Integrating the Healthcare Enterprise

IHE Radiology
Technical Framework Supplement

Cross-Community Web-Based Access to DICOM Objects
(XC-WADO)

Revision 1.1 – Trial Implementation

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Please verify you have the most recent version of this document. See here for Trial Implementation and Final Text versions and here for Public Comment versions.

Foreword

This is a supplement to the IHE Radiology Technical Framework V23.0. 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 August 29, 2025 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 Radiology Technical Framework. Comments are invited and may be submitted at http://www.ihe.net/Radiology_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 IHE.net.

Information about the IHE Radiology domain can be found at IHE Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at Profiles and IHE Process

The current version of the Radiology Technical Framework can be found at Radiology Technical Framework.

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Introduction to this Supplement

The Cross-Community Web-based Access to DICOM Objects (XC-WADO) Integration Profile specifies actors and transactions to retrieve patient-relevant medical imaging data in a multi-community healthcare information-sharing setup.

A community is defined as a combination of healthcare organizations/facilities/enterprises that have agreed to work together using a common set of policies for the purpose of sharing clinical information via an established mechanism. Facilities/enterprises may host any type of healthcare application such as PACS/RIS, EHR, PHR, etc. A community is identifiable by a globally unique identifier called the homeCommunityId. Membership of a facility/enterprise in one community does not preclude it from being a member of another community. Such communities exist on regional, state, national, or multi-national scales. They may be Affinity Domains which define document sharing using the XDS, MHD or MHDS Profiles or any other communities, no matter what their internal sharing structure. This profile addresses sharing imaging information between such communities.

Like the XCA-I Integration Profile, the XC-WADO Profile extends the IT Infrastructure XCA Profile. XCA Profile provides the means to access healthcare records including Diagnostic reports and Imaging Manifests, and XC-WADO provides the means to access the imaging objects referenced in the Manifests by the means of the RESTful web-services standardized by DICOMweb as the Studies Service Retrieve transaction (a.k.a WADO-RS). The reader of XC-WADO is expected to have read and understood the XCA Profile, including the meaning of terms such as Community, homeCommunityId, etc.

Open Issues and Questions

#	Issue / Answer
1	The ITI MHDS Profile defines the set of transactions between actors that form the Community for the purpose of the Healthcare Information Exchange. The MHDS Community may play the similar role to the XDS Affinity Domain. The MHDS Profile does not explicitly specify how to convey the homeCommunityId in the ITI-67 / ITI-68 transactions, and the intent for the Trial Implementation Period of the XC-WADO Profile is to standardize this mechanism. It is suggested to embed homeCommunityId into the URI of the document reference. Adding a dedicated metadata attribute similar to the one used in [ITI-38] transaction is worth exploring.

Closed Issues

#	Issue / Answer
1.	Q: Is the community and repository IDs syntax in the URL resource path OK? A: The final definition of XC-WADO mechanism includes the homeCommunityId and RetrieveLocationUID into the resource path, while the RetrieveURL is conveyed as the query parameter of the WADO-RS URL.
2.	Q: XC-WADO enables retrieval of all four types of content in RAD-107 (instances, rendered instances, metadata, bulkdata). Should that be restricted in any way? A: Yes, the use restricted to original DICOM instances and rendered instances, See also Closed Issue 8. With Imaging Document Consumer required to use the RAD-160 transaction in the Intra-Community WADO-RS option, retrieval of other content is out of scope of this profile.

#	Issue / Answer
3.	Q: What caching requirements, if any, should the profile define for the Gateways to avoid timeouts for requesting sources? A: After deliberation, the discussion of caching operation has been removed from this profile. General consideration of possible approaches to deal with possible timeouts (like use of chunked transfer included into the section 58.4.1.6).
4.	Q: Are there any additional requirements that may be applicable for Federated Use Case? A: More than a single imaging document source in a community is a common situation. This has been explicitly stated in the description of the use case.
5.	Q: What additional text about firewall issues might be useful in Section 58.1.1.2? A: Referring to the security aspects of webservices and explicit reference to local policies that may affect firewall configurations, no additional text is necessary.
6	The public comments suggest profile name change to remove perception of its association with WIA, suggested names are XC-WADO (Cross-Community Web Access to DICOM Objects) and XC-WIR (Cross-Community Web-based Image Retrieval), XCA-Im Any other options? A: XC-WADO has been adopted as a name and abbreviation for the profile
7	The public comments proposed that the list of services for WADO-RS be limited to Instance level, thus assuring that only PUBLISHED instances are retrievable. Should we still allow an option to use higher level (Study, Series) retrievals? If not, does it mean creation of different, more limited transaction than RAD-107? A: There is no need to explicit restriction in the profile – rather, this should be explicitly stated that the different policies would control what the Remote Imaging Document Source will return if asked for a Series or Study – in other word, it should know what was "published", for example, by keeping the manifest, and filtering the returned objects according to manifest. On the other hand, due to possibility of re-publishing of the manifest, it is possible that some instances have been removed from the new version of the manifest which is not known to the IDC but is known to the IDS The way how the retrieval of only published instances is assured is beyond the scope of this profile. When retrieving a Study or Series resource IDC shall be prepared to get less or more than it knows from the manifest if it decides to test against it.
8	The public comments mostly suggested not to allow retrieval of rendered objects/thumbnails, metadata, bulkdata. Should this be out of scope of the profile? Explicitly prohibited? Would that require creation of different transaction? A: The new Transaction [RAD-160] Cross Community WADO-RS Retrieve explicitly limits the initiators to initiate requests for anything but original DICOM instances and optionally rendered instances. The requestor of Transactions [RAD-107] and [RAD-160] shall be prepared to receive an error when requesting the rendered instances. Support of other resources is out of scope
9	Should the Retrieve URL from the Manifest be required to be used? Going cross-community it is mostly useless, Should it be ignored? Should it be mentioned that it can be used for direct access? A: Imaging Document Consumer shall include the RetrieveURL if present in the Imaging Manifest, as a parameter of the WADO URL, Initiating Imaging Gateway shall not remove it, and the Responding Imaging Gateway may use it if present
10	Several comments requested Grouping with MHD actor rather than XDS.b – as an alternative to XDS.b Document Consumer – would that be a named option? A: No named option is introduced in this profile; the proposed grouping with MHD Profile actors is to group the Imaging Document Consumer with MHD Document Consumer and the MHD Document Responder with Initiating Gateway. The respective transactions ITI-67 and ITI-68 are discussed in the context of how the homeCommunityId is communicated as well as what encoding of DICOM Manifests might potentially be in this case. See also Open Issue 1.

#	Issue / Answer
11.	Note that the graphic in XCA-I describes explicit communication of the XDS.b Document Consumer with Initiating Gateway – however, the XCA Profile suggest a grouping of Document Consumer and the initiating gateway. Similarly, the MHD Document Consumer can be grouped with the Initiating Gateway. Should we reflect this XC-WADO graphic? A: See Closed Issue 10
12	Public Comments suggested that remote communities might have multiple PACS systems "behind" a single "RepositoryId". Would it be proper to state that RepositoryId would have to be translated by the Responding Gateway to determine where it should be going for retrieval (for example, a single WADO-RS Document Source that fronts multiple PACS? A: The RepositoryId has been removed from the consideration, rather, the parameters that are defining the Imaging Document Source are the RetrieveLocationURL (required) and RetrieveURL (optional) that are extracted from the Imaging Manifest.
13.	Q: Should we introduce the new option and actors in existing XCA-I? A: No. The XCA-I Profile is in Final Text and places specific requirements for support of the XDS-I.b capabilities as a baseline behavior for all actors. That would be burdensome on the implementors of RESTful services to continue supporting outdates ebXML/MTOM Web-Services.

IHE Technical Frameworks General Introduction

The IHE Technical Frameworks General Introduction is shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to this document where appropriate.

9 Copyright Licenses

IHE technical documents refer to, and make use of, a number of standards developed and published by several standards development organizations. Please refer to the IHE Technical Frameworks General Introduction, Section 9 - Copyright Licenses for copyright license information for frequently referenced base standards. Information pertaining to the use of IHE International copyrighted materials is also available there.

10 Trademark

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IHE Technical Frameworks General Introduction Appendices

The IHE Technical Framework General Introduction Appendices are components shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to these documents where appropriate.

*Update the following appendices to the General Introduction as indicated below. Note that these are **not** appendices to this domain's Technical Framework (TF-1, TF-2, TF-3 or TF-4) but rather, they are appendices to the IHE Technical Frameworks General Introduction located here.*

Appendix A – Actors

*Add the following **new or modified** actors to the IHE Technical Frameworks General Introduction Appendix A:*

New (or modified) Actor Name	Description
Initiating Imaging Gateway	The Initiating Imaging Gateway Actor proxies ~~**Imaging Document Set**~~ Retrieve requests from an Image Document Consumer to a Responding Imaging Gateway with a ~~**Cross-Gateway Retrieve Imaging Document Set separate**~~ **Cross-Community** Retrieve transaction.
Responding Imaging Gateway	The responding Imaging Gateway proxies ~~**Cross-Gateway**~~ **Cross-Community** Retrieve ~~**Imaging Document Set**~~ requests from an Initiating Imaging Gateway to an Imaging Document Source with a ~~**separate an Image Document Set**~~ Retrieve request.

The table below lists *existing* actors that are utilized in this profile.

Complete List of Existing Actors Utilized in this Profile

Existing Actor Name	Definition
Imaging Document Consumer	A system that makes use of imaging data.
Imaging Document Source	Publishes imaging data and makes it available for retrieval.

Appendix B – Transactions

*Add the following **new or modified** transactions to the IHE Technical Frameworks General Introduction Appendix B:*

Transaction	Definition
Cross-Community WADO-RS Retrieve [RAD-160]	Retrieves DICOM Instances located in a remote community via RESTful DICOMweb Study Service transaction.

Appendix D – Glossary

*Add the following **new or modified** glossary terms to the IHE Technical Frameworks General Introduction Appendix D:*

No new or modified glossary terms.

Volume 1 – Profiles

Domain-specific additions

None.

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Add new Section #

58 Cross-Community Web-Based Access to DICOM Objects (XC-WADO) Profile

The Cross-Community Web-based Access to DICOM Objects (XC-WADO) Integration Profile specifies actors and transactions to retrieve patient-relevant DICOM Instances from medical imaging studies being held by other communities. Each community may have multiple sources of medical image data that publish it for sharing within and outside the community.

The ITI XCA Profile, which defines access to healthcare records in a remote community, provides the foundation of cross-community communication. XDS-I or MHD profiles define specific means of retrieving the Imaging Manifests that reference DICOM Instances stored in a community and that were "published" by their holders into the community-level document registry for sharing both inside and outside the community.

While the XCA-I Profile enables retrieval of referenced DICOM Instances via SOAP and MTOM/XOP mechanisms, the XC-WADO Profile introduces a RESTful DICOMWeb Studies Service Retrieve transaction (a.k.a. WADO-RS, DICOM PS3.18 Section 10.4) as an alternative.

The reader of XC-WADO is expected to understand the use of Imaging Manifests defined in XCA-I and to have read and understood the XCA Profile, including the meaning of terms such as Community, homeCommunityId, etc.

58.1 XC-WADO Actors, Transactions, and Content Modules

This section defines the actors, transactions, and/or content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A. IHE Transactions can be found in the Technical Frameworks General Introduction Appendix B. Both appendices are located at https://profiles.ihe.net/GeneralIntro/index.html.

Figures 58.1-1 and 58.1-2 show the actors directly involved in the XC-WADO Profile and the relevant transactions between them.

The Imaging Document Consumer obtains the Imaging Manifests from local and remote communities through grouping with different actors in the ITI profiles that can provide access to the XCA infrastructure, such as the XDS.b Document Consumer or MHD Document Consumer.

XC-WADO actors with a required grouping are shown in conjoined boxes with other actors from different profiles. The shaded actors in these figures are NOT included in this profile but are shown to illustrate the grouping of the Imaging Document Consumer with the XDS.b Document Consumer or MHD Document Consumer and the set of MHD, XDS.b, and XCA actors that support the XC-WADO interactions by providing necessary information through the included transactions.

XDS.b Document Consumer, MHD Document Consumer, and other shaded MHD, XCA, and XDS actors are NOT included in this profile and are shown for illustration only.

The full set of transactions between the shaded actors is not provided, and readers are encouraged to read and understand the interactions between XCA actors and actors in other profiles. XCA, XDS.b and MHD actors are not listed in Table 58.1-1.

The transactions between Imaging Document Consumer and Initiating Imaging Gateway, as well as between Initiating Imaging Gateway and the Imaging Document Source within its community, are only defined when Initiating Imaging Gateway implements the Intra-Community WADO-RS Option. Similarly, the transaction between Responding Imaging Gateway and the Imaging Document Source in its community is only defined when Responding Imaging Gateway implements the Intra-Community WADO-RS Option. All transactions that require implementation of Intra-Community WADO-RS Option are shown as dashed lines.

Note: Initiating Imaging Gateway implementing Intra-Community WADO-RS Option is not required to recognize its own homeCommunityId, thus it may not be able to initiate the WADO-RS Retrieve [107] transaction.

Figure 58.1-1: XC-WADO Actor Diagram (with XDS.b grouping)

Figure 58.1-2: XC-WADO Actor Diagram (with MHD grouping)

260 Table 58.1-1 lists the transactions for each actor directly involved in the XC-WADO Profile. To claim compliance with this profile, an actor shall support all required transactions (labeled "R") and may support the optional transactions (labeled "O").

Table 58.1-1: XC-WADO Profile - Actors and Transactions

Actors	Transactions	Initiator or Responder	Optionality	Reference
Imaging Document Consumer	Cross-Community WADO-RS Retrieve [RAD-160]	Initiator	R	RAD TF-2: 4.160
Initiating Imaging Gateway	Cross-Community WADO-RS Retrieve [RAD-160]	Responder	O (Note 1)	RAD TF-2: 4.160
	WADO-RS Retrieve [RAD-107]	Initiator	O (Note 2)	RAD TF-2: 4.107
	Cross-Community WADO-RS Retrieve [RAD-160]	Initiator	R	RAD TF-2: 4.160
Responding Imaging Gateway	Cross-Community WADO-RS Retrieve [RAD-160]	Responder	R	RAD TF-2: 4.160
	WADO-RS Retrieve [RAD-107]	Initiator	O (Note 1)	RAD TF-2: 4.107
Imaging Document Source	WADO-RS Retrieve [RAD-107]	Responder	R	RAD TF-2: 4.107

Note 1: Required if the actor supports the Intra-Community WADO-RS Option

Note 2: Required if the actor supports the Intra-Community WADO-RS Option and provides mapping for own homeCommunityId

58.1.1 Actor Descriptions and Actor Profile Requirements

Most requirements are documented in RAD TF-2 Transactions. This section documents any additional requirements on the profile's actors.

58.1.1.1 Imaging Document Consumer

The Imaging Document Consumer requests and receives DICOM Instances from one or more communities.

The Imaging Document Consumer obtains the homeCommunityId and Imaging Manifest(s) identifying DICOM Studies of interest and their location from the grouped XDS.b or MHD Document Consumer that uses appropriate transactions to search and retrieve such Imaging Manifest(s) in the initiating or responding communities. See RAD TF-2: 4.68.4.1.2.1.1 for a detailed description of the Imaging Manifest contents.

Using the information from an Imaging Manifest and its associated homeCommunityId, the Imaging Document Consumer determines which DICOM instance(s) it will retrieve and which community holds those instances.

Note: The Imaging Manifests do not identify individual frames within multiframe objects, and as such, there is no possibility to retrieve individual frames using the XC-WADO Profile.

Note: An Imaging Document Consumer uses the homeCommunityId and RetrieveLocationUID to form the DICOMweb Study Service Retrieve transaction URI for the Cross-Community WADO Retrieve [RAD-160] transaction. If present in the manifest, it also includes the value of the Retrieve URL (0008,1190) attribute.

The Imaging Document Consumer issues a Cross-Community WADO-RS Retrieve [RAD-160] transaction in the Requestor role to the Initiating Imaging Gateway, implementing Intra-Community WADO-RS Option, to retrieve the DICOM instances from a remote community served by a Responding Imaging Gateway.

The Imaging Document Consumer forms the Study Service Retrieve Request URL by using the homeCommunityId and following metadata elements from the retrieved Imaging Manifests to identify which DICOM Instances it wants to retrieve and from what location:

- The homeCommunityId of a community where the instance is located
- The Retrieve Location UID of the Imaging Document Source holding the instance
- The Retrieve URL, if present, is the base URI of the WADO-RS endpoint, which, with the addition of any WADO-RS defined resources (study/series/instance), can be used to retrieve the instance
- Study Instance UID
- Series Instance UID, as needed
- SOP Instance UID, as needed

The Imaging Document Consumer will typically retrieve all DICOM instances listed in the Imaging Manifest that belong to the same series from a specific Imaging Document Source within a remote community, by retrieving a Series Instances resource. Alternatively, it may choose to retrieve each Instance resource individually.

The Imaging Document Consumer shall be aware that the list of instances of one series or study referenced in an Imaging Manifest may not be the same as all the instances of that series or study available at an Imaging Document Source and published by it for sharing within and outside the community. In this case, the number of instances retrieved by using the request for Series Instances or Study Instances resource may be larger or smaller than the number of instances expected by the Document Consumer.

58.1.1.2 Initiating Imaging Gateway

The Initiating Imaging Gateway retrieves instances from a remote community by communicating with the Responding Imaging Gateway using the Cross-Community WADO-RS Retrieve [RAD-160] transaction. An Imaging Document Consumer initiates the retrieval of DICOM Instances. The Initiating Imaging Gateway provides the retrieved instances to the Imaging Document Consumer that initiated the retrieval.

The Initiating Imaging Gateway shall implement a method to obtain information from an Imaging Document Consumer sufficient to initiate the Cross-Community WADO-RS Retrieve [RAD-160] transaction. The Initiating Imaging Gateway maps the homeCommunityId that it receives from the Imaging Document Source to the endpoint of the Responding Imaging Gateway to which the request needs to be sent. If the homeCommunityId is unknown to the

Initiating Imaging Gateway, it does not initiate the new request and responds to the Imaging Document Consumer with an error.

To complete the URL, it uses the following attributes provided to it by the Imaging Document Consumer:

- Retrieve Location UID of the Imaging Document Source holding the instance
- Retrieve URL, if present, is the base URI of the WADO-RS endpoint, which, with the addition of any WADO-RS defined resources (study/series/instance), can be used to retrieve the instance
- Study Instance UID
- Series Instance UID, as needed
- SOP Instance UID, as needed

58.1.1.2.1 Intra-Community WADO-RS Option

This option involves the Initiating Imaging Gateway receiving the DICOMweb Study Service Retrieve transaction request from an Imaging Document Consumer.

An Initiating Imaging Gateway that supports the Intra-Community WADO-RS Option shall extract the homeCommunityId from the `<location>` component of the Cross-Community WADO-RS Retrieve [RAD-160] request it received from the local Imaging Document Consumer. There are three scenarios:

- If the homeCommunityId from the inbound request is recognized as the remote community's identifier, the Initiating Imaging Gateway initiates Cross-Community WADO-RS Retrieve [RAD-160] request to a destination Responding Imaging Gateway that it determines by mapping of the homeCommunityId extracted from the inbound request.

  When initiating the request to the remote Responding Imaging Gateway, the Initiating Imaging Gateway maps the homeCommunityId extracted from the inbound request to the endpoint path of the Responding Gateway's DICOMweb Study Service Retrieve transaction URI.

  The <location>, <resource>, and `<qparam>` components of the inbound request are included in the outbound request without change.

- If the homeCommunityId in the inbound request is unknown to the Initiating Imaging Gateway, it does not initiate the new request and responds to the Imaging Document Consumer with an error.

- If the homeCommunityId from the inbound request is recognized as the identifier of the local community, the Initiating Imaging Gateway shall be able to initiate a WADO-RS Retrieve [RAD-107] request to the local Imaging Document Source identified by the RetrieveLocationUID extracted from the `<location>` component of the inbound request.

When composing the request to the local Imaging Document Source, the Initiating Imaging Gateway extracts the RetrieveLocationUID from the inbound request's URI and maps it to the hostname, port, and endpoint path of the respective local Imaging Document Source. The `<resource>` component and all parameters from the `<qparam>`component except RetrieveURL (if present) of the inbound request are included in the outbound request without change.

If the inbound Cross-Community WADO-RS Retrieve [RAD-160] request includes the RetrieveURL parameter in the `<qparam>` component, the Initiating Imaging Gateway may use the provided URL instead of the URL formed as described above.

Figure 58.1.1.2.1-1 illustrates processing of the homeCommunityId by Initiating Imaging Gateway.

Figure 58.1.1.2.1-1: Processing of the homeCommunityId by Initiating Imaging Gateway

After receiving the WADO-RS Retrieve [RAD-160] request from Imaging Document Consumer, Initiating Imaging Gateway initiates the [RAD-107] or [RAD-160] transaction by one of the two methods described in the following subsections.

58.1.1.2.1.1 HTTP Redirect

After forming the complete DICOMweb Study Service Retrieve transaction URI, the Initiating Imaging Gateway uses an HTTP Redirect response to the Imaging Document Consumer, instructing the Imaging Document Consumer to connect to the destination with the modified URL. This way of redirecting the request may only have practical use when the redirect is performed to a local Imaging Document Source. The redirect to the Responding Imaging Gateway will potentially involve changing firewall configurations and considering security policies of the Responding Imaging Gateway's community, as discussed in Section 58.5.

58.1.1.2.1.2 Reverse Proxy

In this configuration, the Initiating Imaging Gateway will construct the URL for the transaction by replacing the `<endpoint path>` of the URL in the received WADO-RS Retrieve [RAD-160] transaction with the `<endpoint path>` of the Responding Imaging Gateway and issue the request to the destination. The Imaging Document Consumer is unaware of the actual destination URL, even if that is the Imaging Document Source in the local Community. The response received from the Responding Imaging Gateway is immediately forwarded to the Imaging Document Consumer. When implementing this approach, the Initiating Imaging Gateway may also have to modify the content of HTTP headers to comply with the authentication, authorization, and security requirements of the Responding Imaging Gateway.

58.1.1.3 Responding Imaging Gateway

The Responding Imaging Gateway retrieves images from the Imaging Document Source Actors in its community at the request of the Initiating Imaging Gateway of a different community.

The Responding Imaging Gateway processes the Cross-Community WADO-RS Retrieve [RAD-160] request from the Initiating Imaging Gateway to verify that the homeCommunityId in the request matches its local homeCommunityId or one of the federated communities it is configured to proxy by grouping with an Initiating Imaging Gateway. If the homeCommunityId matches its local community, the Responding Imaging Gateway also verifies that it can resolve the RetrieveLocationUID to identify the local Imaging Document Source. Based on local policies, the Responding Imaging Gateway may also use the RetrieveURL if it was provided in the inbound request. If the verification checks are unsuccessful, the Responding Imaging Gateway shall return an error.

If verifications are successful, the Responding Imaging Gateway either passes the request to the grouped Initiating Imaging Gateway for retrieval of the DICOM Instances through another Responding Imaging Gateway or retrieves the DICOM instances from the Imaging Document Source in its own community identified by the RetrieveLocationUID and returns retrieved instances in the response to the inbound request from the Initiating Imaging Gateway.

If the Responding Imaging Gateway does not support the Intra-Community WADO-RS Option, the way it communicates with the Imaging Document Sources in its own community is out of scope of this profile.

58.1.1.3.1 Intra-Community WADO-RS Option

This option involves the Responding Imaging Gateway accessing data from Imaging Document Sources inside its own community using the DICOMweb Retrieve Transaction of the Studies Service.

The HTTP Request URI for the DICOMweb Retrieve Transaction of the Studies Service is formed from the `<protocol>` component, `<endpoint>` component, `<resource>` component, and `<qparam>` component.

The value of the `<protocol>` component shall be set to `https://`.

Responding Imaging Gateway that supports the Intra-Community WADO-RS Option shall extract RetrieveLocationUID from the `<location>` component of the Cross-Community WADO-RS Retrieve [RAD-160] request it received from the Initiating Imaging Gateway. It then maps the RetrieveLocationUID to the endpoint path of the respective local Imaging Document Source.

The `<resource>` component of the inbound request is included in the outbound request without change. The query parameters (other than the RetrieveURL, if present) from the `<resource>` component of the inbound request are included in the outbound request without change.

If the inbound WADO-RS Retrieve [RAD-160] request includes the RetrieveURL parameter, the Responding Imaging Gateway may use the provided URL instead of the URL created by the mapping described above.

See Section 58.4.1.5 for further discussion.

Responding Imaging Gateway shall generate the outbound request by acting as a reverse proxy so that the destination URL is not exposed to the Initiating Imaging Gateway.

58.1.1.4 Imaging Document Source

The Imaging Document Source receives a WADO-RS Retrieve [RAD-107] transaction request from an Initiating Imaging Gateway or Responding Imaging Gateway to retrieve the requested objects and returns them to the requestor. If the <resource> component of the inbound request indicates the request for retrieval of a complete study or series, Imaging Document source may select to only return those DICOM Instances that have been published by it in an Imaging Manifest.

The Imaging Document Source that belongs to the same community as the Initiating Imaging Gateway (Local Imaging Document Source) will send the Retrieve response either to the Initiating Imaging Gateway or directly to the Imaging Document Consumer. The latter case will occur if the Initiating Imaging Gateway selects to use HTTP Redirect response to the original Retrieve request from the Imaging Document Consumer.

A remote Imaging Document Source will send the response to the Responding Imaging Gateway. The response to the Imaging Document Consumer will traverse through the Initiating Imaging Gateway.

58.2 XC-WADO Actor Options

Options that may be selected for each actor in this profile, if any, are listed in Table 58.2-1. Dependencies between options, when applicable, are specified in notes.

Table 58.2-1: XC-WADO – Actors and Options

Actor	Option Name	Reference
Imaging Document Consumer	No options defined	--
Initiating Imaging Gateway	Intra-Community WADO-RS	Section 58.1.1.2.1
Responding Imaging Gateway	Intra-Community WADO-RS	Section 58.1.1.2.1
Imaging Document Source	No options defined	--

58.3 XC-WADO Required Actor Groupings

An actor from this profile (Column 1) shall implement all of the required transactions in this profile ***in addition to all*** of the requirements for the grouped actor (Column 2) of the Table 58.3-1.

Table 58.3-1: XC-WADO - Required Actor Groupings

XCA-I Actor	Actor(s) to be grouped with	Reference
Imaging Document Consumer	ITI XDS.b / Document Consumer OR ITI MHD / Document Consumer (see Note 1)	ITI TF-1: 10.1 ITI TF-1: 33
	ITI CT / Time Client	ITI TF-1: 7.1
	ITI ATNA / Secure Node or Secure Application	ITI TF-1: 9.1
Imaging Document Source	ITI ATNA / Secure Node or Secure Application	ITI TF-1: 9.1
	ITI CT / Time Client	ITI TF-1: 7.1
Initiating Imaging Gateway	ITI ATNA / Secure Node or Secure Application	ITI TF-1: 9.1
	ITI CT / Time Client	ITI TF-1: 7.1
Responding Imaging Gateway	ITI ATNA / Secure Node or Secure Application	ITI TF-1: 9.1
	ITI CT / Time Client	ITI TF-1: 7.1

Note 1: The Imaging Document Consumer is required to be grouped with one of the respective XDS.b or MHD Document Consumer Actors.

58.4 XC-WADO Overview

The XC-WADO Profile addresses sharing image data sets between communities.

58.4.1 Concepts

58.4.1.1 Inter-community sharing infrastructure

XC-WADO enables retrieval of DICOM Instances shared between the communities using RESTful services. XC-WADO can be used with different image-sharing infrastructures within each community, including but not limited to XDS / XDS-I and DICOM / DICOMweb, provided each community implements both XCA and XC-WADO Initiating and Responding Gateways.

Imaging Document Consumer

The Imaging Document Consumer is typically an application that is grouped with an actor providing access to the Imaging Manifest Document that contains a list of DICOM Instances published by an Imaging Document Source in a remote Community. The mechanism of obtaining the Imaging Manifest is not constrained, and several models are available.

As an example, the Imaging Document Consumer can discover and retrieve Imaging Manifests across community lines by grouping with one of the following actors:

- XCA Initiating Gateway: The Imaging Document Consumer provides the XCA Initiating Gateway with the information (such as Patient ID and Issuer of Patient ID) that is sufficient for XCA Initiating Gateway to perform Cross Gateway Query [ITI-38] and subsequent Cross Gateway Retrieve [ITI-39] transactions to retrieve one or more Imaging Manifests that are provided to the Imaging Document Consumer together with the homeCommunityIds of the remote communities they have been retrieved from. In this case there is no inherent requirement for the local community to implement an XDS-based Affinity Domain.
- XDS.b Document Consumer: The Imaging Document Consumer is grouped with the XDS.b Document Consumer that is the initiator of the document discovery and retrieval and communicates with the XCA-I Initiating Imaging Gateway implementing the XDS Affinity Domain Option using the Registry Stored Query [ITI-18] and Retrieve Document Set [ITI-43] transactions. XCA Initiating Gateway then performs the Cross Gateway Query [ITI-38] and subsequent Cross Gateway Retrieve [ITI-39] transactions to return the retrieved Imaging Manifests to the XDS.b Document Consumer along with the homeCommunityIds of the remote communities they have been retrieved from. XDS.b Document Consumer then transfers that information to the Imaging Document Consumer. In this case the local community of the Imaging Document Consumer is expected to implement an XDS-based Affinity Domain.
- MHD Consumer: The Imaging Document Consumer is grouped with the MHD Document Consumer that is the initiator of the document discovery and retrieval and communicates with the MHD Document Responder that is in turn grouped with the XCA

Initiating Gateway. MHD Document Consumer uses the Find Document References [ITI-67] and Retrieve Document [ITI-68] transactions supply information to the XCA Initiating Gateway that performs the Cross Gateway Query [ITI-38] and subsequent Cross Gateway Retrieve [ITI-39] transactions to return the retrieved Imaging Manifests to the MHD Document Consumer in the response to the ITI-68 transaction together with the homeCommunityIds of the remote communities they have been retrieved from. MHD Consumer then provides this information to the Imaging Document Consumer. There is no requirement for the local community of the Imaging Document Consumer to implement an XDS-based or MHDS Affinity Domain.

Note: The ITI Domain does not explicitly specify how to convey the homeCommunityId in the ITI-67 / ITI-68 transactions, and the intent for the Trial Period of this profile is to standardize this mechanism. It is currently suggested to embed homeCommunityId into the URI of the document reference. Adding a dedicated metadata attribute similar to the one used in [ITI-38] transaction is worth exploring.

The Imaging Manifests retrieved by an actor with which the Imaging Document Consumer is grouped are the DICOM KOS instances.

Note: Since the implementation of an actor with which the Imaging Document Consumer is grouped handles the transfer and transfer encoding of the DICOM KOS instances (e.g., they can be encoded as a DICOM Part 10 File format with a MIME type of "application/dicom" or as a DICOM JSON Model with the MIME type of "application/dicom+json."), the transfer encoding is out of scope of the XC-WADO Profile.

Once the Imaging Document Consumer has an Imaging Manifest, it forms the request to retrieve DICOM Instances from a remote community through the Initiating Imaging Gateway of its local community.

If the local Initiating Imaging Gateway implements the Intra-Community WADO-RS Option, the Imaging Document Consumer will send the retrieve request to the Imaging Initiating Gateway using the WADO-RS Retrieve [RAD-160] transaction, as specified in Section 58.1.1. Otherwise, the method of communication between Imaging Document Consumer and Imaging Initiating Gateway is unconstrained.

The Imaging Document Source in the XC-WADO Profile returns DICOM Instances that it published for sharing in response to retrieve requests. The source of the DICOM Instances is not constrained, and several models are possible. As an example, the Imaging Document Source can access DICOM Instances from sources such as:

- Image Manager/Image Archive: The Imaging Document Source can have direct access to the Image Manager/Image Archive or communicate with one or more Image Managers/Image Archives via a standard mechanism such as the Retrieve Images [RAD-16] transaction.
- XDS-I Imaging Document Source: The Imaging Document Source can have direct access to the XDS-I Imaging Document Source or communicate with one or more XDS-I Imaging Document Sources via retrieval mechanisms defined in XDS-I.

Imaging Document Source may verify the list of DICOM Instances in the retrieval request against the Imaging Manifest(s) that it published and only return those DICOM Instances that are

listed in a published Imaging Manifest. The method of verification is outside the scope of the XC-WADO Profile.

As a result, the Imaging Document Consumer can retrieve DICOM Instances from an Imaging Document Source through Initiating Imaging Gateway and Responding Imaging Gateway using a consistent mechanism, regardless of the exact method of publication of the Imaging Manifest referencing DICOM Instances and how the Imaging Document Source makes them available for retrieval.

58.4.1.2 Federated inter-community sharing infrastructure

XC-WADO allows the Imaging Document Consumers to retrieve DICOM Instances from remote communities that may not be directly accessible to them because the Initiating Imaging Gateway is not able to map homeCommunityId to a Responding Imaging Gateway of specific community.

For example, for cross-border access between communities in different countries, there may be a requirement that all out-of-country cross-community retrieval requests be issued to a single country-specific Responding Imaging Gateway. Such a Responding Imaging Gateway is grouped with the Initiating Imaging Gateway, which redirects the received requests to specific regional Responding Gateways. The Regional Gateways will, in turn, retrieve the DICOM Instances from the Imaging Document Sources within the Regional Community and return them to the requestor through the country-specific gateways.

Similarly, the country-specific Responding Imaging Gateways may require that any retrieval requests come from a designated country-specific Initiating Imaging Gateway rather than from regional Initiating Gateways from other countries. In this case, regional Initiating Imaging Gateways will send their requests to the country-specific Responding Imaging Gateway that is grouped with the Initiating Imaging Gateway, which, in turn, routes them to the other country's Responding Imaging Gateway.

58.4.1.3 Intra-community sharing infrastructure

In addition to providing means of retrieval DICOM Instances across the lines of communities, XC-WADO Profile allows the Imaging Document Consumers to retrieve DICOM Instances from its own community by issuing requests to the local Initiating Imaging Gateway that supports Intra-Community WADO-RS Option, which provides a single retrieval endpoint for all requests. This allows the Imaging Document Consumer to avoid implementing additional logic for the segregation of local and remote homeCommunityIDs. Furthermore, it allows the Imaging Document Consumer to retrieve DICOM Instances from multiple local Imaging Document Sources, which may not be directly accessible to the Imaging Document Consumer.

58.4.1.4 Imaging Reports

XC-WADO focuses on retrieving DICOM Instances using RESTful services. Other imaging study-related documents, such as radiology reports in CDA or other formats, may be retrieved using the ITI MHD Actors grouped with XCA infrastructure. See ITI TF-1: 33.6.2.

58.4.1.5 DICOMweb Study Service Retrieve transaction URI

The DICOMweb Study Service Retrieve transaction URI used in the [RAD-107] and [RAD-160] transactions between different actors in the XC-WADO Profile is formed by each actor as described in this section.

The HTTP Request URI for the DICOMweb Retrieve Transaction of the Studies Service is formed from the `<protocol>` component, `<endpoint>` component, `<location>` component, `<resource>` component and `<qparam>` component.

The value of the `<protocol>` component shall be set to `https://`.

The `<endpoint>` component of DICOMweb Study Service Retrieve transaction URI is formed from hostname, port, and endpoint path of the RESTful service of the responder, as follows:

`<hostname[:port]>/<endpoint path>/`

The `<location>` component is formed from homeCommunityId and RetrieveLocationUID as follows:

`homeCommunityId/<homeCommunityId>/RetrieveLocationUID/<RetrieveLocationUID>/`

The `<resource>` component is formed from appropriate resource UIDs depending on the resource being retrieved as well as the type of the resource.

The `<qparam>` component of the [RAD-107] transaction URI may include the query parameters that depend on the type of resource being retrieved.

The `<qparam>` component of the [RAD-160] may include the query parameters that depend on the type of the resource being retrieved as well as the RetrieveURL parameter.

The DICOMweb Study Service Retrieve transaction URI formatted by the Imaging Document Consumer starts with the endpoint of the local Initiating Imaging Gateway, with the addition of `<location>` component conveying homeCommunityId and RetrieveLocationUID followed by the sub-resources based on the resource (study, series, or instance) to be retrieved. If the Imaging Document Consumer desires to retrieve rendered instances, it shall include the “rendered” subresource and may modify the DICOMweb Study Service Retrieve transaction URI further by including parameters appropriate for the rendered resource retrieval. Imaging Document Source is required to support the retrieval of original DICOM objects, and may support the retrieval of rendered instances. Support for retrieval of other types of resources is outside of scope of the XC-WADO Profile.

Note: Although the Imaging Document Consumer may request the rendered objects, they may be retrieved only from an Imaging Document Source within a community, provided the Imaging Document source supports these optional

modes. The imaging document source shall be aware of potential issues when doing so on the study or series level, as discussed in DICOM CP1978.

Imaging Document Consumer shall include in the `<qparam>` component the RetrieveURL parameter if the Imaging Manifest includes the Retrieve URL (0008,1190) attribute.

Each XC-WADO Imaging Gateway (both Initiating and Responding) modifies the URL by replacing the `<endpoint>` component of the URL with the endpoint of the respective responder. It may also modify the content of HTTP headers as required by the security requirements of each community served by such a gateway. It shall preserve the values of the Accept and MediaType headers.

The Initiating Imaging Gateway does not modify the sub-resources or parameters of the URL. The Initiating Imaging Gateway that does not implement the Intra-Community WADO-RS Option shall include parameters in the URL in the same way as the Imaging Document Consumer.

Responding Imaging Gateway does not modify sub-resources or the parameters of the URL except `<location>` component and the RetrieveURL parameter – these elements shall not be used by the Responding Imaging Gateway in the [RAD-107] transaction with the Remote Imaging Document Source

The following is an example of the URL transformation by the gateways where the responding community does not include the Retrieve URL (0008,1190 attribute into the published Imaging Manifests.

```
Initiating Imaging Gateway hostname: initiating-gateway.example.com
Initiating Imaging Gateway endpoint_path: wado
Responding Imaging Gateway hostname: responding-gateway.example.org
Responding Imaging Gateway endpoint_path: wado-rs
Initiating Community homeCommunityId: urn:oid:1.2.3.4
Responding Community homeCommunityId: urn:oid:5.6.7.8
RetrieveLocationUID: 1.2.840.9.10.11.12
Imaging Document Source hostname: document-source.example.org
Imaging Document Source endpoint_path: pacs/wado-rs
Study Instance UID: 1.2.840.113619.2.207.28521.42888.1640475282.450
```

The Imaging Document Consumer would construct the WADO-RS URL as follows:

```
https://initiating-gateway.example.com/wado/
homeCommunityId/5.6.7.8/RetrieveLocationUID/1.2.840.9.10.11.12/study/1.2.840.
113619.2.207.28521.42888.1640475282.450/
```

The Initiating Imaging Gateway would then forward this request to the Responding Imaging Gateway, replacing only the hostname and endpoint_path:


```
https://responding-gateway.example.org/wado-rs/
homeCommunityId/5.6.7.8/RetrieveLocationUID/1.2.840.9.10.11.12/study/1.2.840.
113619.2.207.28521.42888.1640475282.450/
```

The Responding Imaging Gateway verifies the homeCommunityId as the identifier of its own community and maps the RetrieveLocationUID to the hostname and endpoint_path of the Imaging Document Consumer. It then constructs the URL using mapped values and the resource from the inbound request without the homeCommunityId and RetrieveLocationUID parameters:

```
https://document-source.example.org/pacs/wado-rs/
study/1.2.840.113619.2.207.28521.42888.1640475282.450
```

The DICOM Instances returned by the Imaging Document Source are delivered to the requesting Imaging Document Consumer traversing the Responding and Initiating Imaging Gateways.

58.4.1.6 Proxying at the Imaging Gateways

When Initiating Imaging Gateway does not implement the Intra-Community WADO-RS Option, it initiates the Cross-Community WADO Retrieve [RAD-160] transaction by forming the DICOMweb Study Service Retrieve transaction URI according to the requirements in RAD TF-2: 160. The method by which it obtains the information necessary for creating the URI from the Imaging Document Consumer is outside the scope of this profile. The method by which it hands back the retrieved DICOM Instances is also outside of the scope of this profile.

When Responding Imaging Gateway does not implement the Intra-Community WADO-RS Option, it processes the [RAD-160] transaction, identifies the Imaging Document Source and obtains the requested DICOM Instances from it by means outside the scope of this profile. The DICOM instances are then sent back to the Initiating Imaging Gateway as a response to the [RAD-160] transaction.

When implementing the Intra-Community WADO-RS Option, both Initiating and Responding Imaging Gateways in the XC-WADO Profile communicate not only with each other but also with the Imaging Document Consumer and Imaging Document Source, respectively, via [RAD-107] transaction. In this option, an imaging gateway initiates an outbound transaction request based on the results of processing the inbound transaction request. A gateway initiates the outbound transaction as a proxy, by transforming the DICOMweb Study Service Retrieve transaction URI it received from a requestor in the inbound transaction with the new location component. As part of the transformation process, an imaging gateway may also modify the HTTP headers as needed to meet the security and policy requirements of the destination. Finally, the imaging gateway sends the request using the transformed URI to the destination. A response from the destination is immediately forwarded back to the initiator of the inbound transaction.

An Imaging Gateway has to account for the significant time that might be required to receive the complete response from the outbound transaction it initiates and take steps to avoid a timeout of the request of the inbound transaction. Specific means of avoiding such a timeout are outside the scope of this profile. As an example, the imaging gateway may consider using chunked transfer

and start responding to the inbound transaction as soon as it begins receiving responses to the outbound transaction.

58.4.2 Use Cases

The use cases below are based on the assumed sharing infrastructure, which includes a large geographic area, including separate administrative areas that have different arrangements on data sharing and form three separate communities identified as Region A, Region B and Region C. The use cases below consider the implications of different data sharing arrangements between communities where Region A is the "local" community that initiates requests for imaging data from "remote" communities (Regions B and C).

For the purpose of describing use cases, each community implements Health Information Exchange Service Provider (HIE-SP) that implements:

- an XDS Infrastructure (an XDS Registry and an XDS Repository) for sharing reports and image manifests.
- an Affinity Domain with a common patient identifier and common coded terminology for managing the sharing of images.
- Diagnostic Imaging Service Providers provide access to locally stored images in each community through transactions defined by the XC-WADO Integration Profile.
- The communities agree to share patient records for urgent care using transactions defined in XC-WADO.
- Imaging Initiating and Responding Gateways in each community support Intra-Community WADO-RS Option.

58.4.2.1 Use Case #1: Image Set sharing between communities

58.4.2.1.1 Image Set Sharing Between Communities Use Case Description

A patient X, who receives her primary care in Region B, frequently travels to the Region A for business. While visiting Region A, patient X is admitted to the local healthcare facility for urgent care. The attending physician places an imaging procedure order.

The local PACS system, acting as an XDS.b Document Consumer, performs an automated query for relevant priors to the local HIE-SP's Initiating Gateway.

The Initiating Gateway in Region A queries both the local Document Registry and the Responding Gateway for Region B. Relevant priors are located in Region B and in one of the external imaging centers within Region A that shares images though its HIE-SP infrastructure.

The local PACS system, acting as an Imaging Document Consumer, retrieves all relevant prior images from all sources through the Region A's XC-WADO Initiating Imaging Gateway. Initiating Imaging Gateway, on behalf of the local Imaging Document Consumer retrieves images from the Region A's imaging center and returns them to the requestor. It retrieves the

images from the Region B's XC-WADO Responding Imaging Gateway which, in turn, retrieves the images from Imaging Document Source(s) in the Region B.

58.4.2.1.2 Image Set Sharing Between Communities Process Flow

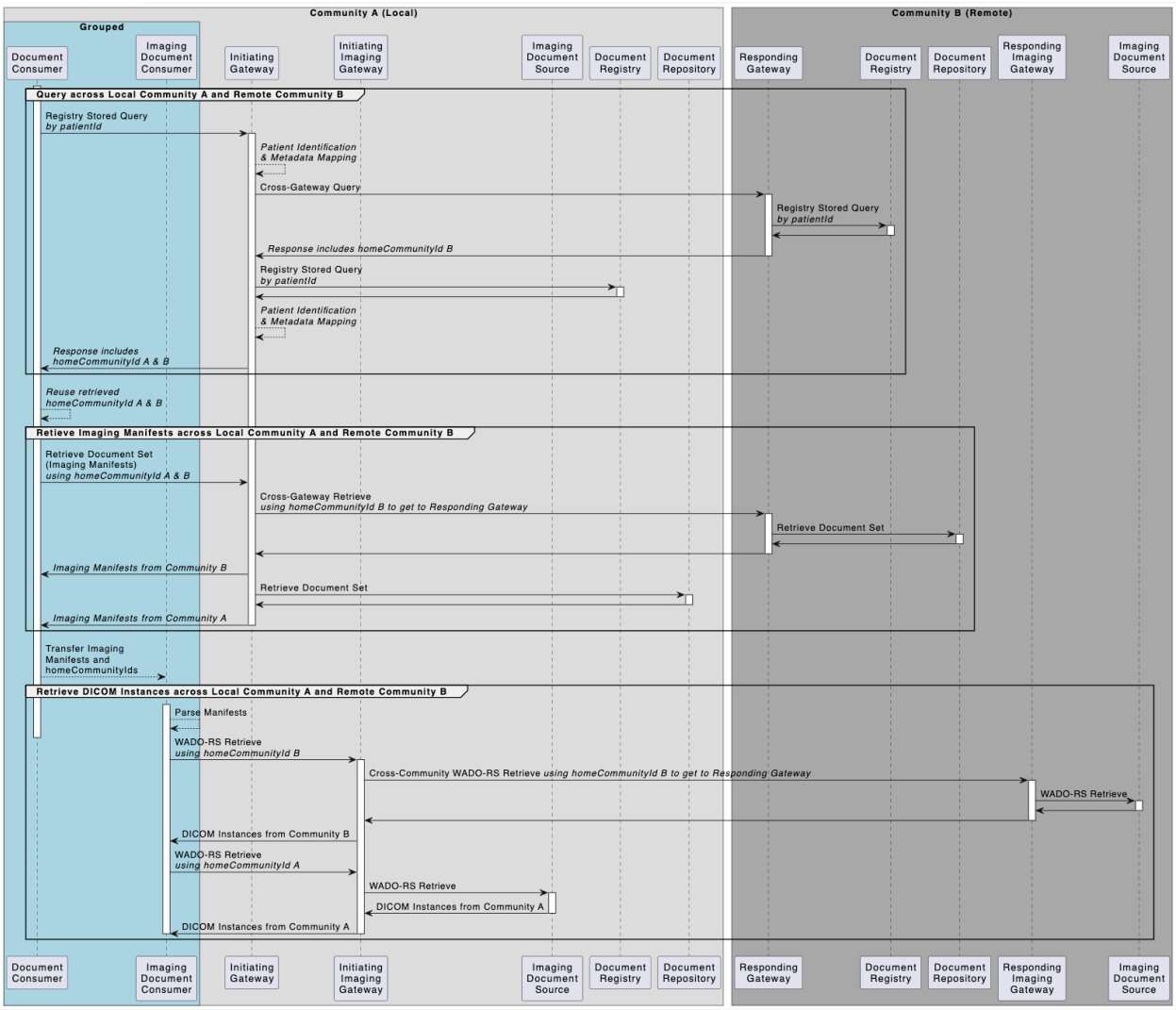

Figure 58.4.2.1.2-1: Basic Process Flow in XC-WADO Profile

The text in Figure 58.4.2.1.2-2 was used to generate the diagram in Figure 58.4.2.1.2-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.

```
@startuml Basic Process Flow in XC-WADO
!pragma teoz true
box "Community A (Local)"
```



```
box "Grouped" #LightBlue
participant "Document\nConsumer" as XDC
participant "Imaging\nDocument\nConsumer" as IDC
end box
participant "Initiating\nGateway" as IG
participant "Initiating\nImaging\nGateway" as IIG
participant "Imaging\nDocument\nSource" as LIDS
participant "Document\nRegistry" as LDReg
participant "Document\nRepository" as LDRepo
end box

box "Community B (Remote)" #DarkGray
participant "Responding\nGateway"  as RG
participant "Document\nRegistry" as RDReg
participant "Document\nRepository" as RDRepo
participant "Responding\nImaging\nGateway"  as RIG
participant "Imaging\nDocument\nSource" as RIDS
end box

activate XDC
group Query across Local Community A and Remote Community B
XDC->IG: Registry Stored Query\n//by patientId//
activate IG
IG-->IG: //Patient Identification//\n//& Metadata Mapping//
IG->RG: Cross-Gateway Query
activate RG
RG->RDReg: Registry Stored Query\n//by patientId//
activate RDReg
RDReg->RG
deactivate RDReg
RG->IG: //Response includes homeCommunityId B//
deactivate RG
IG->LDReg: Registry Stored Query\n//by patientId//
activate LDReg
LDReg->IG
deactivate LDReg
IG-->IG: //Patient Identification//\n//& Metadata Mapping//
IG->XDC: //Response includes//\n//homeCommunityId A & B//
end
XDC-->XDC: //Reuse retrieved//\n//homeCommunityId A & B//
group Retieve Imaging Manifests across Local Community A and Remote Community B
XDC->IG: Retrieve Document Set\n(Imaging Manifests)\n//using homeCommunityId A & B//
IG->RG: Cross-Gateway Retrieve\n//using homeCommunityId B to get to Responding
Gateway//
activate RG
RG->RDRepo: Retrieve Document Set
activate RDRepo
RDRepo->RG
deactivate RDRepo
RG->IG
deactivate RG
IG->XDC: //Imaging Manifests from Community B//
IG->LDRepo : Retrieve Document Set
activate LDRepo
LDRepo->IG
deactivate LDRepo
IG->XDC: //Imaging Manifests from Community A//
deactivate IG
```



```
end
XDC-->IDC: Transfer Imaging\nManifests and\nhomeCommunityIds
group Retrieve DICOM Instances across Local Community A and Remote Community B
activate IDC
IDC-->IDC: Parse Manifests
deactivate XDC
IDC->IIG: WADO-RS Retrieve\n//using homeCommunityId B//
activate IIG
IIG->RIG: Cross-Community WADO-RS Retrieve //using homeCommunityId B to get to
Responding Gateway//
activate RIG
RIG->RIDS: WADO-RS Retrieve
activate RIDS
RIDS->RIG
deactivate RIDS
RIG->IIG
deactivate RIG
IIG->IDC: DICOM Instances from Community B
IDC->IIG: WADO-RS Retrieve\n//using homeCommunityId A//
IIG->LIDS: WADO-RS Retrieve
activate LIDS
LIDS->IIG: DICOM Instances from Community A
deactivate LIDS
IIG->IDC: DICOM Instances from Community A
deactivate IIG
deactivate IDC

@enduml
```

Figure 58.4.2.1.2-2: Basic Process Flow in XC-WADO Profile Pseudocode

XCA Interactions to query for and retrieve Imaging Manifests for a patient

Retrieval of the Imaging Manifest for a patient uses the set of XCA transactions performed by the XDS.b Document consumer, with which the XC-WADO Imaging Document Consumer is grouped. As a result of queries performed by the Document Consumer, the Imaging Document Consumer obtains Imaging Manifests for the patient from both Local Community A and Remote Community B. See RAD TF-1: 29.3.2 for a detailed explanation.

XC-WADO Interactions to retrieve DICOM Instances from Remote Community B and Local Community A:

Imaging Document Consumer *wants to retrieve the studies referenced in the Imaging Manifests:*

- The Imaging Document Consumer initiates a Cross-Community WADO-RS Retrieve [RAD-160] request to the Initiating Imaging Gateway.
- Each Cross-Community WADO-RS Retrieve [RAD-160] request initiated by the Imaging Document Consumer may be for a DICOM study, series, or an instance from a specific location within a specific community. For example, in a typical request to retrieve all DICOM Instances of a series from a single location (identified by

homeCommunityId + RetrieveLocationUID), the Imaging Document Consumer will use a single request rather than as many requests as there are instances.

Initiating Imaging Gateway *processes inbound Cross-Community WADO-RS Retrieve [RAD-160] request –*

- The Initiating Imaging Gateway uses the homeCommunityId value to determine where to retrieve the requested DICOM Instances from.
- The Initiating Imaging Gateway performs the mapping of homeCommunityId provided in the inbound request to the endpoint of the remote Responding Imaging Gateway and initiates Cross-Community WADO-RS Retrieve [RAD-160] request for retrieval of DICOM Instances in the same manner (a study, series, or individual DICOM Instance) as indicated in the inbound Cross-Community WADO-RS Retrieve [RAD-160] request. The response to the Cross-Community WADO-RS Retrieve [RAD-160] request is forwarded to the local Image Document Consumer as a response to the inbound Cross-Community WADO-RS Retrieve [RAD-160] request.
- If homeCommunityId mapping yields the endpoint of the local Imaging Document Source, the Initiating Imaging Gateway initiates a WADO-RS Retrieve [RAD-107] request to the identified local Imaging Document Source. The response to the outbound WADO-RS Retrieve [RAD-107] request is forwarded to the local Image Document Consumer as a response to the inbound Cross-Community WADO-RS Retrieve [RAD-160] request.
- When initiating the WADO-RS Retrieve [RAD-107] request to the local Imaging Document Source, the Imaging Document Gateway may respond to the requestor with the HTTP Redirect status code, instructing it to connect directly to the local Imaging Document Source. In this case, the response from the local Imaging Document Source is sent directly to the Imaging Document Source and not routed through the Initiating Imaging Gateway

Responding Imaging Gateway *processes Cross-Community WADO-RS Retrieve [RAD-160] request –*

- The Responding Imaging Gateway verifies that the homeCommunityId in the Cross-Community WADO-RS request matches its community and performs the mapping of the RetrieveLocationUID from the inbound request to the endpoint of a local Imaging Document Source supporting WADO-RS Retrieve [RAD-107] transaction and sends a WADO-RS Retrieve [107] request to that Imaging Document Source for data retrieval. The response to the WADO-RS Retrieve [107] request is forwarded to the Initiating Imaging Gateway as a response to the inbound Cross-Community WADO-RS Retrieve [RAD-160] request.

Remote Imaging Document Source *processes WADO-RS Retrieve [RAD-170] request –*

- The Remote Imaging Document Source accesses the requested DICOM Instances and generates the response to the inbound WADO-RS Retrieve [RAD-107] request from the Responding Imaging Gateway. The response contains either requested DICOM Instances or an error code indicating that some or all requested instances are not accessible.

Local Imaging Document Source *processes WADO-RS Retrieve [RAD-170] request –*

- The Remote Imaging Document Source accesses the requested DICOM Instances and generates the response to the inbound WADO-RS Retrieve [RAD-107] request from the Initiating Imaging Gateway. The response contains either requested DICOM Instances or an error code indicating that some or all requested instances are not accessible.
- If the Initiating Imaging Gateway used the HTTP Redirect to instruct the Imaging Document Consumer to connect directly to the local Imaging Document Source, the response is sent directly to the Imaging Document Consumer rather than through the Initiating Imaging Gateway.

58.4.2.2 Use Case #2: Federated Image Set sharing between communities

58.4.2.2.1 Federated Image Set Sharing Between Communities Use Case Description

Patient X, while on vacation in Region A is admitted to the local healthcare facility for urgent care. The attending physician places an imaging procedure order.

The local PACS, acting as an XDS.b Imaging Document Consumer, performs an automated query for relevant priors to the local HIE-SP's XCA Initiating Gateway.

The Initiating Gateway in Region A queries both the local Document Registry and the Responding Gateway for Region B. Although no relevant priors are located in Region A, they are located in the imaging centers in Regions B and C.

The local PACS, acting as an Imaging Document Consumer, sends requests for all relevant studies to Region A's XC-WADO Initiating Imaging Gateway which in turn contacts the Region B's XC-WADO Responding Imaging Gateway.

Images from the imaging center in Region B are retrieved by Region B's Responding Imaging Gateway from their XC-WADO Imaging Document Source.

The requests for images from Region C's imaging center are sent by Region B's Initiating Imaging Gateway (grouped with its Responding Imaging Gateway to Region C's XC-WADO Responding Imaging Gateway. The Region C's XC-WADO Responding Imaging Gateway, in turn, retrieves the images from an Imaging Document Source within the region.

58.4.2.2.2 Federated Image Set Sharing Between Communities Process Flow

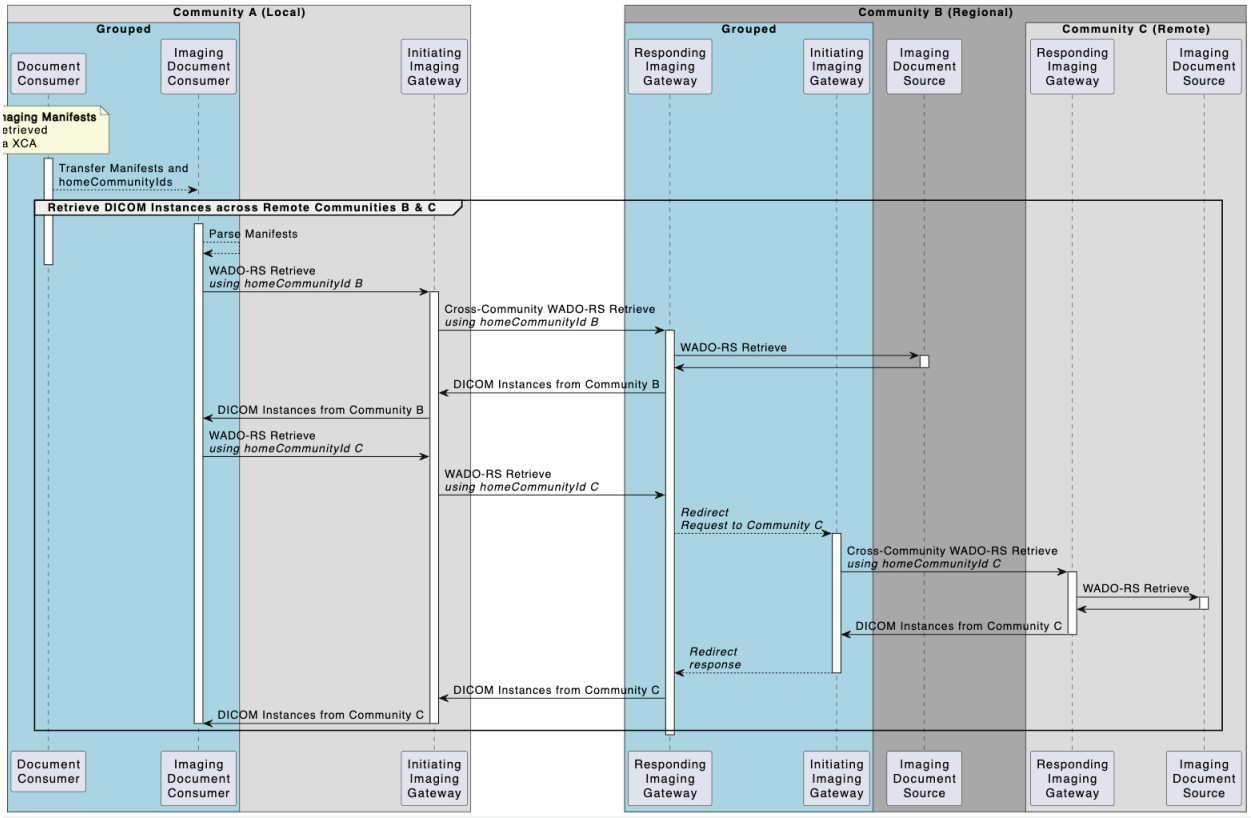

Figure 58.4.2.2.2-1: Federated Process Flow in XC-WADO Profile

The text in Figure 58.4.2.2.2-2 was used to generate the diagram in Figure 58.4.2.2.2-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.

```
@startuml Federated Process Flow in XC-WADO
!pragma teoz true
box "Community A (Local)"
box "Grouped" #LightBlue
participant "Document\nConsumer" as XDC
participant "Imaging\nDocument\nConsumer" as IDC
end box
participant "Initiating\nImaging\nGateway" as IIG
end box
box "Community B (Regional)" #DarkGray
box "Grouped" #LightBlue
participant "Responding\nImaging\nGateway"  as RIG
participant "Initiating\nImaging\nGateway" as IIG2
end box
participant "Imaging\nDocument\nSource" as RIDS
box "Community C (Remote)"
participant "Responding\nImaging\nGateway" as RIG2
participant "Imaging\nDocument\nSource" as RIDS2
end box
end box
```

```
note over XDC: Imaging Manifests\nRetrieved\nvia XCA
activate XDC
XDC-->IDC: Transfer Manifests and\nhomeCommunityIds
group Retrieve DICOM Instances across Remote Communities B & C
activate IDC
IDC-->IDC: Parse Manifests
deactivate XDC
IDC->IIG: WADO-RS Retrieve\n//using homeCommunityId B//
activate IIG
IIG->RIG: Cross-Community WADO-RS Retrieve\n//using homeCommunityId B//
activate RIG
RIG->RIDS: WADO-RS Retrieve
activate RIDS
RIDS->RIG
deactivate RIDS
RIG->IIG: DICOM Instances from Community B
IIG->IDC: DICOM Instances from Community B
IDC->IIG: WADO-RS Retrieve\n//using homeCommunityId C//
IIG->RIG: WADO-RS Retrieve\n//using homeCommunityId C//
RIG-->IIG2: //Redirect//\n//Request to Community C//
activate IIG2
IIG2->RIG2: Cross-Community WADO-RS Retrieve\n//using homeCommunityId C//
activate RIG2
RIG2->RIDS2: WADO-RS Retrieve
activate RIDS2
RIDS2->RIG2
deactivate RIDS2
RIG2->IIG2: DICOM Instances from Community C
deactivate RIG2
IIG2-->RIG://Redirect//\n//response//
deactivate IIG2
RIG->IIG: DICOM Instances from Community C
IIG->IDC: DICOM Instances from Community C
deactivate RIG
deactivate IIG
deactivate IDC

@enduml
```

Figure 58.4.2.4.2-2: Federated Process Flow in XC-WADO Profile Pseudocode

XCA Interactions to query for and retrieve Imaging Manifests for a patient

The retrieval of an Imaging Manifest for a patient uses the set of XCA transactions performed by the XDS.b Document Consumer, with which the XC-WADO Imaging Document Consumer is grouped. As a result of queries performed by the Document Consumer, the Imaging Document Consumer obtains Imaging Manifests for the patient from Remote Communities B and C. See RAD TF-1: 29.3.2 (XCA-I) for a detailed explanation.

XC-WADO Interactions to retrieve DICOM Instances from Remote Communities B and C:

Imaging Document Consumer *wants to retrieve the studies referenced in the Imaging Manifests:*

- The Imaging Document Consumer initiates a Cross-Community WADO-RS Retrieve [RAD-160] request to the Initiating Imaging Gateway.
- Each Cross-Community WADO-RS Retrieve [RAD-160] request initiated by the Imaging Document Consumer may be for a DICOM study, series or an instance from a specific location within a specific community. For example, to retrieve all DICOM Instances of a study from the same location (identified by homeCommunityId + RetrieveLocationUID), the Imaging Document Consumer will use a single request rather than as many requests as there are series.

Initiating Imaging Gateway A *processes the inbound Cross-Community WADO-RS Retrieve [RAD-16-] request–*

- The Initiating Imaging Gateway uses the homeCommunityId value to determine where to retrieve the requested DICOM Instances from.
- The Initiating Imaging Gateway performs the mapping of homeCommunityId provided in the inbound request to the endpoint of the remote Responding Imaging Gateway and initiates Cross-Community WADO-RS Retrieve [RAD-160] request for retrieval of DICOM Instances in the same manner (a study, series, or individual DICOM Instance) as indicated in the inbound Cross-Community WADO-RS Retrieve [RAD-160] request. The response to the Cross-Community WADO-RS Retrieve [RAD-160] request is forwarded to the local Image Document Consumer as a response to the inbound Cross-Community WADO-RS Retrieve [RAD-160] request.
- In this example, it initiates Cross-Community WADO-RS Retrieve [RAD-160] requests to the Responding Imaging Gateway of Community B as the mapping points to that Responding Gateway as the system that handles requests for the Communities B and C.

Responding Imaging Gateway B *processes Cross-Community WADO-RS Retrieve [RAD-160] request –*

- The Responding Imaging Gateway B verifies the homeCommunityId in the Cross-Community WADO-RS request matches its community and performs the mapping of the RetrieveLocationUID from the inbound request to the endpoint of a local Imaging Document Source B supporting WADO-RS Retrieve [RAD-107] transaction and sends a WADO-RS Retrieve [107] request to that Imaging Document Source for data retrieval. The response to the WADO-RS Retrieve [107] request is forwarded to the Initiating Imaging Gateway as a response to the inbound Cross-Community WADO-RS Retrieve [RAD-160] request.
- In case the homeCommunityId in the inbound request identifies Community C, the Responding Imaging Gateway B hands it off to the Initiating Imaging Gateway B that initiates the Cross-Community WADO-RS Retrieve [RAD-160] transaction to the Responding Imaging Gateway C. The method of handing off the request between the

Responding Imaging Gateway B and Initiating Imaging Gateway B is out of scope of this profile.

Remote Imaging Document Source B *processes WADO-RS Retrieve [RAD-170] request –*

- The Remote Imaging Document Source accesses the requested DICOM Instances and generates the response to the inbound WADO-RS Retrieve [RAD-107] request from the Responding Imaging Gateway. The response contains either requested DICOM Instances or an error code indicating that some or all requested instances are not accessible.

Initiating Imaging Gateway B *initiates the Cross-Community WADO-RS Retrieve [RAD-160] request –*

- The Initiating Imaging Gateway B uses the homeCommunityId value to determine where to retrieve the requested DICOM Instances from.
- The Initiating Imaging Gateway performs the mapping of homeCommunityId provided in the inbound request to the endpoint of the remote Responding Imaging Gateway C and initiates Cross-Community WADO-RS Retrieve [RAD-160] request for retrieval of DICOM Instances in the same manner (a study, series, or individual DICOM Instance) as indicated in the inbound Cross-Community WADO-RS Retrieve [RAD-160] request it received from Responding Imaging Gateway B. The response to the Cross-Community WADO-RS Retrieve [RAD-160] request is handed over to the Responding Imaging Gateway B to be forwarded to the Initiating Imaging Gateway A and subsequently to Imaging Document Consumer. The method of handing off the response between the Responding Imaging Gateway B and Initiating Imaging Gateway B is out of scope of this profile.

Responding Imaging Gateway C *processes Cross-Community WADO-RS Retrieve [RAD-160] request –*

- The Responding Imaging Gateway C verifies that the homeCommunityId in the Cross-Community WADO-RS request matches its community and performs the mapping of the RetrieveLocationUID from the inbound request to the endpoint of a local Imaging Document Source C supporting WADO-RS Retrieve [RAD-107] transaction and sends a WADO-RS Retrieve [107] request to that Imaging Document Source for data retrieval. The response to the WADO-RS Retrieve [107] request is forwarded to the Initiating Imaging Gateway B as a response to the inbound Cross-Community WADO-RS Retrieve [RAD-160] request.

Remote Imaging Document Source C *processes WADO-RS Retrieve [RAD-107] request –*

- The Remote Imaging Document Source accesses the requested DICOM Instances and generates the response to the inbound WADO-RS Retrieve [RAD-107] request from the Responding Imaging Gateway. The response contains either requested DICOM Instances or an error code indicating that some or all requested instances are not accessible.

Ultimately, the responses from Imaging Document Sources in Communities B and C are sent back to the Imaging Document Consumer in Community A, traversing through the set of Imaging Responding and Initiating Gateways.

58.5 XC-WADO Security Considerations

The XC-WADO Profile has similar security considerations to other IHE profiles that are based on HTTP or REST. See ITI TF-2: Appendix Z.8 for recommendations for secure transportation, authentication, authorization, and securing patient identifiers in URLs. Implementers are encouraged to review that section for applicability to their product environment.

All the XDS security requirements apply to an Imaging Document Consumer grouped with an XDS.b Document Consumer accessing XCA infrastructure. See ITI TF-1: 10.7 for details.

Implementers may also consider implementing Cross-Origin Resource Sharing (CORS) (https://www.w3.org/TR/cors/) support to allow browser-based clients to retrieve information from distributed sources (for example, queries are performed on server A, and instances are downloaded from server B).

Deployments should consider whether or not:

- The Imaging Document Consumer performs user authentication to access patient data.
- The Initiating Imaging Gateway, Responding Imaging Gateway and Imaging Document Source use credentials or tokens supplied by the Imaging Document Consumer in the WADO-RS Retrieve transaction.
- Initiating Imaging Gateway and Responding Imaging Gateway use their own credentials or tokens when initiating the WADO-RS Retrieve transaction in response to the transaction they received.
- The Imaging Document Consumer, Imaging Document Responder or the Imaging Document Source (or all) records access in an audit log.

This profile does not define how the Imaging Document Consumer supplies credentials to the Initiating Imaging Gateway to provide the user with a seamless "single sign-on" experience. The HTTP GET URL transaction allows for a range of authentication mechanisms, including use of mTLS authentication, digest authentication, client certificate-based authentication, provision of a SAML assertion in an authentication header, or other mechanisms suitable for stateless atomic transactions.

The user authentication and authorization methods are outside the scope of the XC-WADO Profile. Implementers should consider implementing the IHE ITI Profiles Enterprise User Authentication (EUA) and Internet User Authorization (IUA).

Implementations should also consider how availability and integrity will be protected, including intentional attacks such as maliciously crafted queries that interfere with service availability.

The WADO-RS transactions may include in their response a URL specifying where the corresponding objects can be retrieved. In the absence of protection, such as TLS, a malicious attacker may intercept the response and rewrite these URLs to a location of suspect origin. An Imaging Document Consumer should verify that any received URL is valid and corresponds to a known secure location.

58.6 XC-WADO Cross Profile Considerations

The XC-WADO Profile requires that the Initiating and Responding Imaging Gateways are used in conjunction with the XCA Initiating and Responding Gateways and be part of communities that support XDS.b.

XC-WADO initiating and responding communities use the XDS-I.b and XDS.b Integration Profiles to enable Imaging Document Set behavior.

Note: The XC-WADO Profile does not explicitly group the XC-WADO Initiating Imaging Gateway and XCA Initiating Gateway pair and the XC-WADO Responding Imaging Gateway and XCA Responding Gateway pair.

Volume 2 – Transactions

Update Section 4.107

4.107 WADO-RS Retrieve [RAD-107]

4.107.1 Scope

The WADO-RS Retrieve [RAD-107] transaction accesses DICOM SOP Instances via an HTTP interface.

4.107.2 Actor Roles

The Roles in this transaction are defined in the following table and may be played by the actors shown here:

Table 4.107.2-1: Actor Roles

Role:	**Requester**: Submit retrieve DICOM object requests
Actor(s):	The following actors may play the role of Requester: Imaging Document Consumer **Initiating Imaging Gateway** **Responding Imaging Gateway**
Role:	**Responder**: Returns the requested DICOM object
Actor(s):	The following actors may play the role of Responder: Imaging Document Source

Transaction text specifies behavior for each Role. The behavior of specific actors may also be specified when it goes beyond that of the general role.

…

Add Section 4.160

4.160 Cross-Community WADO-RS Retrieve [RAD-160]

4.160.1 Scope

The WADO-RS Retrieve [RAD-160] transaction accesses DICOM SOP Instances via an HTTP interface.

4.160.2 Actor Roles

The Roles in this transaction are defined in the following table and may be played by the actors shown here:

Table 4.160.2-1: Actor Roles

Role:	**Requester**: Submit retrieve DICOM object requests
Actor(s):	The following actors may play the role of Requester: Imaging Document Source Initiating Imaging Gateway
Role:	**Responder**: Returns the requested DICOM object
Actor(s):	The following actors may play the role of Responder: Responding Imaging Gateway Initiating Imaging Gateway

The transaction text specifies the behavior for each Role. When behavior goes beyond that of the general role, the behavior of specific actors may also be specified.

4.160.3 Referenced Standards

RFC1738 Uniform Resource Locators (URL), http://www.ietf.org/rfc/rfc1738.txt

RFC2616 HyperText Transfer Protocol HTTP/1.1, http://www.ietf.org/rfc/rfc2616.txt

RFC7540 Hypertext Transfer Protocol Version 2 (HTTP/2), https://tools.ietf.org/html/rfc7540

RFC4627 The application/json Media Type for JavaScript Object Notation (JSON), http://www.ietf.org/rfc/rfc4627.txt

Extensible Markup Language (XML) 1.0 (Second Edition). W3C Recommendation 6 October 2000, http://www.w3.org/TR/REC-xml

DICOM PS3.18 Section 10.4: Web Services – Retrieve Transaction of the DICOM Studies Service

DICOM PS3.18 Annex F: DICOM JSON Model

DICOM PS3.19 Annex A.1: Native DICOM Model

DICOM PS3.19 Annex B: Interfaces Definition (WSDL and Schema)

4.160.4 Messages

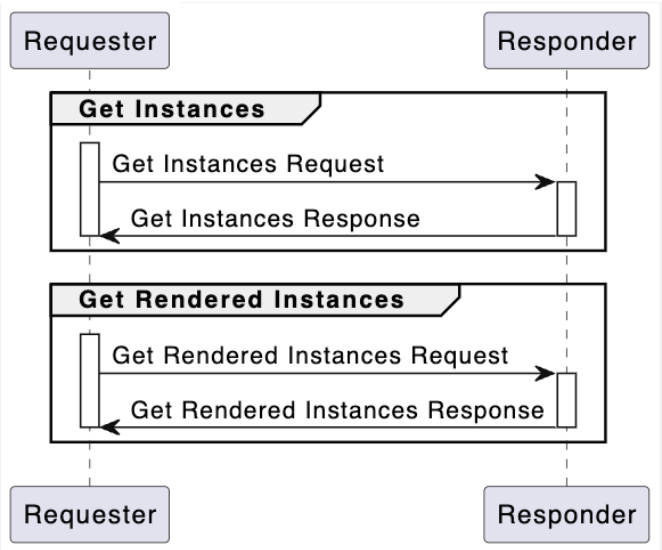

Figure 4.160.4-1: Interaction Diagram

This transaction defines request/response message pairs:

- Get Instances (Section 4.160.4.1 and 4.160.4.2),
- Get Rendered Instances (Section 4.160.4.3 and 4.160.4.4).

A Requester and a Responder shall support Get Instances request/response message pair as defined in DICOM. They may optionally implement Get Rendered Instances request/response message pair as defined in DICOM.

4.160.4.1 Get Instances Request Message

The Requester retrieves one or more DICOM instances from the Responder.

4.160.4.1.1 Trigger Events

The Requester wishes to retrieve DICOM instances.

4.160.4.1.2 Message Semantics

The Get Instances Request message is a Retrieve transaction of the DICOM Studies Service. See DICOM PS3.18 Section 10.4.

The Requester is the User Agent, and the Responder is the Origin Server. The

The message shall correspond to one of the Instance Resources in Table 4.160.4.1.2-1.

The requestor shall include the homeCommunityId and the RetrieveLocationUID in the <location> component of the HTTP Retrieve URI. It may include the RetrieveURL (if known) as a query parameter of the HTTP Retrieve URI, following any query parameters included in the URI according to the DICOM specification.

Table 4.160.4.1.2-1: Retrieve Transaction Instance Resources

Resource	Reference
Study Instances	DICOM PS3.18 Section 10.4.1.1.1
Series Instances	
Instance	

Although DICOM also includes the Frame Pixel Data resource, it is not required for this transaction.

The HTTP Request URI for the DICOMweb Retrieve Transaction of the Studies Service is formed from the `<protocol>` component, `<endpoint>` component, `<location>` component, `<resource>` component, and the `<qparam>` component.

- The value of the `<protocol>` component shall be set to `https://`.
- The `<endpoint>` component of DICOMweb Study Service Retrieve transaction URI is formed from hostname, port, and endpoint path of the RESTful service of the responder, as follows: `<hostname[:port]>/<endpoint path>/`.
- The `<location>` component is formed from homeCommunityId and RetrieveLocationUID as follows: `homeCommunityId/<homeCommunityId>/RetrieveLocationUID/<RetrieveLocationUID>/`
- The `<resource>` component is formed from appropriate resource UIDs depending on the resource being retrieved as well as the type of the resource. The value of the `<resource>` component shall be formatted as specified in the definition of the WADO-RS Retrieve [RAD-107] transaction. See RAD TF-2: 4.107.4.3
- The `<qparam>` component is the [RAD-160] transaction URI shall include the homeCommunityId and RetrieveLocationUID query parameters. It may include the RetrieveURL query parameter. If included, the value of the RetrieveURL parameter shall be URL-encoded as defined in the RFC1738.

4.160.4.1.2.1 Example of a Get Instances Request message

The following is an example of an HTTP Request URI for retrieving a composite DICOM Instance. This example uses an Accept header to request the DICOM Instance returned in the Native DICOM binary format. The request indicates that the DICOM Instance shall be retrieved from the remote community identified by the homeCommunityId parameter and from a specific location identified by the RetrieveLocationUID parameter.

```
https://www.responding-
gateway.org/homeCommunityId/2.9999.1.2.3.4.5/RetrieveLocationUID/2.9999
.1.2.3.4.5.1/studies/2.999.1.59.40211.12345678.678910/series/2.999.1.59
.40211.789001276.14556172.67789/instances/2.999.1.59.40211.2678810.8799
1027.899772.2
Accept: multipart/related; type=application/dicom
```

4.160.4.1.3 Expected Actions

The Responder shall parse the request and redirect it to a destination from which the appropriate representation of the Resource in the Selected Media Type (see DICOM PS3.18 Section 10.4.2) shall be retrieved, and return a response as described in Section 4.160.4.2.

4.160.4.2 Get Instances Response Message

The Responder reports the outcome of the Get Instances Request Message.

4.160.4.2.1 Trigger Events

The Responder completes the processing of the Get Instances Request Message and receives complete or partial response from the destination it forwarded the request to.

4.160.4.2.2 Message Semantics

The message is a Response to a Retrieve Transaction as specified in DICOM PS3.18 Section 10.4.3.

The Requester is the User Agent, and the Responder is the Origin Server.

The Responder shall provide a response as described in Table 4.160.4.2.2-1.

Table 4.160.4.2.2-1: Response Message Semantics

Resource	Reference
Study Instances	DICOM PS3.18 Section 10.4.3.3.1
Series Instances	
Instance	

The Responder shall provide a response message header containing the appropriate status code indicating success, warning, or failure as described in DICOM PS3.18 Section 10.4.3.1.

4.160.4.2.3 Expected Actions

The Requester shall accept the response.

The Requester shall follow redirects (responses with values of 301, 302, 303 or 307. See https://tools.ietf.org/html/rfc7231#section-6.4 for details) unless a loop or security policy violation is detected.

4.160.4.3 Get Rendered Instances Request Message

The Requester retrieves one or more representations of a DICOM Resource, rendered as appropriate images or other representations, from the Responder.

4.160.4.3.1 Trigger Events

The Requester wishes to retrieve rendered instances.

4.160.4.3.2 Message Semantics

The Get Rendered Instances Request message is a Retrieve transaction of the DICOM Studies Service. See DICOM PS3.18 Section 10.4.

The Requester is the User Agent, and the Responder is the Origin Server.

The message shall correspond to one of the Instance Resources in Table 4.160.4.3.2-1.

The requestor shall include the homeCommunityId and RetrieveLocationUID in the `<location>` component of the HTTP Retrieve URI. It may include RetrieveURL (if known) as the HTTP Retrieve URI query parameter, following any query parameters included in the URI according to the DICOM specification.

Table 4.160.4.3.2-1: Retrieve Transaction Instance Resources

Resource	Reference
Rendered Instance	DICOM PS3.18 Section 10.4.1.1.3

Although DICOM also includes the Rendered Study, Rendered Series, and Rendered Frame Pixel Data resource, it is not required for this transaction.

The HTTP Request URI for the DICOMweb Retrieve Transaction of the Studies Service is formed from the `<protocol>` component, `<endpoint>` component, `<resource>` component and the `<qparam>` component.

- The value of the `<protocol>` component shall be set to `https://`.
- The `<endpoint>` component of DICOMweb Study Service Retrieve transaction URI is formed from hostname, port, and endpoint path of the RESTful service of the responder, as follows: `<hostname[:port]>/<endpoint path>/`.

- The `<location>` component is formed from homeCommunityId and RetrieveLocationUID as follows: `homeCommunityId/<homeCommunityId>/RetrieveLocationUID/<RetrieveLocationUID>/`
- The `<resource>` component is formed from appropriate resource UIDs depending on the resource being retrieved as well as the type of the resource. The value of the `<resource>` component shall be formatted as specified in the definition of the WADO-RS Retrieve [RAD-107] transaction. See RAD-TF2: 4.107.4.3
- The `<qparam>` component is the [RAD-160] transaction URI may include the RetrieveURL query parameter. If included, the value of the RetrieveURL parameter shall be URL-encoded as defined in the RFC1738.

4.160.4.3.2.1 Example of a Get Instances Request message

The following is an example of an HTTP Request URI for retrieving a rendered composite DICOM Instance. This example uses an Accept header to request the DICOM Instance returned in the JPEG format. The request indicates that the DICOM Instance shall be retrieved from the remote community identified by the homeCommunityId parameter and from a specific location identified by the RetrieveLocationUID parameter.

```
https://www.responding-gateway.org/
homeCommunityId/2.9999.1.2.3.4.5/RetrieveLocationUID=2.9999.1.2.3.4.5.1
studies/2.999.1.59.40211.12345678.678910/series/2.999.1.59.40211.789001
276.14556172.67789/instances/2.999.1.59.40211.2678810.87991027.899772.2
/rendered/
Accept: multipart/related; type=image/jpeg
```

4.160.4.3.3 Expected Actions

The Responder shall parse the request and redirect it to a destination from which the appropriate representation of the Resource in the Selected Media Type (see DICOM PS3.18 Section 10.4.2) shall be retrieved, and return a response as described in Section 4.160.4.2.

The Responder is not expected to prepare the rendered instances but rather to request that to be prepared by the destination.

4.160.4.4 Get Rendered Instances Response Message

The Responder reports the outcome of the Get Rendered Instances Request Message.

4.160.4.4.1 Trigger Events

The Responder completes the processing of the Get Instances Request Message and receives a complete or partial response from the destination it forwarded the request to.

4.160.4.4.2 Message Semantics

The message is a Response to a Retrieve Transaction as specified in DICOM PS3.18 Section 10.4.3.

The Requester is the User Agent, and the Responder is the Origin Server.

The Responder shall provide a response as described in Table 4.160.4.2.2-1.

Table 4.160.4.4.2-1: Response Message Semantics

Resource	Reference
Rendered Instance	DICOM PS3.18 Section 10.4.3.3.3

The Responder shall provide a response message header containing the appropriate status code indicating success, warning, or failure as described in DICOM PS3.18 Section 10.4.3.1.

4.160.4.4.3 Expected Actions

The Requester shall accept the response.

The Requester shall follow redirects (responses with values of 301, 302, 303 or 307. See https://tools.ietf.org/html/rfc7231#section-6.4 for details) unless a loop or security policy violation is detected.

4.160.5 Security Considerations

Additional security considerations that may apply are discussed in RAD TF-1: 58.5 – XC-WADO Security Considerations.

4.160.5.1 Security Audit Considerations

The Radiology Audit Trail Option in the ITI Audit Trail and Node Authentication (ATNA) Profile (ITI TF-1: 9) defines audit requirements for IHE Radiology transactions. See RAD TF-3: 5.1.

Volume 3 – Cross-Transaction Specifications

Add the following rows to RAD TF-3: Table 5.1-2

5.1 ITI-20 Record Audit Event

…

Table 5.1-2: IHE Radiology transactions and resulting ATNA trigger events

IHE Radiology Transaction	ATNA Trigger Event(s)	Actor Grouped with Secure Node or Secure Application
…		
Cross Gateway Retrieve Imaging Document Set [RAD-75]	Instances-Stored	Responding Imaging Gateway
	Study-used	Initiating Imaging Gateway
…		
WADO-RS Retrieve [RAD-107]	Instances-Stored	**Requester:** Imaging Document Source, **Responding Gateway**
	Study-used	**Responder:** Imaging Document Consumer, **Initiating Imaging Gateway**
…		
Cross-Community WADO-RS Retrieve [RAD-160]	**Instances-Stored**	**Requester: Imaging Document Source, Initiating Imaging Gateway**
	Study Used	**Responder: Initiating Imaging Gateway**

