element in an existing document
      including
      demographics/allergies/encounters/problems/medication
      s
4.3.1.3 Removal of an existing document.

5 Error Handling

As these standards have matured, over time, one often neglected area of implementation is the handling of errors returned from the web services requests.

Each of the messages, described above, can return an associated set of errors.

It takes time and experience to develop a set of detailed procedures to manage each type of error that is returned from web services. For now, we can only make a few generalized assumptions that the sending system can use to manage these returned errors.

This approach can be considered very similar to the ACK/NAK response to HL7 error messages, however, it also can become more complex.

- **Success or CA**—In the response: happy path

- **No Response to Web Service**—If you don't receive a response from a web service within 30 seconds, retry until you get a response. Wait for a response for no more than two hours before alerting the receiving system of this problem.
  If the receiving system is down for a known outage, you will be notified so that you can be assured that messages will not be lost. In these instances, the error reporting can be suppressed until the outage is resolved and the application is restored.

- **Error in Response to Web Service**—There are a handful of known errors. General procedures for responding to each type of error will be provided in future revisions of this document.

6 Notes