Integrating the Healthcare Enterprise

IHE IT Infrastructure Technical Framework Supplement

Mobile access to Health Documents (MHD)

Trial Implementation

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Foreword

This is a supplement to the IHE IT Infrastructure Technical Framework V11.0. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on October 14, 2014 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the IT Infrastructure Technical Framework. Comments are invited and may be submitted at http://www.ihe.net/ITI_Public_Comments.

This supplement describes changes to the existing technical framework documents.

"Boxed" instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend Section X.X by the following:

Where the amendment adds text, make the added text **bold underline**. Where the amendment removes text, make the removed text **~~bold strikethrough~~**. When entire new sections are added, introduce with editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.

General information about IHE can be found at: http://www.ihe.net.

Information about the IHE IT Infrastructure domain can be found at: http://www.ihe.net/IHE_Domains.

Information about the structure of IHE Technical Frameworks and Supplements can be found at: http://www.ihe.net/IHE_Process and http://www.ihe.net/Profiles.

The current version of the IHE Technical Framework can be found at: http://www.ihe.net/Technical_Frameworks.

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Introduction to this Supplement

The IHE MHD profile and the HL7 FHIR activities are working together to revise and enhance the transactions profiled here. For details on HL7 FHIR See http://hl7.org/fhir

The Volume 1 material present here is current. The volume 2 and volume 3 materials are being developed. The current status of this evolution can be found on the IHE Wiki at http://wiki.ihe.net/index.php?title=MHD_Status

The Mobile access to Health Documents (MHD) profile defines a simple HTTP interface to an XDS like environment. The MHD profile is intended for any system that prefers the simplified HTTP RESTful technology rather than the more robust technology used in XDS. It defines transactions to a) submit a set of documents and metadata from the mobile device to a document receiver, b) find the document submission set metadata based on query parameters; c) find document entries containing metadata based on query parameters, and d) retrieve a copy of a specific document.

These transactions leverage the document content and format agnostic metadata concepts from XDS, but simplify them for access by constrained environments such as mobile devices. The MHD profile does not replace XDS. It can be used to allow mobile devices, or other resource constrained systems, access to an XDS health information exchange. The following figure shows one possible way to implement MHD with a document sharing environment (that may, but is not necessarily, XDS based). This implementation choice is not mandatory and we recognize other architectures will be implemented. An Implementation Guide is being maintained at **http://wiki.ihe.net/index.php?title=MHD_Implementation_Guide**

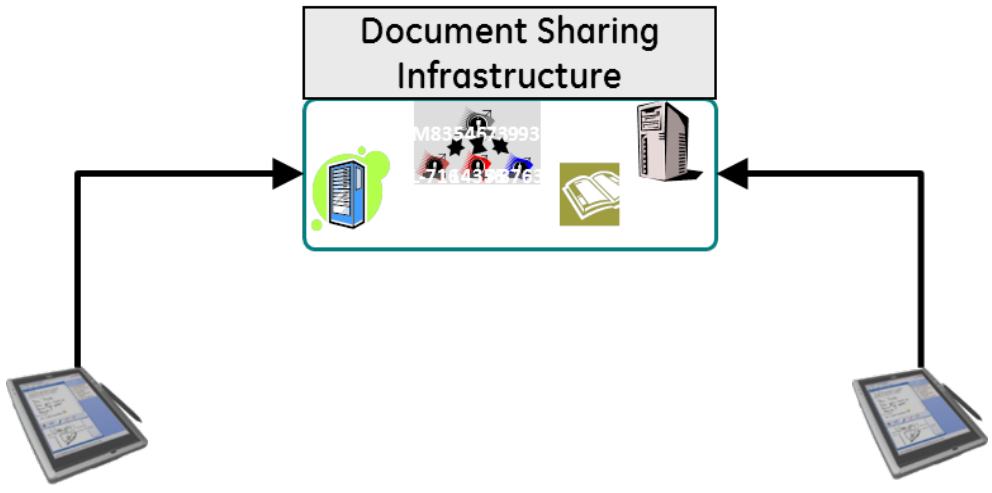

Figure 1: Mobile access to a Document Sharing environment.

The XDS profile is specifically designed to support the needs of Cross-Enterprise security, privacy, interoperability, and includes characteristics to support this level of policy and operational needs. The MHD profile has simplified the interactions in ways that are more consistent with a single policy domain use. The MHD transactions are not specifically tied to XDS, and some of the system implementations envisioned would interface directly to an organizational EHR, or a multi-national PHR.

The following lists a few examples of the environments which might choose to use the MHD profile instead of the XDS profile. The MHD profile supports a broad set of the XDS use cases and functionality while keeping the technology as simple as possible. The MHD profile is focused on a useful subset of the use-cases that XDS supports and does not try to reproduce the full scalability, flexibility, privacy, or security supported by the more robust XDS infrastructure.

- Medical devices such as those targeted by the Patient Care Devices (PCD) domain or Continua organization, submitting data in the form of documents.
- Kiosks used by patients in hospital registration departments, where it is anticipated that a hospital staff member will review, edit, and approve the document before it is allowed into the hospital system.
- PHR publishing into a staging area for subsequent import into an EHR or HIE.
- Patient or provider application that is configured to securely connect to a PHR in order to submit a medical history document. (For example BlueButton+)
- Electronic measurement device participating in an XDW workflow and pulling medical history documents from an HIE.
- A General Practitioner physician's office with minimal IT capabilities using a mobile application to connect to an HIE or EHR.

Open Issues and Questions

- MHD_024: The Volume 2 and Volume 3 content is evolving. Discussion of these changes. To participate please see http://wiki.ihe.net/index.php?title=Mobile_access_to_Health_Documents_-_Supplement_revision_2

Closed Issues

- MHD_001: Standards selection is now FHIR. The profile will restrict FHIR use to that which can be supported by an underlying XDS environment, keeping with the fact this is the MHD profile. The broad expectation is to use DocumentReference for DocumentEntry, DocumentManifest for SubmissionSet, and List for Folders. The inclusion of other FHIR resources as needed. The Provide Document Resources will be a bundle of the various resources necessary to be equivalent to the XDS

ProvideAndRegister. The Find Document References will query on DocumentReference resources. The Find Document Manifests will query on DocumentManifest resources.

- MHD_002: Security model is recommended to use IUA profile, but not mandated as there are plenty of HTTP based security models that layer in between the low level transport (TCP) and the HTTP encoding. These security models can be layered in without modifying the characteristics of this profile. The use of TLS will be encouraged, specifically the use of ATNA, but will not be mandated. The IUA profile includes guidance on the use of the current common implementations of OpenID Connect and OAuth 2.

Volume 1 – Profiles

Add to Section 33

33 Mobile access to Health Documents (MHD) Profile

Applications specific to mobile device is an emerging platform for healthcare enhancing software. The MHD profile is not limited to mobile devices, using the term “mobile” only as a grouping for mobile applications, mobile devices or any other system that is resource and platform constrained, driving the implementer to use simpler network interface technology. There are numerous uses of documents, for example hosted by a Health Information Exchange (HIE), large health provider electronic health record (EHR), or personal health record (PHR).

The Mobile access to Health Documents (MHD) profile defines one standardized interface to health documents (aka an Application Programming Interface (API)) for use by mobile devices so that deployment of mobile applications is more consistent and reusable. In this context, mobile devices include tablets and smart-phones, plus embedded devices like home-health devices. This profile is also applicable to larger systems where the needs are simple, such pulling the latest summary for display. The critical aspects of the ‘mobile device’ are that it is resource constrained, has a simple programming environment (e.g., JSON, javascript), simple network stack (e.g., HTTP), and simple display functionality (e.g., HTML browser). The goal is to limit the additional libraries that are necessary to process SOAP, WSSE, MIME-Multipart, MTOM/XOP, ebRIM, and multi-depth XML.

The Mobile access to Health Documents (MHD) profile defines actors and transactions. There is one set of actors and a transaction used to submit or push a new document entry or set of document entries from the mobile device to a receiving system. The other set of actors and transactions is used to get a list of document entries containing metadata, and to retrieve a copy of a specific document.

These transactions leverage the metadata concepts from XDS, but simplify the technology requirements for access by mobile devices. The MHD profile does not replace XDS. It enables simplified access by mobile devices to an XDS (or a similar) document management environment containing health information.

33.1 MHD Actors, Transactions, and Content Modules

Figure 33.1-1 shows the actors directly involved in the MHD Profile and the relevant transactions between them.

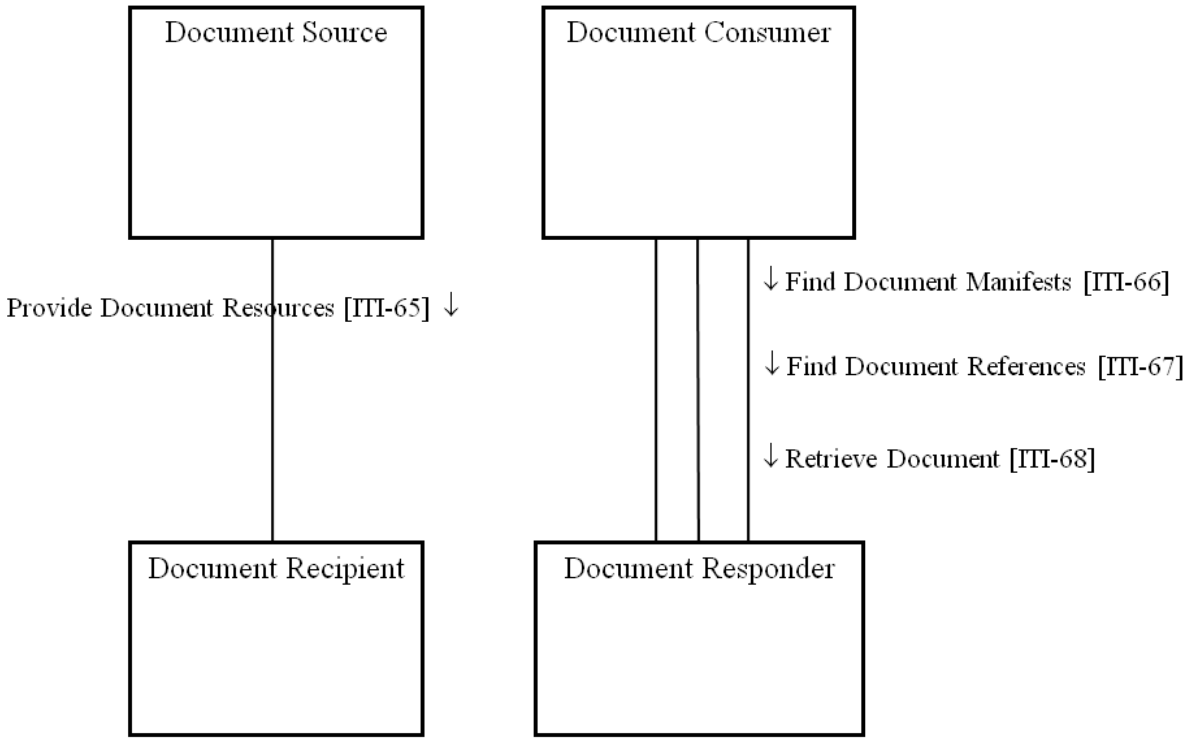

Figure 33.1-1: MHD Actor Diagram

Table 33.1-1 lists the transactions for each actor directly involved in the MHD Profile. In order to claim support of this Profile, an implementation of an actor must perform the required transactions (labeled "R") and may support the optional transactions (labeled "O"). Actor groupings are further described in Section 33.3.

Table 33.1-1: MHD - Actors and Transactions

Actors	Transactions	Optionality	Section in Vol. 2
Document Source	Provide Document Resources [ITI-65]	R	ITI TF-2b:3.65
Document Recipient	Provide Document Resources [ITI-65]	R	ITI TF-2b:3.65
Document Consumer	Find Document Manifests [ITI-66]	O (Note 1)	ITI TF-2b:3.66
	Find Document References [ITI-67]	O (Note 1)	ITI TF-2b:3.67

Actors	Transactions	Optionality	Section in Vol. 2
	Retrieve Document [ITI-68]	O (Note 1)	ITI TF-2b:3.68
Document Responder	Find Document Manifests [ITI-66]	R	ITI TF-2b:3.66
	Find Document References [ITI-67]	R	ITI TF-2b:3.67
	Retrieve Document [ITI-68]	R	ITI TF-2b:3.68

Note 1: Document Consumer shall implement at least one transaction: Find Document Manifests, Find Document References, or Retrieve Document.

33.1.1 Actor Descriptions and Actor Profile Requirements

The Document Source and Document Consumer actors are designed so that they can easily be implemented on a mobile device, and yet have sufficient functionality to support a wide range of applications and use cases.

The Document Recipient and Document Responder are expected to be implemented in a service environment and thus do not have the mobile device constrained environment.

The transactions in the MHD Profile correspond to the following equivalent transactions used in XDS.

- MHD Provide Document References → XDS Provide and Register
- MHD Find Document References → XDS Registry Stored Query – FindDocuments
- MHD Find Document Manifests → XDS Registry Stored Query – FindSubmissionSets
- MHD Retrieve Document → XDS Retrieve Document Set

The MHD transactions are not precisely equal to the XDS transactions as the MHD profile provides less functionality. These limitations are:

- the MHD Provide Document Resources cannot be used to replace an existing document or provide a transform
- the MHD Retrieve Document can only retrieve one document at a time.
- the MHD Find Document References does not support the XDS Registry Stored Query GetRelatedDocuments stored query.
- The MHD Provide Document Resources cannot create or update folders

In XDS, the Document Registry and Document Repository actors are independent to enable the widest possible deployment architectures. In contrast, the MHD profile combines the Registry and Repository functionality in one MHD Document Responder. This is expected to ease configuration needs on the mobile health application and mobile health application deployment, and reduce the overall solution complexity. The MHD Document Recipient and the MHD Document Responder actors are independent because there are use cases where only one is needed, such as supporting a mobile medical measuring device that simply creates and submits

new documents. More general-purpose systems would likely implement both of these actors to provide a complete service definition for the hosting organization.

Due to these simplifying constraints, the MHD profile can be used as an interface to an XDS environment, but as discussed above, the MHD profile does not support all of the functionality supported by the XDS Document Source and XDS Document Consumer.

33.2 MHD Actor Options

Options that may be selected for this Profile are listed in the Table 33.2-1 along with the actors to which they apply. Dependencies between options when applicable are specified in notes.

Table 33.2-1: MHD - Actors and Options

Actor	Options	Volume & Section
Document Source	*No options defined*	- -
Document Recipient	*No options defined*	- -
Document Consumer	*No options defined*	- -
Document Responder	*No options defined*	- -

33.3 MHD Actor Required Groupings

Actor(s) which are required to be grouped with another actor(s) are listed in this section. The grouped actor may be from this profile or a different domain/profile. These mandatory required groupings, plus further descriptions if necessary, are given in the table below.

An actor from this profile (Column 1) must implement all of the required transactions in this profile in addition to all of the required transactions for the grouped profile/actor listed (Column 2).

Table 33.3-1: MHD - Actors Required Groups

MHD Actor	Actor to be grouped with	Technical Framework Reference	Content Binding Reference
Document Source	None		
Document Recipient	None		
Document Consumer	None		
Document Responder	None		

33.4 MHD Overview

The MHD Profile defines a base URL pattern with a mandatory patient identifier argument. This is a typical HTTP RESTful pattern and has the advantage of making it clearer that these are patient-centric transactions. The mobile device may get the patient ID using the Patient Demographics Query for Mobile (PDQm) profile or it could come from a previous browser session, some service call, or be configured. The mandatory inclusion of the Patient Identity on the URL should make the enforcement of privacy and security more straightforward (See Section 33.5 Security Considerations).

33.4.1 Concepts

The MHD profile supports a broad set of the XDS use cases and functionality while keeping the technology as simple as possible. The MHD profile is focused on a subset of the use cases that XDS supports and does not try to reproduce the full scalability, flexibility, privacy, or security supported by the more robust XDS infrastructure. Example Use cases are:

- Medical devices such as those targeted by the Patient Care Devices (PCD) domain or Continua organization, submitting data in the form of documents.
- Kiosks used by patients in hospital registration departments, where it is anticipated that a hospital staff member will review, edit, and approve the document before it is allowed into the hospital system.
- PHR publishing into a staging area for subsequent import into an EHR or HIE.
- Patient or provider application that is configured to securely connect to a PHR in order to submit Recording history document. (For example BlueButton+)
- Electronic measurement device participating in an XDW workflow and pulling medical history documents from an HIE.
- A General Practitioner physician's office with minimal IT capabilities using a mobile application to connect to an HIE or EHR.

These specific use cases can be generalized into two general use cases. The first general use case is one where a new document(s) is published from the mobile device. The second general use case is one where the mobile device needs to discover available documents and retrieve documents of interest. There are clearly complex use cases that combine these two general use cases. These are not specifically diagramed.

Where more complex use cases are needed, the one of the more robust XDS family of profiles is a more appropriate interface.

33.4.2 Use Case #1: Publication of new documents

33.4.2.1 Publication of new documents Use Case Description

In this use case there is a single new document or set of documents that are published from the mobile device. An example might be that the mobile device is a medical device that has acquired new health measurements, or the mobile device has a user-interface used to capture user input such as a Patient Consent. This device created content is formed by the application implementing the Document Source into a Document and is submitted with the metadata.

The use cases presume that the mobile device knows the patient identity or discovers it using the PDQm Profile. It is also allows for identity cross-referencing to be implemented in the Document Recipient. The patient identity might be obtained through some IHE transactional method such as PIX/PDQ/PDQm, might simply be entered via some device interface (RFID, Bar-Code), a user interface, or be specified in a configuration setting (e.g., mobile PHR Application). This use case also presumes that the mobile device knows the location of the URL endpoints, likely through a configuration setting, or a workflow driven by a web interface.

33.4.2.2 Publication of new documents Process Flow

The publication of a new document(s) is done using the Provide Document Resources transaction, which carries both the document metadata and the document (similar to an XDS Provide and Register transaction).

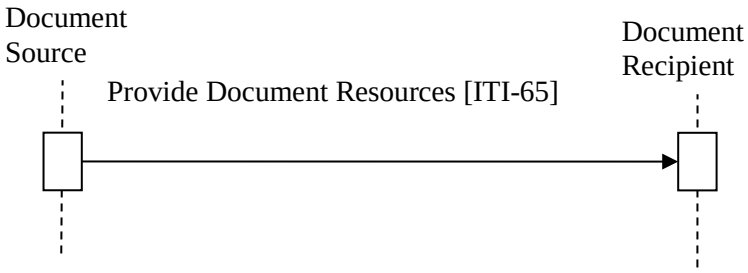

Figure 33.4.2.2-1: Basic Process Flow in MHD Profile

33.4.3 Use Case #2: Discovery and Retrieval of existing documents

33.4.3.1 Discovery and Retrieval of existing documents Use Case Description

In this use case the mobile device needs access to existing documents. An example is a mobile device involved in a workflow that needs to determine the current state of the workflow, or where the mobile device needs to discover the most current medical summary.

33.4.3.2 Discovery and Retrieval of existing documents Process Flow

The Find Document References transaction is used to provide parameterized queries that result in a set of Document Entries.

The Find Document Manifest transaction is used to provide parameterized queries that result in a set of Document Submission Sets.

The Retrieve Document transaction is used to get the document itself.

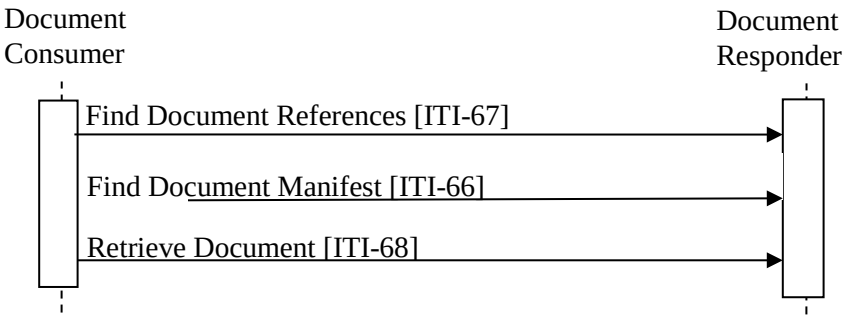

Figure 33.4.3.2-1: Basic Process Flow in MHD Profile

33.4.4 Mapping to RESTful operators

The MHD profile provides the resources and transactions against those resources. These are summarized in Table 33.4.4-1. MHD does not use any additional extended or custom methods.

Table 33.4.4-1: Methods and Resources

HTTP Method	Transactions on Document Entry	Transactions on Document Submission Set	Transactions on Document
GET	Find Document Reference [ITI-67]	Find Document Manifest [ITI-66]	Retrieve Document [ITI-68]
PUT	Prohibited	Prohibited	Prohibited
POST	Provide Document Resources [ITI-65]		
DELETE	Prohibited	Prohibited	Prohibited
UPDATE	Prohibited	Prohibited	Prohibited
HEAD	Not Specified	Not Specified	Not Specified
OPTIONS	Not Specified	Not Specified	Not Specified
TRACE	Not Specified	Not Specified	Not Specified

Note: The items marked Prohibited are indicated prohibited as the MHD profile is focused on core Document Sharing (XDS, XDR) capability, and is not trying to address the larger use-cases of metadata update.

33.5 MHD Security Considerations

There are many security and privacy concerns with mobile devices, simply because they are harder to physically control. Many common information technology uses of HTTP, including the RESTful pattern, are accessing far less sensitive information than health documents. These factors present an especially difficult challenge for the security model. It is recommended that application developers utilize a Risk Assessment in the design of the applications, and that the operational environment utilize a Risk Assessment in the design and deployment of the operational environment.

A resource server should not return any patient information unless proper authentication and communications security has been proven.

There are many reasonable methods of securing the interoperability transactions. These security models can be layered in without modifying the characteristics of the MHD profile transactions. The use of TLS is encouraged, specifically the use of the ATNA profile. User authentication on mobile devices is encouraged to use the Internet User Assertion (IUA) profile. The network communication security, and user authentication are layered in at the HTTP transport layer thus do not modify the interoperability characteristics defined in the MHD profile.

The Security Audit logging (e.g., ATNA) is recommended. Support for ATNA-based audit logging on the mobile health device may be beyond the ability of this constrained environment. This would mean that the operational environment must choose how to mitigate the risk of relying only on the service side audit logging.

The Resource URL pattern defined in this profile does include the Patient ID as a mandatory argument. The advantage of this is to place clear distinction of the patient identity on each transaction, thus enabling strong patient-centric privacy and security controls. This URL pattern does present a risk when using typical web server audit logging of URL requests, and browser history. In both of these cases the URL with the patient identity is clearly visible. These risks need to be mitigated in system or operational design.

33.6 MHD Cross Profile Considerations

33.6.1 MHD Actor grouped with XDS infrastructure

When the MHD Document Recipient Actor is acting as a proxy for an XDS environment, it could be grouped with an XDS Document Source or an XDS Integrated Document Source/Repository. In this way, the Provide Document Resources transaction would be converted by the grouped system into an XDS Provide and Register Document Set-b transaction. It is expected that this system would be configured to support only a designated set of mobile devices authorized by the hosting organization and use the security model defined by that hosting organization. The proxy would be expected to fill in any necessary missing information, convert

any user authentication credentials, and implement fully the IHE ATNA Secure Node or Secure Application actors.

When the MHD Document Responder Actor is acting as a proxy for an XDS environment, it could be grouped with an XDS Document Consumer. In this way the Find Document Manifest, Find Document References, and Retrieve Document transactions will be supported in the system through the use of the XDS Registry Stored Query and XDS Retrieve Document Set-b transactions as needed. It is expected that this proxy would be configured to support a designated set of mobile devices and the security model defined by the hosting organization. The proxy would be expected to fill in any necessary missing information, convert any user authentication credentials, and implement fully the IHE ATNA Secure Node or Secure Application actors.

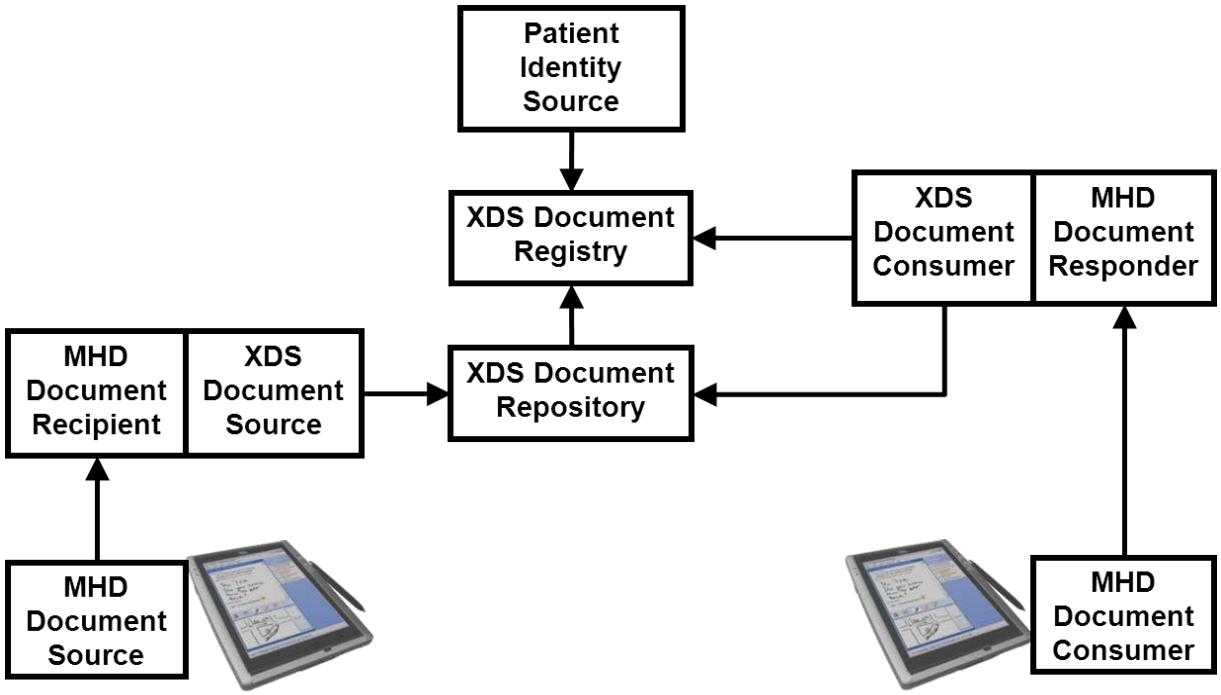

Figure 33.6.1-1: MHD Actors grouped with XDS

33.6.2 MHD Actor grouped with XCA infrastructure

When a MHD Document Responder acts as a proxy into an XCA environment, it could be grouped with an XCA Initiating Gateway. This type of MHD Document Responder will support the Find Document Manifests, Find Document References and Retrieve Document transactions by utilizing the XCA Cross Gateway Query and XCA Cross Gateway Retrieve transactions as necessary. This type of proxy would be configured to support a designated set of mobile devices and enable a security model as defined by the hosting organization. The proxy would be required

to fill in any necessary missing information, convert any user authentication credentials, and implement fully the IHE-ATNA Secure Node or Secure Application.

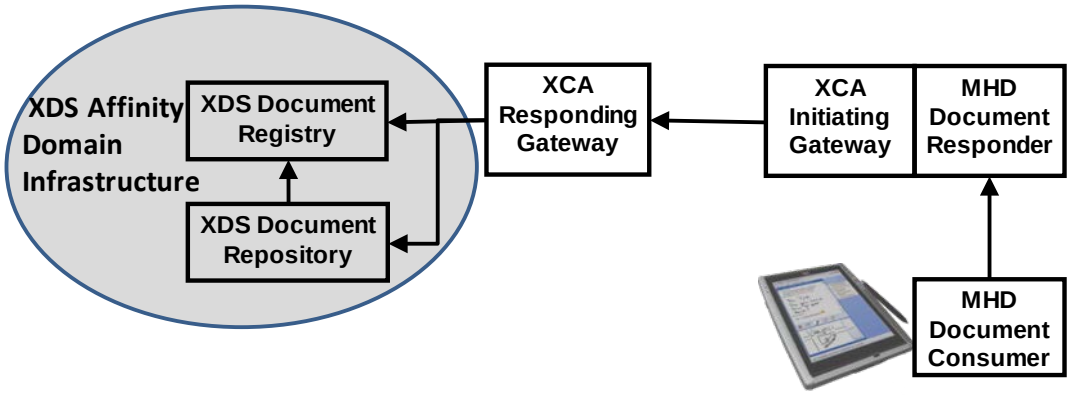

Figure 33.6.2-1: MHD Actors grouped with XCA

33.6.3 MHD Actor grouped with Retrieve Information for Display (RID) Profile

The Retrieve Information for Display (RID) profile includes a similar set of transactions to those defined in the MHD profile for Document Consumer. The RID profile is focused more on delivering display-ready health information that may or may not be document based, whereas the MHD profile is providing access to Documents and the metadata about the document. By grouping the RID "Information Source" Actor with a MHD "Document Responder" Actor will provide both access to the metadata and document content, with also access to display-ready information.

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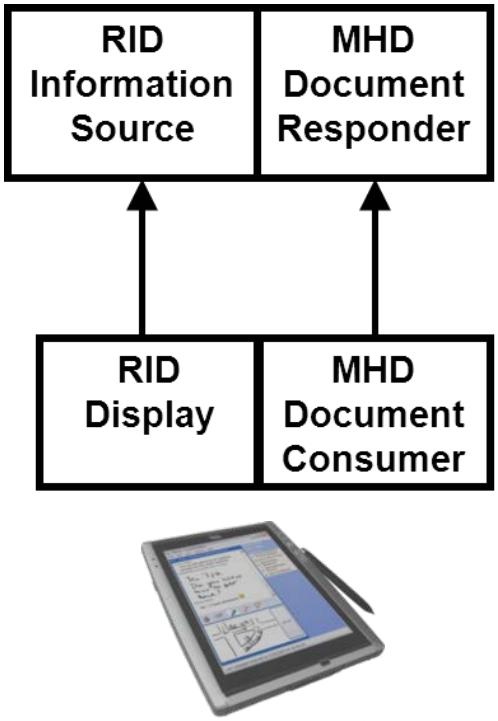

Figure 33.6.3-1: MHD Actors grouped with RID

Appendices

Actor Summary Definitions

Update (and add) the following terms to the IHE TF General Introduction Namespace list of actors:

Document Source - The Document Source Actor is the producer and publisher of documents **and metadata~~. It is responsible for sending documents to a Document Repository Actor. It also supplies metadata to the Document Repository Actor for subsequent registration of the documents with the Document Registry Actor.~~**

Document Consumer - The Document Consumer Actor queries for document metadata meeting certain criteria, and may retrieve selected documents.

Document Recipient: ~~This~~ The Document Recipient Actor receives **~~a set of~~** documents **and metadata** 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 a Health Record.~~**

Document Responder – The Document Responder Actor is receiver of and responder to requests for document entries and documents.

Transaction Summary Definitions

Add the following terms to the IHE TF General Introduction Namespace list of Transactions:

Provide Document Resources This transaction is used to transfer a document and metadata, equivalent to a Provide and Register Document Set-b transaction.

Find Document Manifest – This transaction is used to provide parameterized queries that result in a list of Document Submission Sets.

Find Document References – This transaction is used to provide parameterized queries that result in a list of Document Entries.

Retrieve Document – This transaction is used to get a single document.

Volume 2c – Transactions

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