IHE Change Proposal

Tracking information:

IHE Domain	PaLM
Change Proposal ID:	CP-LAB-279
Change Proposal Status:	Ballot
Date of last update:	2026/06/10
Person assigned:	David Clunie <dclunie@dclunie.com>

Change Proposal Summary information:

Specialize Radiology Transactions in DPIA to add Options and Display Requirements	
Submitter's Name(s) and e-mail address(es):	David Clunie <dclunie@dclunie.com>
Submission Date:	2025/12/05
Integration Profile(s) affected:	DPIA
Actor(s) affected:	Acquisition Manager, Acquisition Modality
IHE Technical Framework or Supplement modified:	PaLM TF
Volume(s) and Section(s) affected:	Trial Implementation V1.4

Rationale for Change:

DPIA originally reused the IHE Radiology TF Vol2 transactions RAD-8 Modality Image Stored and RAD-107 WADO-RS Retrieve, but these are not specific to the Whole Slide Microscopy Image Storage SOP Class nor do they reflect the different source of identifying, demographic and specimen descriptive information.

Further, there was no indication of what an Image Display was required to do with what it had retrieved.

Create IHE PaLM TF specific transactions that mirror the original RAD TF transactions but have the necessary specific requirements.

Rename the "External image storage and commitment" option to "Storage Commitment", since the storage requirements are already specified in the underlying transaction for the involved Acquisition Modality and Image Manager/Archive actors.

Add new options for:

- JPEG (baseline) compression of pyramid tiles
- True Color Tiled Full Single Z Plane Pyramid images (for FFPE H&E brightfield images or similar)

Follow the RAD-16 Retrieve Image transaction pattern of specifying View Image behavior when used by an Image Display actor when a named option for display is supported, and specify basic requirements for the Image Display for zoom/pan, show size, and annotate identification and specimen preparation information.

In future it is expected that additional options will be defined for Z-stacks, multi-channel fluorescence images, other transfer syntaxes such as JPEG 2000 (J2K), JPEG-XL, etc., when consensus is reached on suitable parameters. Future support of annotations, and in particular Image Display retrieval and rendering requirements, is expected to be included in other profiles than DPIA, which is just about scanned image acquisition.

Amend Vol 1 transactions:

Open Issues

Issue new1: Does the RAD-129 QIDO-RS Query transaction need to be specialized, e.g., to additionally require that DICOM PS3.18 optional attributes like Available Transfer Syntax UID (0008,3002), Specimen Description Sequence (xxxx,xxxx), Container Identifier (xxxx,xxxx), etc., be supported by the Origin Server?

Issue new2: Should an additional Image Display option be added (in a future CP) that requires support of display of more than one image at the same time, with synchronized panning and zooming (e.g., for comparison of different stains)?

Issue new3: A future CP should add explicit support for multiple Z-planes from the one acquisition.

Issue new 4: A future CP should add explicit support for single or multiple fluorescence channels (grayscale not color).

X.1 DPIA Actors, Transactions, and Content Modules

...

Ed. Instruction; Replace figure X.1-1:

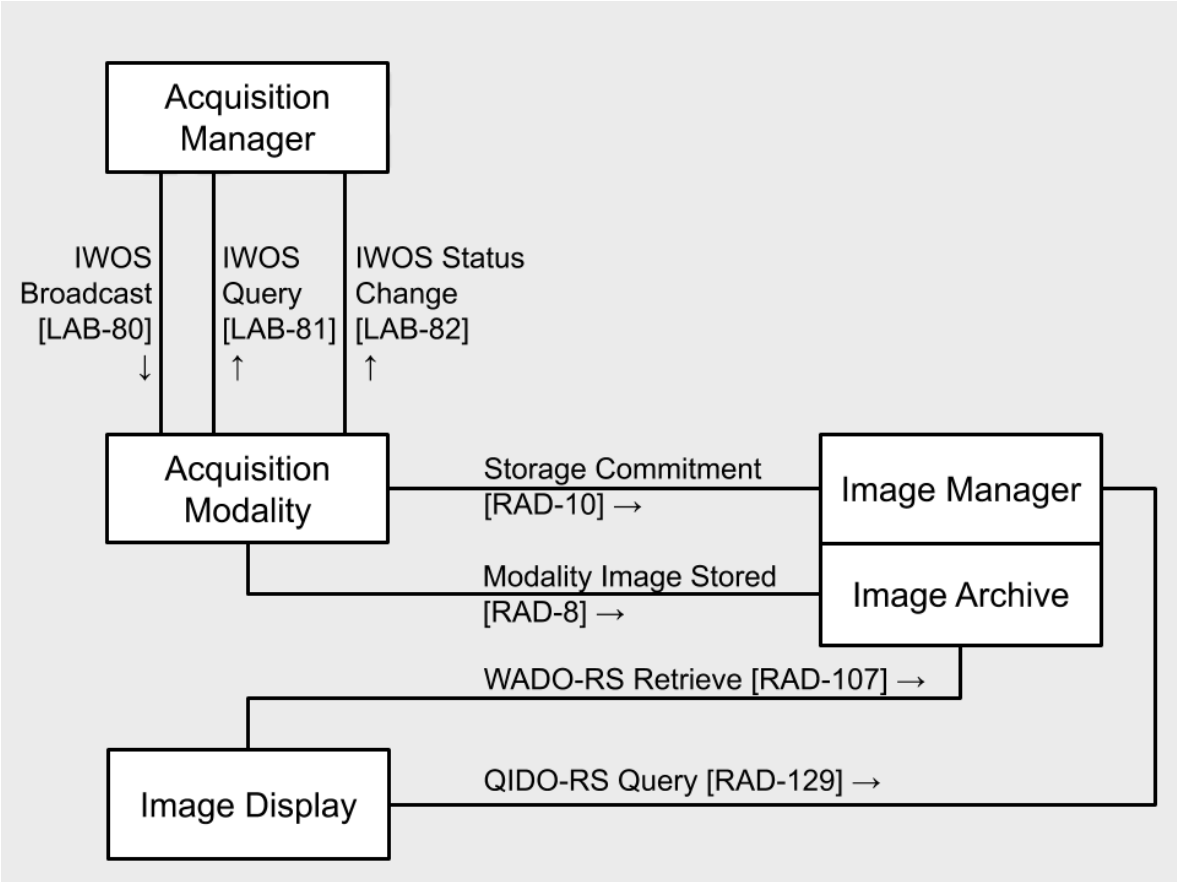


Figure X.1-1: DPIA Actor Diagram

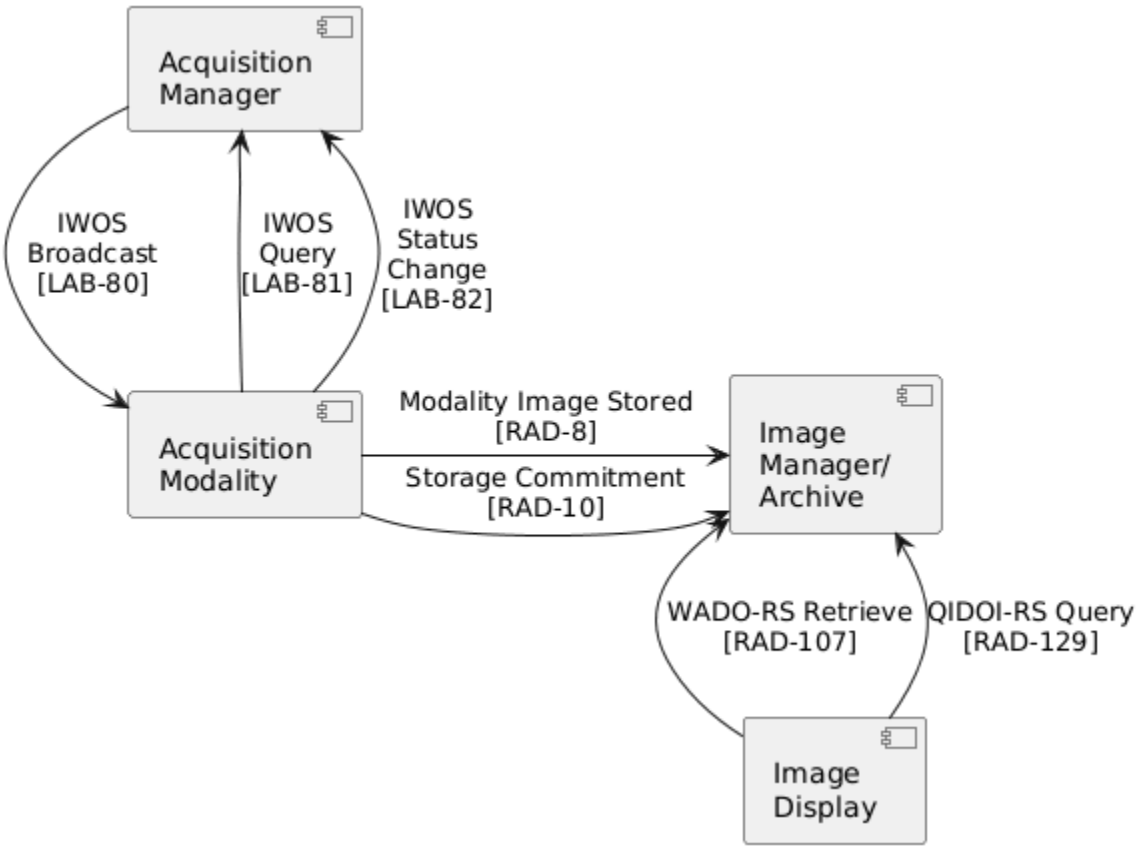


Figure source to render at https://www.plantuml.com/ :

```
@startuml
[Acquisition Manager] as "Acquisition\nManager"
[Acquisition Modality] as "Acquisition\nModality"
[Image Manager/Archive] as "Image\nManager/\nArchive"
[Image Display] as "Image\nDisplay"
   [Acquisition Manager] -down-> [Acquisition Modality] : IWOS\nBroadcast\n[LAB-80]
   [Acquisition Modality] -up-> [Acquisition Manager] : IWOS\nQuery\n[LAB-81]
   [Acquisition Modality] -up-> [Acquisition Manager] : IWOS\nStatus\nChange\n[LAB-82]
   [Acquisition Modality] -right-> [Image Manager/Archive] : Storage Commitment\n[RAD-10]
   [Acquisition Modality] -right-> [Image Manager/Archive] : Modality Image Stored\n[RAD-8]
   [Image Display] -up-> [Image Manager/Archive] : WADO-RS Retrieve\n[RAD-107]
   [Image Display] -up-> [Image Manager/Archive] : QIDOI-RS Query\n[RAD-129]
@enduml
```

With:

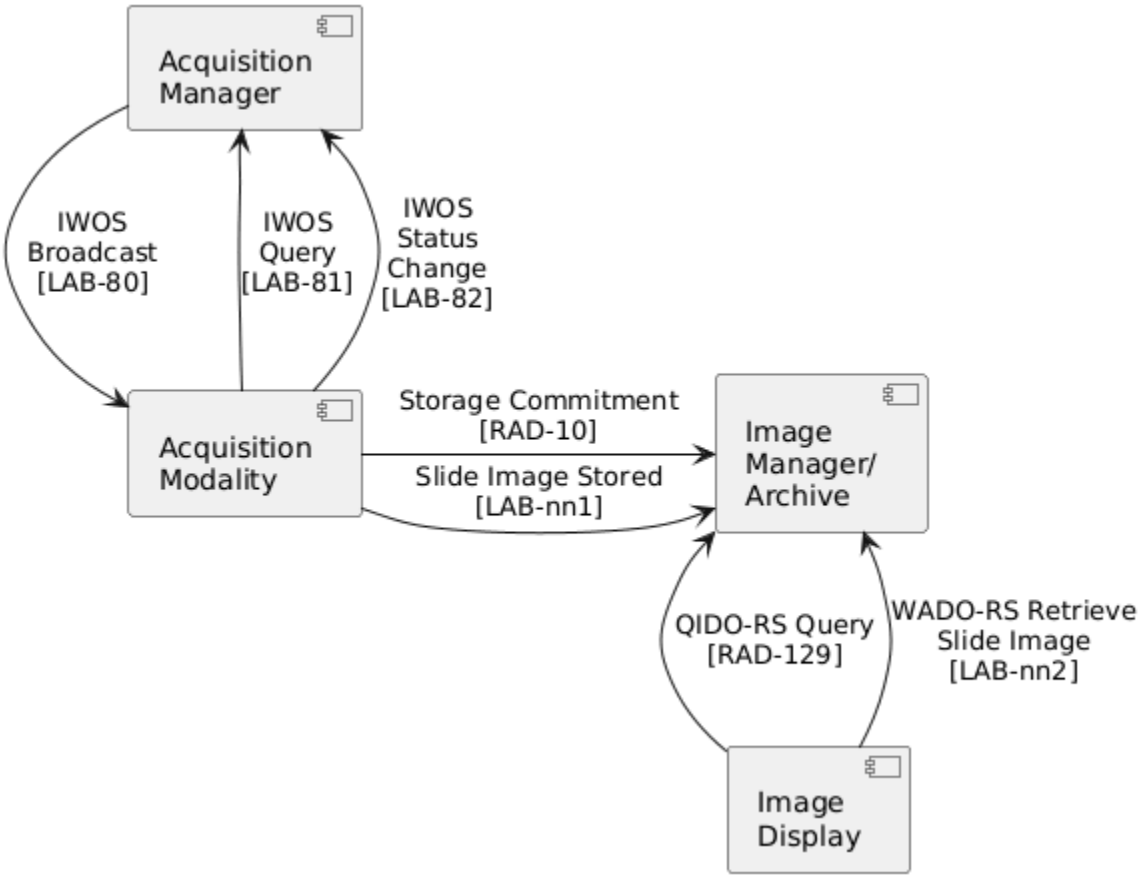


Figure source to render at https://www.plantuml.com/ :

```
@startuml
[Acquisition Manager] as "Acquisition\nManager"
[Acquisition Modality] as "Acquisition\nModality"
[Image Manager/Archive] as "Image\nManager/\nArchive"
[Image Display] as "Image\nDisplay"
  [Acquisition Manager] -down-> [Acquisition Modality] : IWOS\nBroadcast\n[LAB-80]
  [Acquisition Modality] -up-> [Acquisition Manager] : IWOS\nQuery\n[LAB-81]
  [Acquisition Modality] -up-> [Acquisition Manager] : IWOS\nStatus\nChange\n[LAB-82]
  [Acquisition Modality] -right-> [Image Manager/Archive] : Slide Image Stored\n[LAB-nn1]
  [Acquisition Modality] -right-> [Image Manager/Archive] : Storage Commitment\n[RAD-10]
  [Image Display] -up-> [Image Manager/Archive] : QIDO-RS Query\n[RAD-129]
```

[Image Display] -up-> [Image Manager/Archive] : WADO-RS Retrieve\nSlide Image\n[LAB-nn2]

@enduml

Table X.1-1 lists the transactions for each actor directly involved in the DPIA 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 X.1-1: DPIA Profile - Actors and Transactions

Actors	Transactions	Optionality	Reference
…	…		
Acquisition Modality	…		
	~~Modality~~Slide Image Stored [~~RAD-8~~ LAB-nn1]	R	~~RAD TF-2: 4.8~~ Section 3.nn1
	Storage Commitment [RAD-10]	R	RAD TF-2: 4.10
Image Manager / Image Archive	QIDO-RS Query [RAD-129]	R	~~Web-based Image Access (WIA) supplement to RAD TF~~ RAD TF-2: 4.129
	WADO-RS Retrieve Slide Image [~~RAD-107~~ LAB-nn2]	R	~~Web-based Image Access (WIA) supplement to RAD TF~~ Section 3.nn2
	~~Modality~~Slide Image Stored [~~RAD-8~~ LAB-nn1]	R	~~RAD TF-2: 4.8~~ Section 3.nn1
	Storage Commitment [RAD-10]	R	RAD TF-2: 4.10
Image Display	QIDO-RS Query [RAD-129]	R	~~Web-based Image Access (WIA) supplement to RAD TF~~ RAD TF-2: 4.129
	WADO-RS Retrieve Slide Image [~~RAD-107~~ LAB-nn2]	R	~~Web-based Image Access (WIA) supplement to RAD TF~~ Section 3.nn2

X.1.1 Actor Descriptions and Actor Profile Requirements

Most requirements for actors with the same name are documented in Transactions (Volume 2) and Content Modules (Volume 3). This section documents any additional requirements on profile's actors.

1.3.1.1 X.1.1.1 Acquisition Manager

This actor assumes these interoperability responsibilities in the context of the digital pathology workflow:

- Identifies those physical assets for which digital asset acquisition are desired.

- Identifies the acquisition modalities capable of producing those digital assets.
- Creates a number of imaging work order steps (IWOS) to accomplish this process, and directs each IWOS to the appropriate Acquisition Modality.
- Follows up on this process, by capturing the status changes of the IWOS sent by acquisition modalities~~;~~.

1.3.1.2 X.1.1.2 Acquisition Modality

An image acquisition device (e.g., digital camera or whole slide imaging scanner) that receives instructions (image work order steps, IWOS) from an acquisition manager about a physical asset to capture into one or more digital assets. The captured image is stored in the ~~i~~**I**mage ~~m~~**M**anager/~~a~~**A**rchive and the acquisition manager is notified of the completion of the acquisition and storage.

1.3.1.3 X.1.1.3 Image Manager / Image Archive

These may represent two separate but coupled components that manage the storage of captured digital images in a manner that facilitates ready retrieval upon request by all other actors for display or analysis. An Image Manager may be queried for the presence of digital assets associated with a pathology case and, if present, returns ~~**the count of or**~~ the ~~**actual**~~ digital assets available to the requestor ~~**with various configuration options, such as resolution, with or without annotations, with or without the label, with or without the thumbnail etc**~~.

1.3.1.4 X.1.1.4 Image Display

Queries and retrieves digital assets from the Image Manager/Image Archive, in order to display them to its user.

X.2 DPIA Actor Options

Options that may be selected for each actor in this profile, if any, are listed in the Table X.2-1. Dependencies between options when applicable are specified in notes.

Table X.2-1: DPIA - Actors and Options

Actor	Option Name	Reference
Acquisition Manager	No options defined	
Acquisition Modality	~~**External image s**~~Storage~~ and~~ commitment	**Section X.2.1**
	JPEG Storage	**Section X.2.2**
	True Color Tiled Full Single Z Plane Pyramid	**Section X.2.3**
Image Manager / Image Archive	~~**No options defined**~~ **Storage commitment**	**Section X.2.1**
	JPEG Storage	**Section X.2.2**
Image Display	~~**No options defined**~~ **True Color Tiled Full Single Z Plane Pyramid**	**Section X.2.3**

X.2.1 ~~External Image~~ Storage ~~and~~ Commitment Option

This option represents the capability of the Acquisition Modality to **~~store and~~ perform Storage eCommitment of** images **stored** to **~~an external~~ an ~~i~~I**mage **~~m~~M**anager/**~~a~~A**rchive (**~~RAD-8/~~**RAD-10).

X.2.2 JPEG Storage Option

The Acquisition Modality captures. and stores to the Image Manager, images in baseline JPEG format (i.e., DICOM Transfer Syntax 1.2.840.10008.1.2.4.50).

X.2.3 True Color Tiled Full Single Z Plane Pyramid

The Acquisition Modality captures, and stores to the Image Manager, images with the characteristics described in Slide Images Stored [LAB-nn1] Section 3.1.4.1.2.2 Storage of True Color Tiled Full Single Z Plane Pyramid Images.

The Image Display shall be capable of displaying images with such characteristics. See WADO-RS WSI Retrieve Slide Image [LAB-nn2] Section 3.2.6.2.1 Display of Whole Slide Images.

Note: Though the most common use case for true color images is a scanned brightfield illuminated Hematoxylin and Eosin (H&E) stained Formalin-Fixed Paraffin-Embedded (FFPE) slide, the use of this option is not confined to that use case; scanned images of frozen sections, tissues with special stains, color Immunohistochemistry (IHC) stained tissues, and other forms of illumination are supported. Single channel or multiplex immunofluorescence is not supported by this option, since support for display of images with monochrome values of Photometric Interpretation (0028,0004) (+/- pseudocoloring, superimposed channels, transparency, etc.) is not required for this option.

Add new Vol 2 transactions:

3 IHE Transactions

…

Add Section 3.1:

3.1 Slide Images Stored [LAB-nn1]

3.1.1.1.1 Scope

In the LAB-nn1 Slide Images Stored transaction, the Acquisition Modality sends the acquired images to the Image Archive. The information provided from the Imaging Work Order Step Broadcast [LAB-80] shall be included in the headers of the generated images.

Note: The LAB-nn1 transaction follows the pattern of, and specializes, the IHE RAD TF RAD-8 Modality Images Stored transaction.

3.1.2 Actor Roles

Actor: Acquisition Modality

Role: Transmit acquired image data to Image Archive.

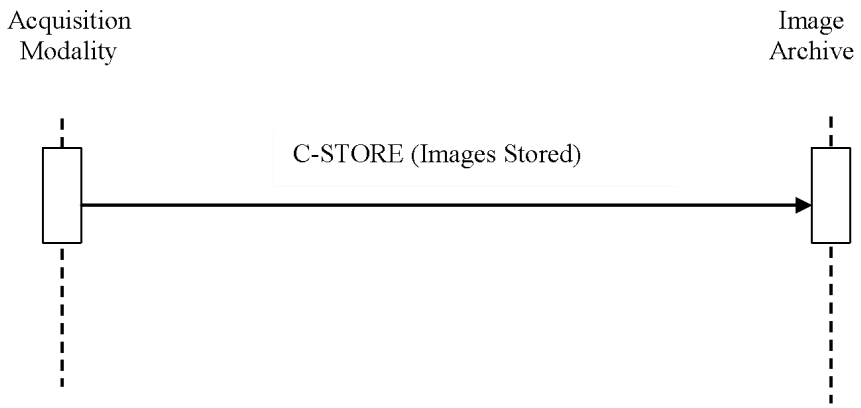
Actor: Image Archive

Role: Accept and store images from Acquisition Modalities.

3.1.3 Referenced Standards

DICOM PS 3.4 Annex B: Storage Service Class.

3.1.4 Interaction Diagram



3.1.4.1 Images Stored

3.1.4.1.1 Trigger Events

The Acquisition Modality can transfer slide images to the Image Archive sequentially within one or more DICOM associations, as the images become available or collectively.

4.8.4.1.1.1 Study UIDs and Series UIDs

Study Instance UID creation shall be the value supplied in the Imaging Work Order Step Broadcast [LAB-80] in an ORM associated OBX segment.

Series Instance UID shall be the same for all images resulting from a single scan of a single slide.

3.1.4.1.2 Message Semantics

The Acquisition Modality uses the DICOM C-STORE message to transfer the images. The Acquisition Modality is the DICOM Storage SCU and the Image Archive is the DICOM Storage SCP.

3.1.4.1.2.1 Storage of Whole Slide images

The Acquisition Modality shall send, and the Image Archive shall receive, whole slide images in the VL Whole Slide Microscopy Image Storage SOP Class (UID "1.2.840.10008.5.1.4.1.1.77.1.6").

3.1.4.1.2.2 Storage of True Color Tiled Full Single Z Plane Pyramid Images

When participating in the DPIA Profile with the True Color Tiled Full Single Z Plane Pyramid Option, the images shall have the following characteristics:

- **The Photometric Interpretation (0028,0004) shall be appropriate to the compression method used, typically RGB (if there has been no color component transformation), YBR_FULL_422 (for baseline JPEG), or YBR_ICT or YBR_RCT (for JPEG 2000).**
- **A multi-resolution pyramid is required.**

Note: This need not be decimated by a factor of 2, nor even by a regular factor, but multiple layers are expected (typically 3 to 5 depending on the area of the tissue scanned but more are permitted).

- **Dimension Organization Type (0020,9311) shall be TILED_FULL and the Per-Frame Functional Groups Sequence (5200,9230) shall not be present.**

Note: I.e., no sparse images or overlapping tiles – a full raster scan of all tiles in the whole slide regions will be sent with the tiles in a pre-defined order.

- **Only a single pyramid with a single Z-plane shall be present, i.e., Total Pixel Matrix Focal Planes (0048,0303) shall be 1 and all images in the pyramid shall have the same value for Total Pixel Matrix Origin Sequence (0048,0008) > Z Offset in Slide Coordinate System (0040,074A).**
- **All of the images for a single scan of a single slide shall be in a single DICOM Series (same value of Series Instance UID (0020,000E)), including all Image Type (0008,0008) Value 3 VOLUME, THUMBNAIL, OVERVIEW and LABEL images, if present, and shall have the same value for Acquisition UID (0008,0017), if present.**
- **All of the images in the pyramid shall have the same value for Frame of Reference UID (0020,0052), and, if present, Pyramid UID (0008,0019).**
- **Concatenations shall not be used.**
- **The Whole Slide Microscopy Image Frame Type Sequence (0040,0710) shall be present in the Shared Functional Groups Sequence (5200,9229).**
- **Either a (non-empty) Basic Offset Table, or an Extended Offset Table, shall be present**

3.1.4.1.2.3 Storage of JPEG images

When participating in the DPIA Profile with the JPEG Storage Option, the images that are layers of the pyramid shall be encoded in baseline JPEG format (i.e., DICOM Transfer Syntax 1.2.840.10008.1.2.4.50).

Note: LABEL and OVERVIEW images may be sent uncompressed.

Add Section 3.2:

3.2 WADO-RS Retrieve Slide Image [LAB-nn2]

3.2.1 Scope

The WADO-RS Retrieve Slide Image [LAB-nn2] transaction accesses DICOM SOP Instances via an HTTP interface, in order to support the virtual microscopy navigation paradigm for interactive viewing of whole slide images without first retrieving the entire set of instances.

Note: The LAB-nn2 transaction follows the pattern of and specializes the IHE RAD TF RAD-107 WADO-RS Retrieve transaction.

3.2.2 Actor Roles

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

Table 3.2.2-1: Actor Roles

Role:	**Requestor:** Submit retrieve DICOM object requests
Actor(s):	The following actors may play the role of Requester: Image Display
Role:	**Responder:** Returns the requested DICOM object
Actor(s):	The following actors may play the role of Responder: Image Archive

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.

3.2.3 Referenced Standards

RFC7231 Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content, http://www.ietf.org/rfc/rfc7231.txt

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

3.2.4 Messages

This transaction defines four request/response message pairs:

- Get Instances
- Get Metadata
- Get Bulkdata
- Get Rendered Instances

A Requester shall support at least one of these request/response pairs.

A Responder shall support all four pairs, as defined in DICOM.

Upon retrieval, the Requester acting as an Image Display actor shall process the SOP instances according to the requirements specified in Section 3.2.6 “View Images”.

Note: The pattern of using a modality or application specific view images requirements specification is adopted from IHE RAD TF RAD-16 Retrieve Images.

3.2.4.1 Get Instances Request Message

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

3.2.4.1.1 Trigger Events

The Requester wishes to retrieve selected frames of DICOM instances.

3.2.4.1.2 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 message shall correspond to one of the Resources in Table 3.2.4.1.2-1.

Table 3.2.4.1.2-1: Retrieve Transaction Instance Resources

Resource	Reference
Frame Pixel Data	DICOM PS3.18 Section 10.4.1.1.6

3.2.4.1.3 Expected Actions

The Responder shall parse the request, prepare representation(s) of the Resource in the Selected Media Type (see DICOM PS3.18 Section 10.4.2), and return a response as described in Section 3.2.4.2.

3.2.4.2 Get Instances Response Message

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

3.2.4.2.1 Trigger Events

The Responder completes processing of the Get Instances Request Message.

3.2.4.2.2 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 3.2.4.2.2-1.

Table 3.2.4.2.2-1: Response Message Semantics

Resource	Reference
Frame Pixel Data	DICOM PS3.18 Section 10.4.3.3.6

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.

3.2.4.2.3 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.

3.2.4.3 Get Metadata Request Message

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

3.2.4.3.1 Trigger Events

The Requester wishes to retrieve metadata of DICOM instances.

3.2.4.3.2 Message Semantics

The Get Metadata 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 Metadata Resources in Table 3.2.4.3.2-1.

Table 3.2.4.3.2-1: Retrieve Transaction Metadata Resources

Resource	Reference
Study Metadata	DICOM PS3.18 Section 10.4.1.1.2
Series Metadata	
Instance Metadata	

3.2.4.3.3 Expected Actions

The Responder shall parse the request, prepare representation of the Metadata Resource in the Selected Media Type (see DICOM PS3.18 Section 10.4.2), and return response described in Section 3.2.4.4.

3.2.4.4 Get Metadata Response Message

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

3.2.4.4.1 Trigger Events

The Responder completes processing of the Get Metadata Request Message.

3.2.4.4.2 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 3.2.4.4.2-1.

Table 3.2.4.4.2-1: Response Message Semantics

Resource	Reference
Study Metadata	DICOM PS3.18 Section 10.4.3.3.2
Series Metadata	

Instance Metadata	

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.

3.2.4.4.3 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.

3.2.4.5 Get Bulkdata Request Message

The Requester retrieves bulk data from the Responder.

3.2.4.5.1 Trigger Events

The Requester wishes to retrieve bulk data extracted from DICOM instances, using a URI.

Note: The Requester must already know the URI to initiate this message.

3.2.4.5.2 Message Semantics

The Get Bulkdata 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 the Bulkdata Resource in Table 3.2.4.5.2-1.

Table 3.2.4.5.2-1: Retrieve Transaction Bulkdata Resources

Resource	Reference
Bulkdata	DICOM PS3.18 Section 10.4.1.1.5

3.2.4.5.3 Expected Actions

The Responder shall parse the request, prepare representation of the Metadata Resource in the Selected Media Type (see DICOM PS3.18 Section 10.4.2), and return response as described in Section 3.2.4.6.

3.2.4.6 Get Bulkdata Response Message

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

3.2.4.6.1 Trigger Events

The Responder completes processing of the Get Bulkdata Request Message.

3.2.4.6.2 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 include a multipart/related media type with one or more parts containing DICOM instance bulkdata according to Table 3.2.4.6.2-1.

Table 3.2.4.6.2-1: Response Message Semantics

Resource	Reference
Bulkdata	DICOM PS3.18 Section 10.4.3.3.5

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.

3.2.4.6.3 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.

3.2.4.7 Get Rendered Instances Request Message

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

3.2.4.7.1 Trigger Events

The Requester wishes to retrieve selected frames of rendered instances.

3.2.4.7.2 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 Rendered Resources in Table 4.107.4.7.2-1.

Table 3.2.4.7.2-1: Retrieve Transaction Rendered Resources

Resource	Reference
Rendered Frames	DICOM PS3.18 Section 10.4.1.1.3

Note: Although DICOM also includes Rendered Study, Series and Instance Resources, they are not required for this transaction.

3.2.4.7.3 Expected Actions

The Responder shall parse the request, prepare representation(s) of the Rendered Resource in the Selected Media Type (see DICOM PS3.18 Section 10.4.2), and return a response as described in Section 3.2.4.8.

3.2.4.8 Get Rendered Instances Response Message

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

3.2.4.8.1 Trigger Events

The Responder completes processing of the Get Rendered Instances Request Message.

3.2.4.8.2 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 3.2.4.8.2-1 for Rendered Resources.

Table 3.2.4.8.2-1: Response Message Semantics

Resource	Reference
Rendered Frames	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.

3.2.4.8.3 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.

3.2.5 Security Considerations

Additional security considerations that may apply are discussed in RAD TF-1: 42.5 – WIA Security Considerations.

3.2.5.1 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 that are also applicable to the LAB transactions. See RAD TF3:5.1.

3.2.6 View Images

3.2.6.1 Trigger Events

The Image Display is requested to display the whole slide images in a virtual microscopy paradigm (zoom and pan of tiled pyramid of multi-resolution images).

3.2.6.2 Invocation Semantics

This is a local invocation of functions at the Image Display.

3.2.6.2.1 Display of Whole Slide Images

The following requirements are intended to establish a baseline level of capabilities. Providing more intelligent and advanced capabilities is both allowed and encouraged and the profile is not intended to be limiting in any way with respect to capabilities. The intention is not to dictate implementation details.

An Image Display that supports the following options:

- True Color Tiled Full Single Z Plane Pyramid Option

shall be capable of displaying whole slide images stored in the VL Whole Slide Microscopy Image Storage SOP Class (UID "1.2.840.10008.5.1.4.1.1.77.1.6") by retrieving metadata and then either:

- encoded frames (if the JPEG Storage Option is supported),
- or rendered image/jpeg (or other rendered media type) frames via the corresponding resources.

The Image Display shall be able to initially display the scanned slide encoded in the retrieved images, zoomed out to the apex of the multi-resolution pyramid, and shall allow the user to smoothly zoom in and pan until the highest resolution layer encoded in the retrieved images can be displayed such that one encoded pixel equals one displayed pixel.

Note: Over-zooming (magnification of the highest resolution layer pixels) is not required, but is not prohibited.

The Image Display shall provide tools to rotate images by 90 degree increments, and to flip them horizontally and vertically.

Note: This is required to orient the images in the manner deemed necessary by the user, such as with the label on a particular side of the display, or the skin or mucosal surface at the top of the display, etc. An Image Display may or may not recognize the values of Image Orientation (Slide) (0048,0102) and automatically flip or rotate the image into a configured preferred orientation, but the ability to manually override this is required.

The Image Display shall provide tools to manually adjust the contrast and brightness of the image and to adjust the shape of the tone curve (e.g., by changing the gamma value).

3.2.6.2.1.1 Color Management

An Image Display shall support retrieval of the ICC Profile encoded in the stored image, using the bulkdata URI resource if necessary, and shall apply it to the image before display.

Notes: 1. Support of server-side ICC profile application by the Origin Server to produce rendered images is not required, so the User Agent must be capable of applying the ICC profile itself to non-rendered and rendered images.

2. The Image Display may provide the user with control over whether or not the ICC Profile is applied or not, and what ICC Rendering Intent is used, but the initial and default display shall be with the profile applied, using whatever Rendering Intent is specified in the profile, if any.

3.2.6.2.1.2 Annotation of Identification Information

The Image Display shall be capable of displaying the information contained in the attributes listed in Table 3.2.6.2.1.2-1.

Table 3.2.6.2.1.2-1: Identification Attributes for Display

Attribute	Tag	Comment
Patient's Name	(0010,0010)	
Patient's ID	(0010,0020)	
Patient's Sex	(0010,0040)	

Patient's Birth Date	(0010,0030)	
Patient's Age	(0010,1010)	
Accession Number	(0008,0050)	
Study ID	(0020,0010)	
Study Description	(0008,1030)	
Study Date	(0008,0020)	
Study Time	(0008,0030)	
Series Description	(0008,103E)	E.g., "FFPE HE 40x single plane".
Container Identifier	(0040,0512)	Identifier of the slide.
Container Description	(0040,051A)	

Note. The Attributes are listed here with the names used in the DICOM Standard, but it is up to the implementer how to describe the names of the displayed values, which may be configurable and/or localized.

3.2.6.2.1.3 Annotation of Specimen Preparation Information

The Image Display shall be capable of displaying (in a user-friendly manner) the information contained in the attributes listed in Table 3.2.6.2.1.3-1.

Table 3.2.6.2.1.3-1: Specimen Preparation Attributes for Display

Attribute	Tag	Comment
Specimen Description Sequence > Specimen Identifier	(0040,0560) > (0040,0551)	There may be more than one specimen on a slide and implementers should display multiple identifier values when present.
Specimen Description Sequence > Specimen Short Description	(0040,0560) > (0040,0600)	E.g., "FFPE HE".
Specimen Description Sequence > Specimen Preparation Sequence > Specimen Preparation Step Content Item Sequence	(0040,0560) > (0040,0610) > (0040,0612)	Multiple items may be present with text or code values describing fixation, embedding and one or more substances used for staining, and the meaning of all should be displayed to the user.
Specimen Description Sequence > Primary Anatomic Structure Sequence	(0040,0560) > (0008,2228)	There may be multiple items, and all should be displayed to the user.

Note. The Attributes are listed here with the names used in the DICOM Standard, but it is up to the implementer how to describe the names of the displayed values, which may be configurable and/or localized.

3.2.6.2.1.4 Annotation of Size Information

The user needs to be aware of the physical size of the displayed image content, and so the Image Display shall be capable of annotating the displayed images with the following:

- An indication of the size of a portion of the screen, such as a caliper with distance indications in mm
- An indication of the magnification factor at a particular zoom level (e.g., nominal 40x magnification when an encoded pixel of 0.00025 mm is rendered 1:1 with a display pixel)

The exact form of pixel size indications is left to the discretion of the implementer.

Note: How the nominal magnification factor that is displayed is calculated should be documented for the user in the instructions for use.