

Integrating the Healthcare Enterprise



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IHE IT Infrastructure Technical Framework Supplement 2006-2007

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Cross-Enterprise Document Reliable Interchange (XDR)

15

Trial Implementation Version

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1 Foreword

Integrating the Healthcare Enterprise (IHE) is an initiative designed to stimulate the integration of the information systems that support modern healthcare institutions. Its fundamental objective is to ensure that in the care of patients all required information for medical decisions is both correct and available to healthcare professionals. The IHE initiative is both a process and a forum for encouraging integration efforts. It defines a technical framework for the implementation of established messaging standards to achieve specific clinical goals. It includes a rigorous testing process for the implementation of this framework. And it organizes educational sessions and exhibits at major meetings of medical professionals to demonstrate the benefits of this framework and encourage its adoption by industry and users.

The approach employed in the IHE initiative is not to define new integration standards, but rather to support the use of existing standards, HL7, DICOM, IETF, and others, as appropriate in their respective domains in an integrated manner, defining configuration choices when necessary. IHE maintain formal relationships with several standards bodies including HL7, DICOM and refers recommendations to them when clarifications or extensions to existing standards are necessary.

This initiative has numerous sponsors and supporting organizations in different medical specialty domains and geographical regions. In North America the primary sponsors are the American College of Cardiology (ACC), the Healthcare Information and Management Systems Society (HIMSS) and the Radiological Society of North America (RSNA). IHE Canada has also been formed. IHE Europe (IHE-EUR) is supported by a large coalition of organizations including the European Association of Radiology (EAR) and European Congress of Radiologists (ECR), the Coordination Committee of the Radiological and Electromedical Industries (COCIR), Deutsche Röntgengesellschaft (DRG), the EuroPACS Association, Groupement pour la Modernisation du Système d'Information Hospitalier (GMSIH), Société Française de Radiologie (SFR), Società Italiana di Radiologia Medica (SIRM), the European Institute for health Records (EuroRec), and the European Society of Cardiology (ESC). In Japan IHE-J is sponsored by the Ministry of Economy, Trade, and Industry (METI); the Ministry of Health, Labor, and Welfare; and MEDIS-DC; cooperating organizations include the Japan Industries Association of Radiological Systems (JIRA), the Japan Association of Healthcare Information Systems Industry (JAHIS), Japan Radiological Society (JRS), Japan Society of Radiological Technology (JSRT), and the Japan Association of Medical Informatics (JAMI). Other organizations representing healthcare professionals are invited to join in the expansion of the IHE process across disciplinary and geographic boundaries.

The IHE Technical Frameworks for the various domains (IT Infrastructure, Cardiology, Laboratory, Radiology, etc.) defines specific implementations of established standards to achieve integration goals that promote appropriate sharing of medical information to support optimal patient care. It is expanded annually, after a period of public review, and maintained regularly

90 through the identification and correction of errata. The current version for these Technical Frameworks may be found at www.ihe.net/Technical_Framework.

The IHE Technical Framework identifies a subset of the functional components of the healthcare enterprise, called IHE Actors, and specifies their interactions in terms of a set of coordinated, standards-based transactions. It describes this body of transactions in progressively greater
95 depth. The volume I provides a high-level view of IHE functionality, showing the transactions organized into functional units called Integration Profiles that highlight their capacity to address specific clinical needs. The subsequent volumes provide detailed technical descriptions of each IHE transaction.

100 This IHE IT Infrastructure Technical Framework Supplement was initially issued for Trial Implementation in August 2006. It has been updated in July 2007 to account for alignment of the Provide and Register Transaction (Web Services and ebRS 3.0 schema) with the release of the XDS.b Supplement for Trial Implementation. It is therefore re-issued for Trial Implementation through March 2008.

105 Comments and change proposals arising from Trial Implementation may be submitted to <http://forums.rsna.org> under the forum:

“Integrating the Healthcare Enterprise”

Select the sub-forum:

“IHE IT Infrastructure 2006 Supplement for Trial Implementation”

110

The IHE IT Infrastructure Technical Committee will address these comments resulting from implementation, connect-a-thon testing, and demonstrations such as HIMSS 2008. Final text is expected to be published in June 2008.

115 **2 Introduction**

This Supplement introduces a new IHE Integration Profile that facilitates interchange across health enterprises of electronic documents.

120 This Integration Profile, referred to as XDR (for Cross-Enterprise Document Reliable Interchange), is focused on providing a standards-based specification for managing the interchange of documents that healthcare enterprises (anywhere from a private physician to a clinic to an acute care in-patient facility) have decided to explicitly exchange using a reliable point-to-point network communication. This also enables better interoperability between Electronic Health Records (EHRs), Personal Health Records (PHRs) and other Healthcare IT Systems. It is a natural complement to the IHE ITI XDS Integration Profile (for cross-enterprise document sharing) when a sharing infrastructure (repositories and registry) is not needed.

2.1 Background

130 Cross-Enterprise communication of medical information is increasingly required in the Healthcare domain. In parallel to "publish and pull" oriented mechanisms, such as XDS, "push" communication is required. Several standards (i.e. HL7, DICOM, OASIS...) have defined three kinds of mechanisms for conveying such information:

1. Specific workflow messages, as an extension of the Intra-Enterprise messaging format (HL7 messages for lab results, DICOM store).
2. Encapsulation of standardized documents/objects in MIME, in the context of a "push" communication between parties (peer-to-peer), described in the present XDR profile.
- 135 3. Specification of a document interchange format for the transfer of clinical images via portable media (i.e. non-networked based), in the context of a "sneaker" net communication between parties whereby the patient is the often the mode of transport. Such mechanisms are described in the XDM profile.

140 Similar to what has been developed in the XDS profile, a generic standards based mechanism for conveying a set of medical documents in a point to point networked based communication, staying "neutral" vis-à-vis the document content, is needed. The proposed approach results from the analysis of a number of specific solutions, used in various countries around the world, in particular the one based on the concept of a "patient based electronic envelope of documents" originated by EDISanté (working group GT11) in 1998, with a format/protocol called
145 MMF/MXF.

2.2 Proposed solution

150 The present XDR Integration Profile proposes to interchange a set of documents related to a particular patient and the associated metadata using a networked based secure protocol over SMTP (off-line mode) or HTTP/SOAP (on-line mode). It re-uses the metadata and the messages defined by the XDS (Cross-Enterprise Document Sharing) Integration Profile.

This profile aims to be fully consistent and complementary with the XDS Integration Profile, re-using the same transaction “Provide and Register Document Set”.

2.3 Scope of Supplement

155 This supplement extends the existing IHE IT Infrastructure Technical framework and assumes that the reader is familiar with the IHE process and methodology in defining Integration Profiles, as well as familiar with other related IHE Integration profiles defined by the IHE Technical Frameworks available at <http://www.ihe.net>.

160 The XDR Integration Profile is not intended to address all cross-enterprise EHR communication needs. Some may require the use of other IHE Integration profiles, such as Patient Identifier Cross-Referencing, Audit Trail & Node Authentication, Retrieve Information for Display, etc. Others may be only partially supported. Others may require future IHE Integration profiles, which will be defined by IHE as soon as the necessary base standards are available.

165 The development of this IHE Integration Profile relies on considerable work and standards development activities that have been performed in this domain in many countries around the world (e.g. OASIS-ebXML, HL7 CDA, CEN ENV 13606, EDISANTE MMF/MXF, IETF, etc.).

2.4 Open Issues and Questions

- 1) While this profile discusses the use of multipart document content, we have not yet adequately dealt with the necessary processing of this file type. The issue resides in the correct computation of the hash and size attributes.

170 2.5 Closed Issues

- 1) How to associate this profile with PIX, XDS, and how to convey images on the same “Provide and Register Document Set” message, using the (pending) DICOM Email. Done in appendix E.
- 175 2) Recipient addresses in off-line and on-line. Optional because a default value shall exist when absent.
- 3) The XDS metadata have been extended to contain the intendedRecipient(s) of the XDP Integration Profile. How to integrate it in the supplement? As an update of the Register Document Set transaction, advising it is required for XDP and optional for XDS? Add it in the XDS metadata definition as an optional attribute.
- 180 4) Shall ATNA Audit Trails be used in all the cases? Document Source only? Document Recipient only? It is required for all.
- 5) What to do on the Document Recipient if a required metadata does not exist or is void? Depending of the agreement between the creator and the recipient

- 185 6) What to do on the Document Recipient with the coding schemes / codes enforcement?
idem
- 7) Should the Multiple Document Management be an option for the Document Recipient?
And if so, what it does when receiving multiple documents and it does not support this
option. => optional on the Document Source side, Required on the Document Recipient
side
- 190 8) Idem for Lifecycle Management => not supported by this profile (for the moment). The
Document Recipient has to send a negative acknowledgment if the action is not a “new
document”.
- 9) Idem for Folder Management => not supported by this version. The Document Recipient
has to accept the metadata containing folder information but ignore such information.
- 195 10) How deep S/MIME mechanism must be described in the XDP transactions? Or is it better
to describe it in the ATNA profile (as thought initially)? => It had not to be placed in the
ATNA profile but eventually in a new profile. For the time being, it will be described in
two pages inside this profile.
- 200 11) Approach 1 (add recipient slot) vs. approach 2 (add existing rim:user and
rim:organization objects) for the XDP specific metadata. => retain the simplest one
(approach 1).
- 205 12) With the release of the XDS.b Supplement for Trial Implementation in August 2007,
XDS.b is aligned on ebRS V3.0. To avoid introducing a long-term discrepancy between
XDR and XDS.b which is expected to become widely adopted, it is suggested to update
XDR from ebRS 2.0 to ebRS3.0. This introduces no functional differences only a
slightly different XML structure.
- 210 13) Feedback from potential implementers has identified regions or countries where the on-
line mode is needed but the off-line mode is not. It is therefore proposed to make the off-
line mode (like on-line) an explicit option. This does not obsolete any existing
implementation, only introduces the need for deployment projects to ensure that both the
document source and the document receiver actor chose the same option.

3 Profile Abstract

215 This Integration Profile, referred to as XDR (for Cross-Enterprise Document Reliable
Interchange), is focused on providing a standards-based specification for managing the
interchange of documents that healthcare enterprises (anywhere from a private physician to a
clinic to an acute care in-patient facility) have decided to explicitly exchange using a reliable
point-to-point network communication. This also enables better interoperability between
Electronic Health Records (EHRs), Personal Health Records (PHRs) and other Healthcare IT
Systems. It is a natural complement to the IHE ITI XDS Integration Profile (for cross-enterprise
220 document sharing) when a sharing infrastructure (repositories and registry) is not needed.

Volume I – Integration Profiles

<This section describes the changes required in Volume I of the Technical Framework that result from including this Integration Profile.>

225 Changes to Sections 1 – 1.X

1.7 History of Annual Changes

Add the following bullet to the end of the bullet list in section 1.7

- 230 • Added the **Cross-Enterprise Document Reliable Interchange (XDR)**, which provides document interchange using a reliable messaging system. This permits direct document interchange between EHRs, PHRs, and other healthcare IT systems in the absence of a document sharing infrastructure such as XDS.

Add the following section to Table 2-1 Integration Profiles Dependencies in section 2.1

Cross-Enterprise Document Reliable Interchange	ATNA	Requires secure communication, and audit trails.	
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235

Add the following section to section 2.2

2.2.15 Cross-Enterprise Document Reliable Interchange (XDR)

240 *Cross-Enterprise Document Reliable Interchange (XDR)* provides document interchange using a reliable messaging system. This permits direct document interchange between EHRs, PHRs, and other healthcare IT systems in the absence of a document sharing infrastructure such as XDS Registry and Repositories.

Add the following section 15

15 XDR Integration Profile

245 Cross-Enterprise Document Reliable Interchange (XDR) provides document interchange using a reliable messaging system. This permits direct document interchange between EHRs, PHRs, and other healthcare IT systems in the absence of a document sharing infrastructure such as XDS Registry and Repositories.

250

XDR provides a reliable and automatic transfer of documents and metadata for one patient between EHR systems even in the absence of an XDS infrastructure. XDR supports two options: one that reuses the Provide and Register Document Set transaction (off-line option) with SMTP as transport, the other one that reuses the Provide and Register Set transaction-b (on-line option)) with Web-Services as transport. Transfer is direct from source to consumer, no repository or registry actors are involved.

255

XDR is document format agnostic, supporting the same document content as XDS and XDM. Document content is described in XDS Document Content Profiles. Examples are XDS-MS, XDS-LAB, XPHR, and XDS-SD.

260

XDR defines no new metadata or message formats. It leverages XDS metadata with emphasis on patient identification, document identification, description, and relationships.

15.1 Actors/ Transactions

265

Figure 15.1-1 shows the actors directly involved in the XDR Integration Profile and the relevant transactions between them. Other actors that may be indirectly involved due to their participation in XDS, PIX or XUA are not shown.

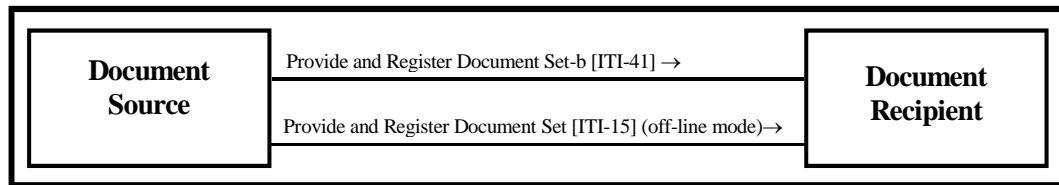


Figure 15.1-1 XDR Actor Diagram

270

Table 15.1-1 lists the transactions for each actor directly involved in the XDR Profile. In order to claim support of this Integration Profile with one or more actors, an implementation must perform the required transactions (labeled “R”). Transactions labeled “O” are optional. A complete list of options defined by this Integration Profile and that implementations may choose to support is listed in Volume I, Section 15.2.

275

Table 15.1-1 XDR Integration Profile - Actors and Transactions

Actors	Transactions	Optionality	Section in Vol. 2
Document Source	Provide and Register Document Set-b (on-line mode)	R (note 1)	ITI TF-2:3.41
Document Recipient	Provide and Register Document Set –b (on-line mode)	R (note 2)	ITI TF-2:3.41
Document Source	Provide and Register Document Set (off-line mode)	R (note 1)	ITI TF-2:3.15

Actors	Transactions	Optionality	Section in Vol. 2
Document Recipient	Provide and Register Document Set (off-line mode)	R (note 2)	ITI TF-2:3.15

Note 1: The Document Source shall support either one of the two transactions

Note 2: The Document Recipient shall support either one of the two transactions

15.2 XDR Integration Profile Options

280 Options that may be selected for this Integration Profile are listed in the table 15.2-1 along with the Actors to which they apply. Dependencies between options when applicable are specified in notes.

Table 15.2-1 XDR - Actors and Options

Actor	Options	Vol & Section
Document Source	<i>Multiple Document Submission</i>	ITI TF-1:15.2.1
	<i>On-Line Mode</i>	ITI TF-1:15.2.2
	<i>Off-Line Mode</i>	ITI TF-1 15.2.3
Document Recipient	<i>On-Line Mode</i>	ITI TF-1 15.2.2
	<i>Off-Line Mode</i>	ITI TF-1 15.2.3

15.2.1 Multiple Documents Submission Option

285 In this option the Document Source offers the ability to include multiple documents in a single Submission Request.

15.2.2 On-Line Mode Option

In this option the Document Source offers the ability to send the set of documents to one unique recipient, using a HTTP web-service based on-line transmission mode, and, the Document
290 Recipient to receive and process such a message.

15.2.3 Off-Line Mode Option

In this option the Document Source offers the ability to send the set of documents to a recipient, using an SMTP reliable e-mail based off-line transmission mode, and, the Document Recipient to receive and process such a message.

295 15.2.4 Folder Option Issue

The Document Source may include Folders in metadata. The Document Recipient may ignore them.

15.3 XDR Process Flow

300 XDR describes the exchange of a set of a patient’s documents between healthcare providers,
such as: physicians, hospitals, special care networks, or other healthcare professionals.

Where XDS Registry/Repositories are not yet implemented or available for the exchange of
information, XDR is the viable approach.

305 In a situation where the information is going to an automated application or robust system
capable of automated storage or processing of documents relative to one patient, XDR is the
appropriate profile.

The XDR integration profile is intended only for exchange of patient related medical documents
and not intended to address all cross-enterprise EHR communication needs.

Use Cases:

- 310 1. Dr. Primary refers his aging patient Mr. Robinson to his first appointment with a
gastroenterology specialist.
Since there is no XDS repository available at the gastro clinic, Dr. Primary cannot use
XDS to communicate the XDS-MS referral to Dr. Gastro. Also, since there is no
affinity domain linking Dr. Primary and Dr. Gastro, XDR is preferable to XDS for the
exchange of Mr. Robinson’s referral information. XDR is also appropriate for Dr.
315 Gastro’s documents communication to Dr. Primary.
2. In a hospital that does not have an XDS infrastructure, the XDS-MS profile discharge
use case can also be handled by XDR. For example:
In a hospital with a robust EHR application, the discharge note could be secure-emailed
using the XDR profile to the patient’s family physician.
- 320 3. Mabel is transferred from a hospital setting to her retirement home for long-term care.
XDR: Mabel’s information can be transferred from the hospital to the long-term care
facility’s EHR application for future review by her attending physicians and nurses,
through XDR.
- 325 4. Stanley’s recent MRI has generated unusual results that Stanley’s primary physician
would like to consult with another specialist in a specialized cancer facility located
across the state. Since there is not likely to be an affinity domain between the remote
health environments, XDR can be used instead.
- 330 5. Mrs. Sweettooth has been diagnosed with adult diabetes and her specialized circle of
care has not yet gotten organized to provide shared access to a common repository.
Until they do, they will need to exchange her information peer-to-peer using XDR.

This profile is only defining the digital transport mechanism used for such use cases, content transported will be detailed by Content Profiles such as the ones defined by the IHE PCC (Patient Care Coordination) domain.

335

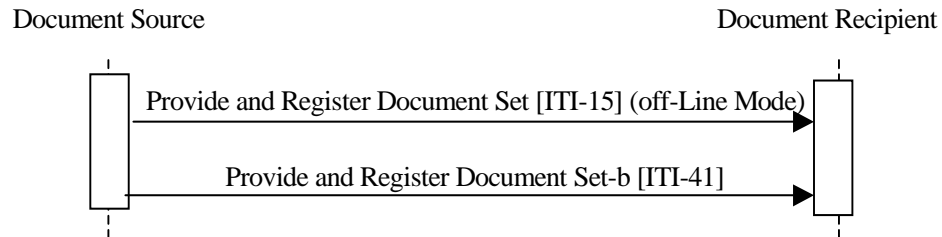


Figure 15.3-1 Process Flow in XDR Profile

15.4 Digital communication

340 It may be either an SMTP secure message (“off-line mode”), or a web service based HTTP message (“on-line mode”).

15.5 Security considerations

345 The Profile assumes that the health organizations that are using Document Source and Document Recipient have an agreement defining when they can interchange PHI. This may require an explicit patient consent (depending on the regulation) and an agreement on how to manage the potential inconsistency between the security policies. The main aspects that should be covered by this agreement are similar to XDS – See Appendix L. In the case of XDR, the EHR-to-EHR (or PHR) communication is a transient XDS Affinity Domain. In addition, the following aspects should be covered:

- 350 • Management of Patient identification in order to perform patient reconciliation correctly upon importation of the documents.

Both Actors for this Profile require a grouping with Secure Node.

<Appendix A> Actor Descriptions

Add the following Actor Descriptions in Appendix A

355 **Document Recipient:** This actor receives a set of documents sent by another actor. Typically this document set will be made available to the intended recipient who will choose to either view it or integrate it into an Health Record.

<Appendix E> Cross Profile Considerations

Add the following section to the existing Appendix E

360 **E.6 XDR Integration with XDS, Content Integration Profiles, PIX, and DSG**

E.6.1 XDR Integration with XDS

The XDR profile and the XDS profile are both similar and complementary.

365 Both profiles are document content neutral, conveying documents without modification and managing the same set of metadata. They both enable a Document Source to transmit a set of documents to another IHE Actor, using a HTTP based on-line mode or a SMTP based off-line mode.

370 But they do differ in some important ways. XDS is a centralized profile with “servers” (Registry and possibly Repository) and “clients” (Source and Consumer). XDR is more symmetrical (Source and Recipient). The on-line mode is simpler for both Profiles but it requires that the recipient is permanently accessible on the network. This is a necessity for XDS, so that documents can be sent from Document Sources at any time to the Repository, and so that such documents will then always be accessible to Document Consumers. The Document Recipient of the XDR profile does not have this requirement because the on-line mode is optional. Thus, XDR can be supported by systems that are not accessible from the network (General Practitioners EHR for example).

375 So XDR and XDS enable a Document Source to transmit a Document Set to multiple Document Recipient(s) or to a Document Repository, in two modes:

- 380 • The network off-line mode: one UNIQUE message will be sent to the Document Recipient(s) and the Document Repository, and it will be compatible with the off-line mode of the Provide and Register Transaction Set.
- The network on-line mode: MULTIPLE similar messages will be sent by the Document Source to the Document Recipient(s) and the Document Repository.

385 If the Document Source and the Document Recipient belong to the same Affinity Domain, the metadata shall respect the rules defined for this Affinity Domain (patientId, assigning Authority, encoding schemes...).

In case the actors are not all part of the same Affinity Domain, the following options should be considered:

390 • If the Document Source is sending the Document Set to a Document Repository while sending it to the Document Recipient(s) at the same “time” (either the same network off-line message or consequent network on-line messages), then the rules defined in the Affinity Domain which includes the Document Source and the Document Repository shall be used.

• In the other cases:

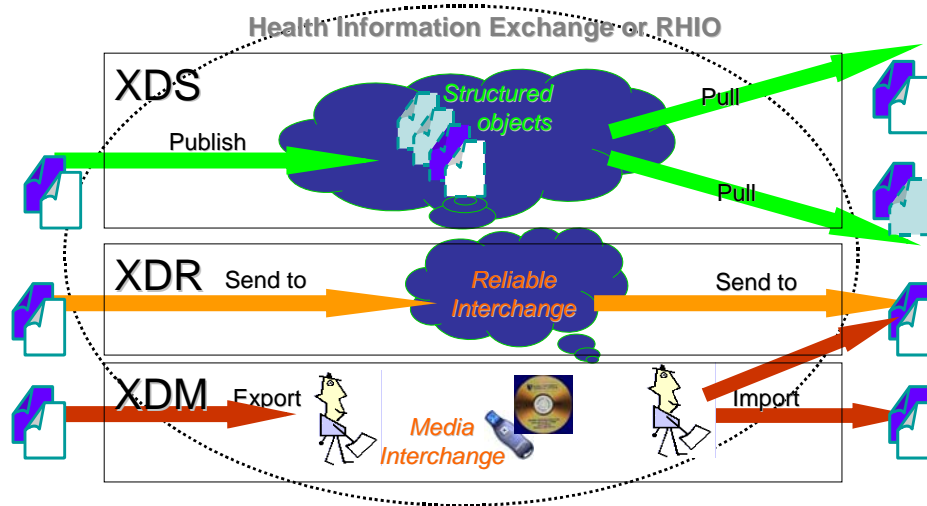
395 • If the Document Source and the Document Recipient(s) have agreed on the rules to use (for example using a “regional patientId” accessible through a PIX compliant server), then these rules shall be used.

Note: it is highly recommended to define such “mutual agreement”

• If not, the rules available on the Document Source side will be used, and so, the Document Recipient has to transpose the patientId and the codes to follow its local rules.

400 The Cross-enterprise Document Reliable Interchange (XDR) Integration Profile may be used in conjunction with the XDS Integration Profile to provide both a cross-enterprise sharing capability and a targeted sending of a set of documents to one or more specific receivers. This is illustrated in the figure below, when the Document Source Actor supports both the XDS and the XDR Integration Profiles.

Flexible Infrastructure: Sharing, Reliable Interchange, and Media



405

Figure E.6-1 Associated XDS, XDR, and XDM Profiles

E.6.2 XDR Integration with XDS Content Integration Profiles

The Cross-enterprise Document Reliable Interchange (XDR) Integration Profile is intended to be used in conjunction with any number of XDS Content Integration Profiles to provide an interoperable specification for the content of the documents interchanged. Any XDS Content Integration Profile such a XDS-SD for scanned documents (See IT Infrastructure Technical Framework) or XDS-MS for medical summaries (See Patient Care Coordination Technical Framework) are examples of document content Integration Profiles that may be integrated along with XDR. One should note that although these Content Integration Profiles are called XDS-Scan or XDS-MS, the use of the XDS in their name does not imply that their use is restricted to XDS. It is equally intended for XDR, for point-to-point interchange.

E.6.3 XDR Integration with PIX

The Cross-enterprise Document Reliable Interchange (XDR) Integration Profile may be used in conjunction with the PIX Integration Profile to provide the cross-referencing or linkage of the patient identifier used by the Document Source with that of the Document Receiver. This Integrated use requires the grouping of the XDR Document Source and of the XDR Document Receiver with a PIX Patient Identity Source, so that the PIX Manager is fed with the patient identities in the Document Source and the Document Receiver identification domains. In addition, the Document Recipient shall be grouped with a PIX Patient Identifier Consumer

425 Actor, so that when a patient Identifier is received in the XDS Document Metadata of the XDR
Provide and Register Document Set transaction, it may invoke the services of the PIX Manager
Actor to cross-reference the received patient identifier to a patient identifier of the Document
Recipient Identification Domain.

E.7 XDM/XDR Distinction

430 Both XDR and XDM describe the exchange of a set of patient's documents between healthcare
providers. They are relevant in situations where XDS is not yet implemented or available at one
of the participating organizations or where point-to-point (versus sharing through a registry)
interaction is desired.

435 XDM is applicable in situations where the information receiver is an individual who will
manually interpret or examine the data and associated documents. XDM allows for one exchange
which contains documents relating to multiple patients and can be used in situations where no
networking capability is available on one or both of the participating healthcare providers..

440 XDR is applicable in situation where the information exchanged is going to an automated
application or robust system capable of automated storage or process of documents relative to
one patient. XDR requires networking capability (intermittent or continuous) between the
healthcare providers exchanging data.

Volume 2 - Transactions

3 IHE Transactions

Update the section 3.15 Provide and Register Document Set Transaction section in ITI TF-2

3.15 Provide and Register Document Set

445 This section corresponds to Transaction ITI-15 of the IHE Technical Framework. Provide and Register Document Set is used by the Document Source to provide a set of documents to the Document Repository **or to Document Recipient(s)**, and to request that the repository store these documents and then register them with the Document Registry.

450 The Provide and Register Document Set transaction describes only the interaction between the Document Source and Document Repository **or Document Recipient** actors. The interaction between the Document Repository and the Document Registry is described separately in the Register Document Set Transaction (ITI-14).

455 This transaction aligns with the Registry Services standard (ebRS). The ebRS standard covers the interaction with a service that includes a registry with integrated repository. From the point of view of the Document Source, the separate nature of the XDS Document Registry and Repository actors is hidden. This transaction exactly matches the registry service for submitting registry/repository content found in ebRS.

460 **By specifying separate Document Registry and Document Repository actors, XDS supports the deployment of multiple repositories coordinated by a single registry.** ~~offers additional flexibility of having a single registry index content for multiple repositories. The ebRIM portion of the registry standard supports this possibility through the ExternalLink object type.~~

The documents and metadata go to the repository actor and then the metadata is forwarded on to the registry actor. They move in this direction for several reasons:

- Allows best reuse of ebXML Registry specified protocols
- 465 • Document Source only needs to know the identity of the Document Repository. Repository knows the identity of the registry. If Provide and Register Document Set transaction were sent to the registry then routing decisions for documents would be more complex.
- Resulting protocols are simpler
- 470 • Simplifies the common case where the Document Source and the Document Repository are grouped.

3.15.1 Scope

The Provide **and** Register Document Set transaction passes a Repository Submission Request (see ITI TF-2: 3.14.4.1.2.3.2) from a Document Source to a Document **Registry Repository or to one or multiple Document Recipient(s)**.

475 A Provider and Register Document Set transaction carries:

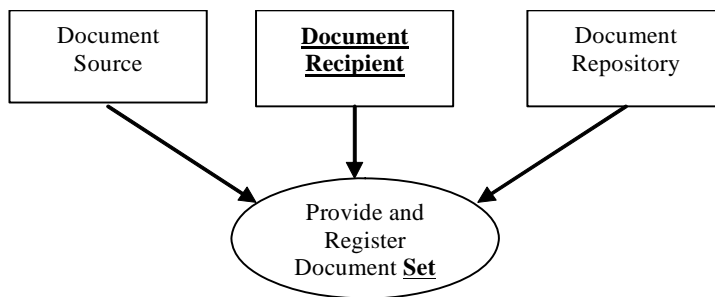
Metadata describing zero or more new documents

Submission Set definition along with the linkage to new documents and references to existing documents

Zero or more XDS Folder definitions along with linkage to new or existing documents

480 Zero or more documents

3.15.2 Use Case Roles



Actor: Document Source

Role: A system that submits documents and associated metadata to a Document Repository.
485 Detail requirements for this actor are discussed in section 3.15.5.1.

Actor: Document Repository

Role: A document storage system that receives documents and associated metadata and:
Stores the documents

Enhances submitted metadata with repository information to enable later retrieval of documents
490 Forwards the enhanced metadata to the Document Registry.

Actor: Document Recipient

Role: A system that receives documents and associated metadata

3.15.3 Referenced Standards

ebMS OASIS/ebXML Messaging Services Specifications v2.0
495 ebRIM OASIS/ebXML Registry Information Model v2.0

ebRS OASIS/ebXML Registry Services Specifications v2.0

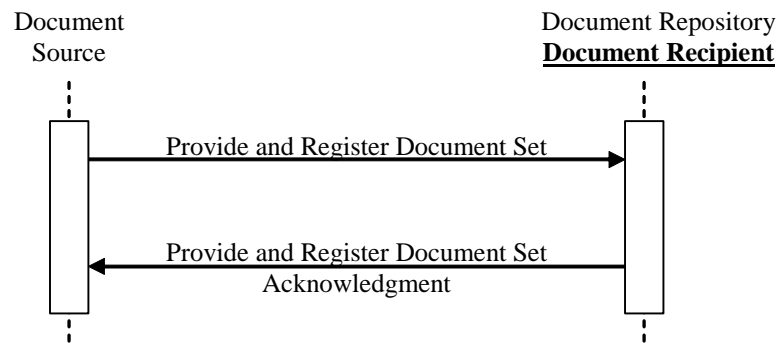
HTTP HyperText Transfer Protocol HTTP/1.1 (IETF RFC2616)

MIME Multipurpose Internet Message Extensions (RFC 2045 to RFC 2049)

SMTP Simple Mail Transfer Protocol (RFC2821)

500 multipart/related The MIME Multipart/Related Content-type (RFC2387)

3.15.4 Interaction Diagram



3.15.4.1 Provide and Register Document Set Message

505 A Document Source sends documents and associated metadata to a Document Repository that has an associated Document Registry or to one or multiple Document Recipient(s). This message corresponds to an ebRS SubmitObjectsRequest with associated documents.

3.15.4.1.1 Trigger Events

The Document Source, based on a human decision or the application of a certain rule of automatic operation, wants to submit

- 510
- Submit a A set of one or more documents to the Document Repository and Tthe associated metadata to the Document Registry, when sent to a Document Repository
 - Transfer a set of documents and the associated metadata to the Document Recipient(s).

3.15.4.1.2 Message Semantics

515 Message semantics are discussed as follows:

1. Metadata
2. Security Requirements

3. Protocol Selection (On-Line Protocol binding and Off-Line Protocol binding)

3.15.4.1.2.1 Metadata

520 The Register Document Set message shall include the metadata attributes (as defined in section 3.14.4.1.2.7) that will be forwarded by the Document Repository to the Document Registry using the Register Document Set Transaction (ITI-14) **or to be used by the Document Recipient(s)**.

The Document Source supplies all necessary registry object attributes with the **following** exceptions:

- 525
- **When sent to a Document Recipient actor, of the URI, size and hash** attributes of an XSDDocumentEntry **shall be present**
 - **When sent to a Document Repository actor, they may be present; that must be assigned by the Document Repository. Therefore, the Document Repository will overwrite must add these attributes before sending to the metadata to the Document Registry in a Provide and before initiating the** Register Document Set transaction **to the registry.**
- 530

3.15.4.1.2.2 Security Requirements

Relevant security requirements are discussed in the Register Document transaction (see ITI TF-1: 3.14.4.1.2.14).

535 **3.15.4.1.2.3 Protocol Selection**

There are two types of **protocol bindings for the Provide and Register Transaction network relationships between the Document Source and Document Repository:**

HTTP/Post (On-line mode) – the Document Source constructs a direct connection (i.e., socket) to the Document Repository.

540 **ebMS over SMTP (Off-line mode) – the Document Source connects to the Document Repository via SMTP.**

3.15.4.1.2.3.1 On-Line Protocol (HTTP/Post) Binding

3.15.4.1.2.3.1.1 General structure and header

545 This is a MIME multipart/related message. The first attachment inside the payload of the SOAP request bears the registry metadata in an XML file containing the SubmitObjectsRequest.

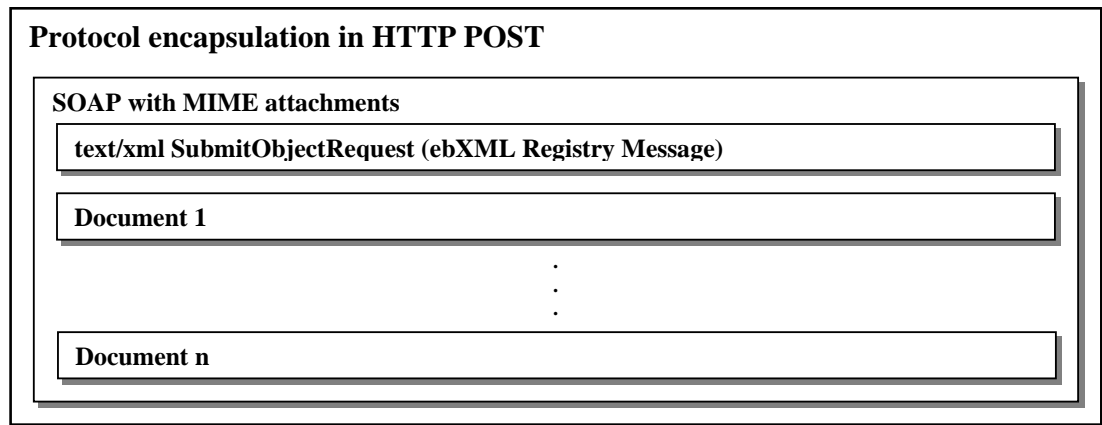


Figure 3.15.4.1-1 General Diagram of the Main message composing the On-Line Provide and Register Document Set Transaction

3.15.4.1.2.3.1.2 Associated Documents

550 The ~~next attachments following MIME part~~ will contain ~~the document(s) to be provided and registered, as MIME parts. There are one or more parts that contain~~ byte streams representing document(s)¹ to be delivered to a Document Repository or Document Recipient(s).

555 The multipart packaging transmits the MIME-type of each part. ~~The metadata part shall be of type text/xml.~~ Parts containing documents destined for the Document Repository or Document Recipient(s) can have any MIME type, either single part or multipart. Each part containing a document has associated with it a document ID that is unique within the scope of this message. The Registry metadata contained within one the first part of this message uses these document IDs to bind pieces of metadata to documents.

560 The registry metadata will be valid according to ebRS and ebRIM and will contain the definition of zero one or more ebXML ExtrinsicObjects. An ExtrinsicObject is a registry object that represents a repository document within the registry. Each ExtrinsicObject shall will contain an id attribute. The format of this id follows the ebXML Registry definition. It is either a valid UUID or a symbolic name.

565 The value of this id attribute is used to link an ExtrinsicObject (XDSDocumentEntry) to a unique single part of the multipart that contains the attachments to the message. The header of the relevant part of the multipart will have a Content-Id header whose value is this id attribute surrounded by angle brackets as in the following example.

For the on-line protocol binding for example, the metadata includes:

¹ This section is written independent of which protocol binding is used to package this multipart message. The protocol choice is documented elsewhere in this profile.

570

```
<ExtrinsicObject id="myDocument" ...  
which links to the following MIME multipart part:
```

```
-----Boundary
```

```
Content-Type: text/xml
```

575

```
Content-Id: <myDocument>
```

```
This sentence is the value of the document.
```

```
-----Boundary
```

3.15.4.1.2.3.2 Off-Line Protocol (ebMS over SMTP) Binding

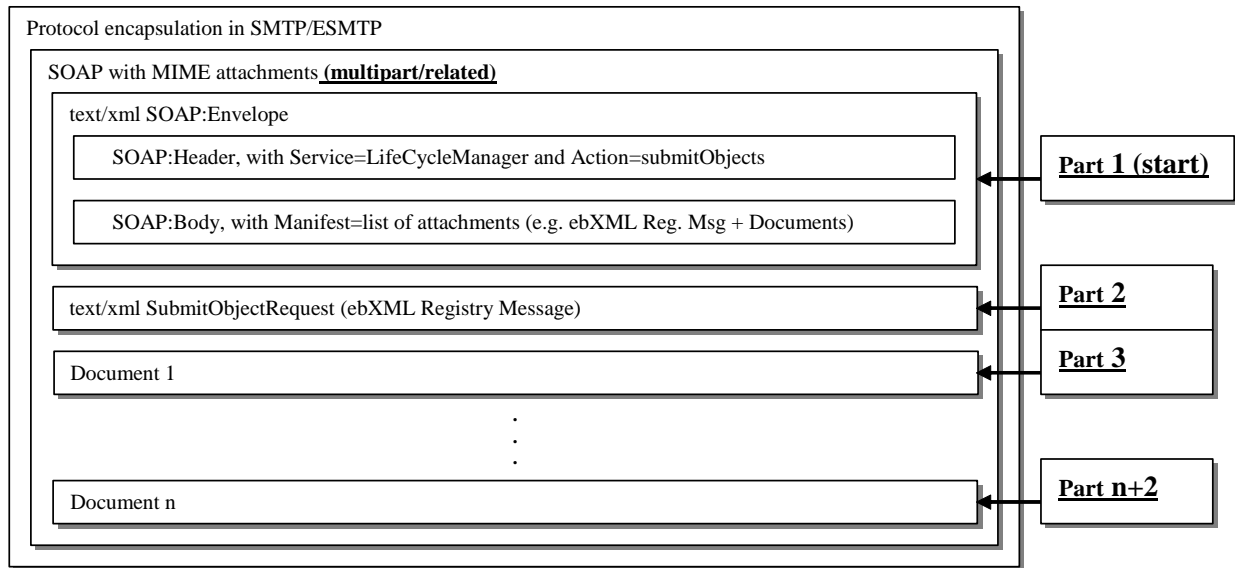
580

3.15.4.1.2.3.2.1 General structure and header

585

As shown on Figure 3.15.4.1-2, the Off-Line transaction ~~is will be~~ based on the ebXML Message Service over SMTP Binding, as defined in the ebXML Registry Service (ebRS), with an Asynchronous Message and responses as defined in ebXML Messaging Services (ebMS). The re-use of ebXML enables implementers to integrate the Provide and Register Document Set transaction into a server which supports more comprehensive services, including some using Collaboration-Protocol Profiles (CPP) and Collaboration-Protocol Agreement (CPA) as supported by ebXML. Because IHE is aiming to specify such as plug-and-play mechanisms, the Off-Line Protocol Binding is entirely defined into ~~this present~~ document. This specification does not mandate the use of a CPA between the Document Repository **or Recipient(s)** acting as "ebRS Registry" and the Document Source acting as "ebRS Registry Client". Such protocol agreement aspects are beyond the scope of the XDS Profile. The Document Source has only to know the Document Repository or Recipient(s) e-mail address(es) to be able to provide and register a document set.

590



595

Figure 3.15.4.1-2 General Diagram of the Main message composing the Off-Line Provide and Register Document Set Transaction

The message is an e-mail message (which the ebXML Messaging Services can split into several messages if a single message would be too big) containing the following fields:

600

- The **From:** e-mail address of the sender (Document Source).
- Optionally, a **Reply-to:** address if the Document Source wants the response messages to be sent to another e-mail address.
- The **To:** e-mail address(es) of the recipient(s) (Document Repository or Recipient(s)). In case the Document Repository is able to register a document set to more than one Document Registry, it will have a different e-mail address for each one of the Repository-Registry peer.
- **Date:** is the date and time of the Provide and Register Document Set Transaction.
- **Subject:** **XDS/1.0/PnR/** (followed optionally by indication of XDS "subprofile" name. It SHALL NOT contain any Patient related information)
- **MIME-Version: 1.0.**
- **SOAPAction: "ebXML".**

605

610

This is a MIME multipart/related message. The first **part attachment** is the text/xml SOAP:Envelope part containing the ebMS header. The character set of the ebMS header is UTF-8.

The Header is described in the ebMS standard. It contains the following ebRS tag values:

615

- The header of the message, in /SOAP:Envelope/ SOAP:Header/eb:MessageHeader/ as shown in the table below.

Table 3.15.4.1-1 ebXML Message Header

Location ("@" for attributes)	Description
eb:From/eb:PartyId	Identification of the message sender (its email address, preceded by mailto:)
eb:From/eb:Role	String indicating the authorized role of the sender formatted as a URI per ebXML messaging specification: http://www.ihe.net/roles/iti/xds/DocumentSource
eb:To/eb:PartyId	Identification of intended recipient of the message (its email address, preceded by mailto:) Note: <u>For the Document Recipient, the intended recipient(s) are the person or organizations corresponding to the email addresses used for the communication. They may differ from the attribute intendedRecipient attribute of the submissionSet metadata. This field targets an email account which may or may not represent a person. The attribute intendedRecipient targets one or more people in the organization.</u>
eb:To/eb:Role	String indicating the authorized role of the sendreceiver formatted as a URI per ebXML messaging specification: http://www.ihe.net/roles/iti/xds/DocumentRepository for the Document Repository and http://www.ihe.net/roles/iti/xds/DocumentRecipient for the Document Recipient(s)
eb:CPAId	Identification of a Collaboration Protocol Agreement between the sender and receiver. This shall contain the trading partner agreed CPA text reference, if it exists (e.g., the URI of the XML file describing the partnership agreement). If there is no CPA, this element shall be the concatenation of eb:From/eb:PartyId and the eb:To/eb:PartyId, separated by the hyphen character (-).
eb:ConversationId	In the absence of a local trading partner agreement, shall be CCYYMMDD-HHMMSS-mmmmm based upon the sending ebXML message generation. When generating responses the eb:ConversationID is taken from the original message.
eb:Service	Shall be LifeCycleManager
eb:Action	Shall be submitObjects
eb:MessageData/eb:MessageId	A unique message identifier generated by the sender: either a concatenation of message elements to create a globally

Location ("@" for attributes)	Description
	unique identifier, or a single message element if that element is globally unique.
eb:MessageData/eb:Timestamp	UTC Time that the message header was created in XMLSchema dateTime format. Example: 2004-12-25T23:50:50
eb:DuplicateElimination	If present, duplicate messages should be eliminated.
eb:Description	Description of the Submission Set (equivalent to the XDSSubmissionSet.comments attribute).
eb:AckRequested	Optional in ebMS, required here to indicate that the repository shall acknowledge the message. This element has the following attributes: SOAP:mustUnderstand="1" eb:version="2.0" eb:signed="false"

- 620
- List of references to document, in /SOAP:Envelope/ SOAP:Body/eb:Manifest/eb:Reference as shown in the table below.

Table 3.15.4.1-2 ebXML Message References

Location ("@" for attributes)	Description
@eb:id	Identification of the document, which is the <u>id attribute of the corresponding ExtrinsicObject OID</u> of the XDS Document. However, the <u>first reference of the second part</u> shall be to the SubmitObjectsRequest XML file, with id set to SubmitObjectsRequest.
@xlink:href	The relative URI of the document in the payload of the ebMS message, cid: followed by the <u>id attribute of the corresponding ExtrinsicObject OID</u> . Used only for a newly submitted XDS Document.
@xlink:role	Shall be present only for the first reference, and be set to <u>http://www.ihe.net/roles/iti/xds/SubmitObjectsRequest</u>
eb:Schema	Shall be present only for the first reference, and has following attributes: eb:location= <u>http://www.ihe.net/schemas/iti/xds/SubmitObjectsRequest</u> eb:version=1.0
eb:Description	To be set to the XDS DocumentEntry.title. However, for the first reference, shall be set to the meaning of SubmitObjectsRequest in the local language (i.e. lang="en-US", "Provide and Register Document Set Metadata").

The following attachment inside the payload of the SOAP request bears the registry metadata in an XML **file part** containing the SubmitObjectsRequest. **The Content-type of the MIME header for this metadata part shall be set to text/xml. When sent to a Document Recipient, it is recommended to add a sub-parameter of this Content-type “name”, to define the name of the file where to save the metadata, named “METADATA.XML”, and a Content-Disposition header set to attachment followed a sub-parameter of this Content-Disposition “filename”, set to the name of the file where to save the metadata, set to “METADATA.XML”.**

This SubmitObjectRequest XML file shall be set in order to reference the documents attached in the message, as described in the following section. When sent to a Document Recipient, the Content-Location of the MIME header shall be present and set to METADATA.XML.

Note: The justification of the multiple MIME header attributes containing the same information (name of the file) is justified to ensure the email client on the recipient side is able to save the files in such a place that makes the document accessible from the metadata part file using the URI attribute.

The MIME header for this part will be structured as follow:

```

640 -----Boundary
Content-Type: text/xml; charset="UTF-8"; name="METADATA.XML"
Content-Location: METADATA.XML
Content-Disposition: attachment; filename="METADATA.XML";
Content-Description: Send Document Set Metadata
645 <?xml version="1.0" encoding="UTF-8"?>
<rs:SubmitObjectRequest xmlns:rs=...>
...
</rs:SubmitObjectRequest>
-----Boundary

```

650

3.15.4.1.2.3.2.2 Associated Documents

See the subsection "Associated Documents" in the On-Line Binding section (ITI TF-2: 3.15.4.1.2.3.1.1). Any document that has, **in the manifest**, a referenced **in the @xlink:href** and contains a URI that is a content id (URI scheme "cid") shall be included in the payload.

Any document referenced in the @xlink:href of the SOAP:Body of the ebMS Header part of the message as a real document (URI starting by cid:) shall be included in the message as a MIME Part, with the Content-id header set to the corresponding value.

When the message is sent to Document Recipient(s), it is recommended that the Content-Type header contains an attribute “name” set to the name of the file where to save the document, respecting the filename restriction (8 alphanumeric characters and a period “.” character followed by the 3 characters extension) and a Content-Disposition header set to attachment followed a sub-parameter of this Content-Disposition “filename”, set to the

665 **name of the file where to save the attachment. The Content-Location header shall be present and set to the file in which the part shall be saved, respecting the ISO9660 described above.**

Note: The justification of the multiple MIME header containing the same information (name of the file) is to ensure the email client on the recipient side is able to save the files in such a place that makes the document accessible from the metadata part file using the URI attribute.

670 **In the case of a “multipart document”, each sub part of the multipart/related MIME corresponding to the “multipart document” shall contain a Content-Location header set to the name of “start” part file preceded by the name of the “sub-directory” where to save the part (e.g. DOC0000P/DOC0000P.XML).**

For example, the metadata includes:

675 <ExtrinsicObject id="DOC00001.1899732003atmainhospital.org" ...

which links to the following MIME multipart part:

680 -----Boundary
Content-Type: text/plain; charset="UTF-8"; name="DOC00001.TXT"
Content-Location: DOC00001.TXT
Content-Disposition: attachment; filename="DOC00001.TXT";
Content-Id: <DOC00001.1899732003atmainhospital.org>
This sentence is the value of the document.
685 -----Boundary

690 **The MIME parts (attachments and the ebMS Manifest) can also contain (respectively refer) other documents that are not referred in this Metadata file. They shall be ignored by the Document Recipient. It enables the same message to also contain other files that are not managed by this profile (DICOM images in a DICOM email format for example).**

Further examples of “multipart document”s and their MIME format encoding can be found in the MIME Type Sub-Registration examples of the DICOM Standard (see PS3.12, Annex L).

695 **3.32.4.1.2.3.1.3 Communication protocol**

700 **The SMTP binding, as defined by ebMS, builds a reliable communication, by using different mechanisms for enabling the sender to be advised on the status of the message it sends. Appendix T of this document describes how such a mechanism works in the context of communication between a Document Source and a Document Recipient using off-line mode.**

3.15.4.1.3 Expected Actions

3.15.4.1.3.1 Document Repository

705 The Document Repository will receive this message. Each document within the message will be stored into the repository as an octet stream with an associated MIME type. A detected failure will result in an error result message being returned to the Document Source thus terminating this transaction.

The Document Repository will modify the received registry metadata adding:

- A URI identifier (xdsDocumentEntry.URI) must be created that can be used by a Document Consumer to reference the document.
- 710 • A hash value (xdsDocumentEntry.hash)
- A size (xdsDocumentEntry.size).

A Register Document Set transaction with this modified metadata will be issued to the XDS Document Registry.

715 The repository ~~shall accept and perform a will ensure that any Document~~ Retrieve ~~Document~~ Transaction ~~received including the referencing this URI identifying the XDS Document, this document shall be provided to the Document Consumer unchanged from the by supplying the exact~~ octet stream ~~received in the multipart part of the Provide and Register Document Set Transaction that was submitted~~ (full fidelity repository).

3.15.4.1.3.2 Document Recipient

720 The Document Recipient will receive this message. It shall address it to the intendedRecipient, if present. However it shall accept a Provide and Register Document Set transaction without intendedRecipient without discarding the submission set received. So it shall have a default value for the intendedRecipient.

725 Note: This behavior is very consistent with the real world where a document relative to a patient is sent to a healthcare provider without precision in terms of the organization/person will be addressed to the general clinical facility.

730 The recipient will process the metadata and check it is well formed, conforms to the schema, issued from an acceptable source (identified by the sourceId), and respects the requirements as defined in the Section ITI TF-2: 3.15.4.1.2.1 above. By default there is no metadata attribute enforcement. In some contexts accepted by both Document Source and Document Recipient, some enforcement may be appropriate. Example of metadata attributes enforcement are described in the Register Document Set Transaction, Section ITI TF-2: 3.1.4.1.2.3.1

735 Each document within the message will be processed as an octet stream with an associated MIME type, and its size and its hash have to be compared with the respective values in the

metadata of the relative XSDDocumentEntry. A detected failure will result in an error result message being returned to the Document Source thus terminating this transaction.

3.15.4.2 Provide and Register Document Set Acknowledgment

740 The Document Repository **or Recipient(s)** sends a Provide and Register Document Set Acknowledgment when the processing of a Provide and Register Document Set is complete. This message is identical to the RegistryResponse message specified in ebRS. It shall be conveyed in the same protocol as the request.

3.15.4.2.1 Trigger Events

745 **This trigger applies to the actions of a single Repository or Recipient. This is a local decision without global coordination.**

The following events can trigger this message:

Documents stored **into the** repository successfully and metadata stored **into the** registry successfully (**the** registry part is carried out as part of a Register Document Set transaction) **or processed successfully by a Document Recipient.**

750 Documents stored to repository successfully **or processed successfully by a Document Recipient** but an error occurred in storing the metadata to the registry **or in processing it by the Document Recipient(s).**

Documents were not successfully stored to the repository **or processed by the Document Recipient(s).**

755 3.15.4.2.2 Message Semantics

An ebRS RegistryResponse message **shall be** returned containing status and an error message if necessary.

Additional relevant semantics for both the repository and registry are described in the Register Document Set transaction.

760 3.15.4.2.3 Expected Actions

When sent to a Document Repository: The Document Source now knows **that whether** the transaction succeeded **or** failed **and continue**. The metadata added to the registry as a result of this transaction is now available for discovery via query transactions. The document(s) added to the repository are now available for retrieval.

765 **When sent to a Document Recipient: The Document Source now knows whether the Document Recipient accepted the transaction.**

3.15.5 Actor Requirements

770 This section summarizes the capabilities of one or more actors relevant to this transaction. The details regarding how to perform these operations are documented elsewhere in this transaction or possibly in other transactions.

3.15.5.1 Document Source

An implementation of the Document Source Actor shall be capable of the following operations:

1. Submit a single document
- 775 2. Submit a document as a replacement for another document already in the registry/repository (**does not apply when sending to Document Recipient**)

Note: In order to support document addition to an existing folder, grouping with the Document Consumer may be necessary in order to Query the registry (e.g. for UUIDs of existing folder).

An implementation of the Document Source Actor may support one or more of the following XDS/**XDR** Options:

- 780 1. **Multiple Documents Submission Option.** In this option the Document Source offers the ability to include multiple documents in a single Submission Request.
2. **Document Life Cycle Management** In this option the Document Source offers the ability to perform the following operation (**does not apply when sending to Document Recipient**):
 - 785 • Submit a document as an addendum to another document already in the registry/repository
 - Submit a document as a transformation of another document already in the registry/repository

790 Note: In order to support document replacement/addendum/transformation grouping with the Document Consumer may be necessary in order to Query the registry (e.g. for UUIDs of existing document entries)

3. **Folder Management Option.** ~~In this option the Document Source offers the ability to perform the following operations:~~

When Sending to Document Repository

795 **In this option the Document Source offers the ability to perform the following operations:**

- Create a folder
- Add one or more documents to a folder

When Sending to Document Recipient

800 **The Document Source may include folders. The Document Recipient may ignore them.**

Note: In order to support document addition to an existing folder, grouping with the Document Consumer may be necessary in order to Query the registry (e.g. for UUIDs of existing folder).

805 **If a Document Recipient receives a Provide and Register transaction containing a feature labeled above as not applying, it may reject the transaction, returning an error with appropriate message.**

These operations are discussed in section **ITI TF-2**: 3.14.4.1.2.3.4 Other Properties of Submission Requests.

3.15.5.2 Document Repository or Recipient

810 A Document Repository **or Recipient** may validate the following metadata elements received as part of a Provide and Register transaction:

XDSDocumentEntry.uniqueId – a submission may be rejected if not unique within the **Document Repository or Recipient**.

XDSSubmissionSet.sourceId – a **Document Repository or Recipient** may choose to accept submissions only from certain sources and use this field to perform the filtering.

815

Update the Table 3.14.4.1-5 Document Metadata Attribute Definition of the Section 3.14.4.1.2.7 Document Definition Metadata with the following entries

Table 3.14.4.1-5 Document Metadata Attribute Definition

XDS Document Entry Attribute	Definition	Source/ Query	Data Type
hash	<p>When used in the Register Document Set transaction, this contains the hash key of the XDS Document itself. This value is used by the recipient for detecting the improper resubmission of Documents.</p> <p>If this attribute is received in a Provide and Register Document Set transaction it shall be ignored.</p> <p>This attribute shall be present in the Send Document Set and Distribute Document Set on Media transactions where it represents the hash of the attached document.</p> <p>See ITI TF-2: 3.14.4.1.2.7.3 for additional details.</p> <pre data-bbox="475 940 1206 1176"> <rim:Slot name="hash"> <rim:ValueList> <rim:Value> da39a3ee5e6b4b0d3255bfef95601890afd80709 </rim:Value> </rim:ValueList> </rim:Slot> </pre>	Cp/P	SHA1 hash
size	<p>When used in the Register Document Set transaction, this contains the size in bytes of the byte stream that was provided in the Provide and Register Transaction and stored by the XDS Document Repository. This value is computed by the XDS Document Repository and included in the Register Documents Set Transaction.</p> <p>If this attribute is received in a Provide and Register Document Set transaction it shall be ignored.</p> <p>This attribute shall be present in the Send Document Set and Distribute Document Set on Media transactions where it represents the size in bytes of the attached document.</p> <p>See ITI TF-2: 3.14.4.1.2.7.3 for additional details.</p> <pre data-bbox="475 1717 824 1768"> <rim:Slot name="size"> <rim:ValueList> </pre>	Cp/P	Integer

XDS Document Entry Attribute	Definition	Source/Query	Data Type
	<pre><rim:Value>3654</rim:Value> </rim:ValueList> </rim:Slot></pre>		
URI	<p>When used in the Register Document Set transaction, this contains the URI of the XDS Document to be used for retrieval. If this attribute is received in a Provide and Register Document Set transaction it shall be ignored.</p> <p>This paragraph will be updated by CP 144.</p> <p>XDS (and XDR) es does not constraint the format of this URI beyond RFC 2616. However, the IHE Retrieve Information for Display Integration Profile defined format may be used in cases where the Document repository is grouped with a RID Information Source Actor (See ITI TF-1:Appendix E.5)</p> <p>This attribute shall be present in the Send Document Set and Distribute Document Set on Media transactions where it represents the location in the transmission/media of the relevant document.</p> <p>When used in the Provide and Register Document Set transaction to a Document Recipient, this attribute shall be in the format of a simple filename with file extension (e.g. “DOC00001.TXT”). When it is contained in a sub-directory (the media equivalent of a multi-part in a communications context), its value shall contain the sub-directory name, and the main file name, separated by a forward slash “/” character (e.g. “DOC0000P/DOC0000P1.XML”).</p> <p>When used in the Distribute Document Set on Media transaction, this attribute shall contain a relative path to the document on the media. This path shall be relative to the submission set directory as discussed in Message Semantics of that transaction. This attribute takes on two forms. A simple file shall be represented as of a simple filename with file extension (e.g. “DOC00001.TXT”). When it is contained in a sub-directory (the media equivalent of a multi-part in a communications context), its value shall contain the sub-directory name, and the main file name, separated by a forward slash “/” character (e.g. “DOC0000P/DOC0000P1.XML”).</p>	Cp/P	URI

XDSDocument Entry Attribute	Definition	Source/ Query	Data Type
	<p>RID links can be used only if they yield the document in full fidelity.</p> <pre data-bbox="472 464 1127 604"><rim:Slot name="URI"> <rim:ValueList> <rim:Value>http://www.ihe.net</rim:Value> </rim:ValueList> </rim:Slot></pre>		

820 *Update the Table 3.14.4.1-6 Submission Set Metadata Attribute Definitions of the Section 3.14.4.1.2.8 Submission Set Metadata with the following entry*

Table 3.14.4.1-6 Submission Set Metadata Attribute Definitions

XDSSubmissionSet Attribute	Definition	Source/ Query	Data Type
intendedRecipient	<p>Represents the organization(s) or person(s) the Document Source intends the Submission Set to be for. This attribute may be multi-valued. Each entry should include one organization, one person, or both. Example below shows two doctors from the same organization, another doctor without precision of the organization and another organization without the precision of the person.</p> <p>If this attribute is received in a Provide and Register Document Set or Register Document Set transaction, it shall be ignored.</p> <p>Note: It is highly recommended to define the organization for all the persons, avoiding errors in the transmission of the documents internally at the Document Recipient side. There is a “ ” character separator between the organization and the person, which is required when the person information is present.</p> <pre data-bbox="472 1434 1243 1753"><rim:Slot name="intendedRecipient"> <rim:ValueList> <rim:Value>Fair Clinic^L^716 ^Wel^Marcus^^^Dr^MD</rim:Value> <rim:Value>Fair Clinic^L^716 ^Al^Peter^^^Dr^MD</rim:Value> <rim:Value> 12345^John^Smith^^^Dr^MD</rim:Value> <rim:Value>Main Hospital</rim:Value> </rim:ValueList> </rim:Slot></pre>	O/O	XON XCN

Add the following section to section 3.19.6 Message Semantics to the 3.19 Authenticate Node transaction section in ITI TF-2

3.19.6.3 SMTP communication

825 *Update the contents of this section later so that it reflects the changes in the NULL_SHA Change Proposal.*

When configured for use on a network that is physically secured, implementations shall use the S/MIME over SMTP protocol, and the following cyphersuite shall be supported:

- S/MIME_RSA_WITH_NULL_SHA
- 830 • The signature is using the signedData format (i.e. encapsulated signature vs. multipart/signed format for detached signature) making the signature verification easier for the remote node. The email shall be digitally signed by the sender, by a one level only detached signature. This digital signature shall be interpreted to mean that the sender is attesting to their authorization to disclose the information to the intended recipient(s). RSA/SHA-1 signature
- 835 shall be supported by both the sender and the receiver.
- All the certificates of the "trust chain" shall be contained within the signature, while using a PKI or out of bound certificate.

When configured for use on an unsecured network, the following cyphersuite shall also be supported:

- 840 • S/MIME_RSA_WITH_AES_128_CBC_SHA (the receiver shall however support additionally S/MIME_RSA_WITH_3DES_128_CBC_SHA).
- The email shall be digitally signed by the sender, by a one level only detached signature, applied BEFORE the encryption. This digital signature shall be interpreted to mean that the sender is attesting to their authorization to disclose the information to the intended
- 845 recipient(s).
- As explained in S/MIME, the sender will generate a unique session key, encrypt the payload of the message using the symmetrical AES algorithm, encrypt the key using the RSA asymmetrical algorithm with each one of receiver(s) public key and attach the result to the message. Each one of the receiver(s) will decrypt this result using its private key, revealing
- 850 the session key, and decrypt the payload of the message

Add the following Appendix to ITI TF-2

Appendix T: Use of eMail (Informative)

855 The off-line mode protocol uses the classical email exchange, based on SMTP server(s) as well as a POP3 server storing the recipient mailbox. The different steps of the exchange are described below, depending on the success or failure status of the exchange. The mechanism may be similar and use the evolution of these protocols (ESMTP, EMAP4). The Document Source and the Document Recipient shall at least support SMTP and POP3, but they may also support ESMTP and EMAP or similar. The example may also apply for a Document Repository when the off-line protocol binding is used.

860 In case the message cannot reach the Document Recipient POP3 server, the diagram is the following:

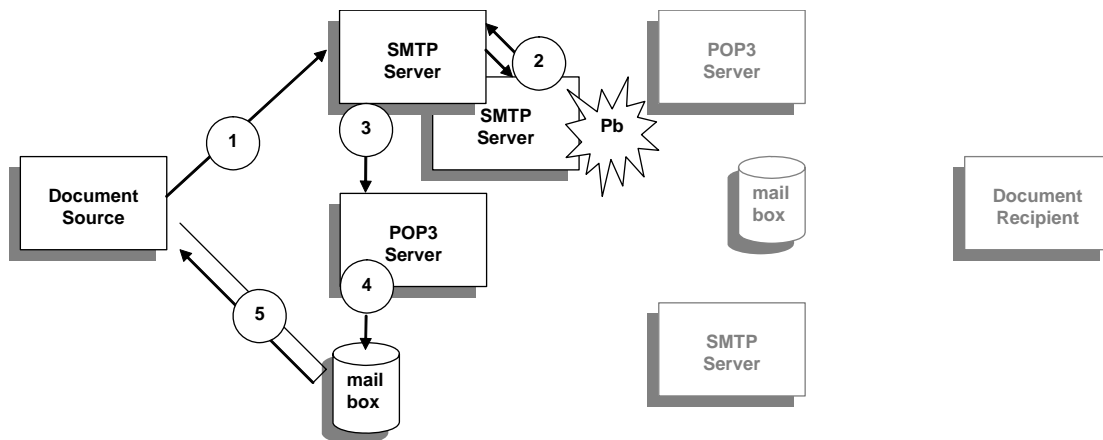


Figure T-1: Exchange diagram when the message is sent with error

Where the steps are:

- 865
1. Initial message sent by the Document Source to its SMTP server
 2. Transfer of this message to the Document Recipient POP3 server, potentially through a number of other SMTP servers acting as relays, but with a problem arising (which could be also at the POP3 Server level as “user email unknown” or “over quota exceeded in the destination mailbox”). An error message “Delivery Status Notification” (DSN) is generated by the server where the problem occurs, and sent back to the sender (using its “reply to” address if present, its “from” address otherwise)
- 870
3. Reception of the negative DSN message by the Document Source POP3 server
 4. Store of the received message by the POP3 server in the mail box dedicated to the Document Source

- 875 5. Query and retrieve of the message by the Document Source from its mailbox (and normally deletion of this message).

In case the message reaches the Document Recipient POP3 server, the diagram is the following:

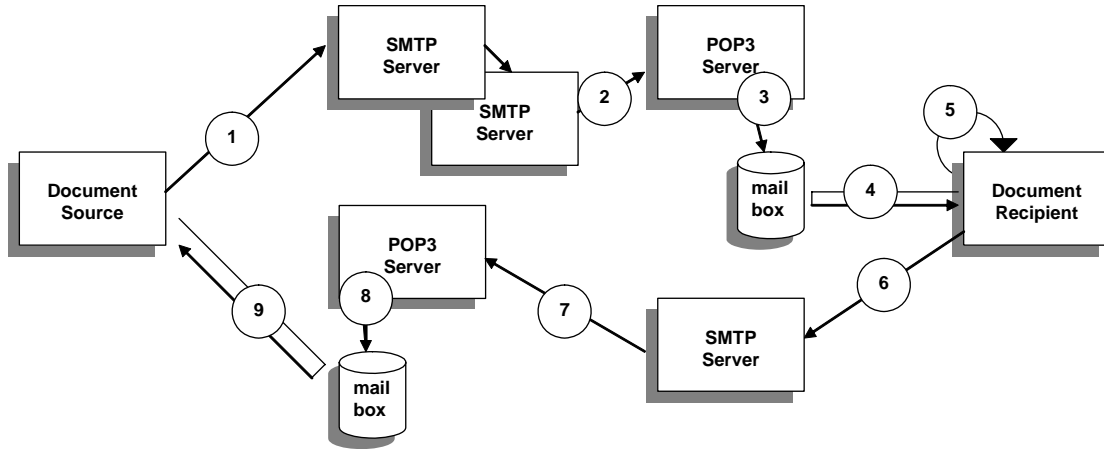


Figure T-2 Exchange diagram when the message is successfully sent

880 Where the steps are:

1. Initial message sent by the Document Source to its SMTP server
2. Transfer of this message to the Document Recipient POP3 server, potentially through a number of other SMTP servers acting as relays
3. Store of the received message by the POP3 server in the mail box dedicated to the Document Recipient
- 885 4. Query and retrieve of the message by the Document Recipient from its mailbox (and normally deletion of this message).
5. Local confirmation of the success (or failure) when it “processes” the message inside the Document Recipient (which could be that the user has read the message or at least that it has been correctly imported in the EHR)
- 890 6. Generation by the Document Recipient of a “Message Delivery Notification” message, that can be positive (respectively negative with the status)
7. Reception of the positive MDN message by the Document Source POP3 server
8. Store of the received message by the POP3 server in the mailbox dedicated to the Document Source
- 895 9. Query and retrieve of the message by the Document Source from its mailbox (and normally deletion of this message).

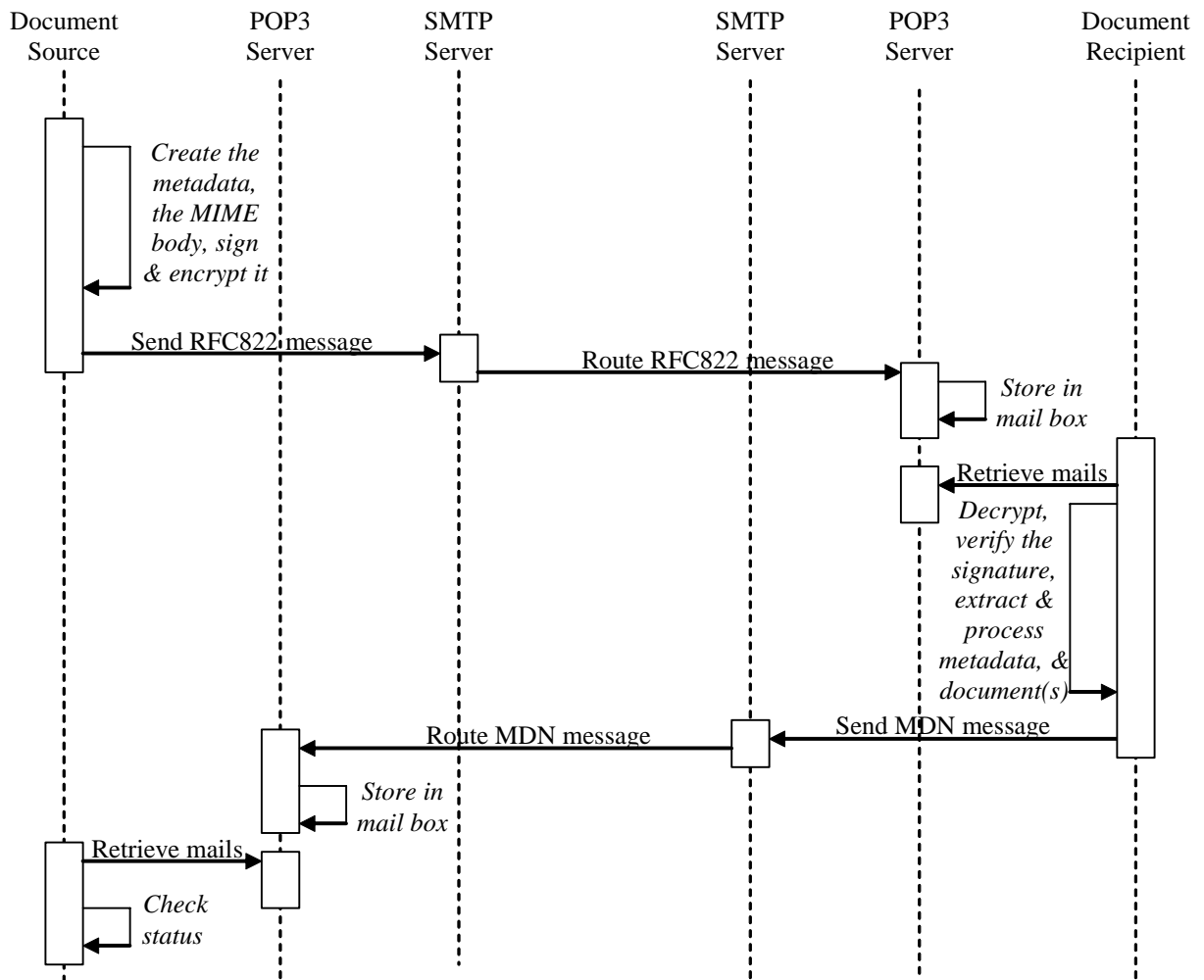


Figure T-3 Sequence diagram of the secured Send Document Set Transaction

900