**Integrating the Healthcare Enterprise**

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**IHE Radiology**

**Technical Framework Supplement**

**Cross-Enterprise Read for Images**

**Workflow Definition Profile**

**(XRi-WD)**

**Draft in preparation for Public Comment**

Date: February 26, 2015

Author: Christopher Lindop

Email: [Radiology@ihe.net](mailto:Radiology@ihe.net)

**Foreword**

This is a Volume segment to supplement to the IHE Radiology Technical Framework Revision 13.0.

General information about IHE can be found at: [www.ihe.net](http://www.ihe.net).

Information about the IHE Radiology domain can be found at: <http://www.ihe.net/Domains/index.cfm>.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at: <http://www.ihe.net/About/process.cfm> and <http://www.ihe.net/profiles/index.cfm>.

The current version of the IHE Radiology Technical Framework can be found at: <http://www.ihe.net/Technical_Framework/index.cfm>.

# Introduction to Cross-Enterprise Read Workflow Definition Profile

In this release, we present the typical clinical use-case process flows, describing many possible scenarios of the related workflow for the Cross-Enterprise Read for Images process.

## Open Issues and Questions

1. *Do the use cases specified address the most critical remote read workflows needed? If not, what are the missing use cases? Is the detail sufficient? If not, what do you suggest to include?*
2. *Use case Common Workflow scenario includes the capability for the Service Performer to manage availability of its own reading resources, where the Direct Assign Common Workflow Scenario has the Dispatcher managing availability of the Service Performer’s reading resources. Are both use cases needed? Should either one be optional?*
3. *Required grouping includes XDW for XDS/XDS-I workflow profiles. Equally technically capable is UPS-RS standards. How should UPS-RS be considered?*

## Closed Issues

# General Introduction

Integrating the Healthcare Enterprise (IHE) is an initiative promoting the use of standards to achieve interoperability of health information technology (HIT) systems and effective use of electronic health records (EHRs). IHE provides a forum for volunteer committees of care providers, HIT experts and other stakeholders in several clinical and operational domains to reach consensus on standards-based solutions to critical interoperability issues. IHE publishes the implementation guides they produce (called *IHE profiles*), first to gather public comment and then for trial implementation by HIT vendors and other system developers.

General information about IHE, including its governance structure, sponsorship, member organizations and work process, is available at [www.ihe.net](http://www.ihe.net/).

This Volume Segment document captures the intended use cases for the Cross-Enterprise Read for Images Workflow Definition Profile.

## Audience

The intended audience of this document is:

* Radiologist
* Imaging Department Administrators
* HIE Administrators
* Software Developers for this profile

Volume 1 – Profiles

# X Cross-Enterprise Read for Images Workflow Definition Profile

Cross-Enterprise Read for Images Workflow Definition profile is an IHE Workflow Definition Profile for Remote Reading Workflow.

Remote Reading workflow is the practice of having medical images interpreted (read) by a reading specialist who is not present at the site the image study was acquired. This is particularly important for subspecialties like Nuclear Medicine or Neuro-radiology where these professionals are generally located at large institutions in major metropolitan areas, working daytime hours. Equally important are with smaller clinical institutions, including urgent care units, imaging centers, private practices and mobile imaging services with limited credentialed 24/7 staff to handle the read workload.

With the introduction of cross-enterprise image sharing profiles, such as XDS-I, providing cross-institutional access of the patient’s clinical images, the ability to share reading workload within an affinity domain community is the next logical step. Institutions today, share studies for better treatment of their patients. This image-sharing infrastructure is already producing improved patient care outcomes and reducing the need for duplicate procedures.

## X.2 Workflow Options

Options that may be selected for this Profile are listed below along with the Workflow Definition Actors to which they apply. Although this Workflow Definition Profile is intended to be combined with other IHE Profiles, the specific options of these other Profiles are not addressed in this section, which focuses only on the Options identified for this Workflow Definition Profile.

Table X.2-1 specifies the options that are available, if any for each selected Workflow Actors.

Table X.2-1: XRi Profile Workflow Definition Actors and Options

| XRi-WD Workflow Definition Actor | option | Volume & Section |
| --- | --- | --- |
| Service Requester actor | *No options selected* | - |
| Service Dispatcher actor | *No options selected* | - |
| Workflow Monitor actor | *No options selected* | - |

## X.3 XRi-WD Profile Grouping with other Profiles

The XRi Workflow Definition Profile is intended to be combined with other IHE Profiles. The profiles that are required for such combinations and the associated rules are specified in this Section. Note that Image Sharing as well as Document Sharing is required for grouping with XDS/XDS-I profiles as the base architecture. XDR/XDR-I, XCA/XCA-I and MHD/MHD-I may be considered as well.

### X.3.1 XRi-WD Profile Grouping with Workflow Sharing Profiles

The grouping of XDW actors with each of the XRi-WD workflow definition actors is specified in table X.3-1. These XDW Actors support the creation, consumption and update of the XDW workflow document, which is the shared data structure which is tracking the evolution of the workflow. This allows the XRi-WD workflow definition actors, at any point in the workflow to access the most current status of the workflow and share the tasks performed with all other workflow definition actors.

Note: See IHE ITI TF-1: Section 30.3 (XDW Supplement) for other groupings that are needed for the XDW Actors to permit sharing of a Workflow Document with IHE XDS, XDR or XDM Profiles.

Table X.3-1: XRi-WD workflow definition actors grouping with ITI XDW Profile Actors

Table X.3-1: XRi-WD Workflow Definition Actors grouping with XDW Actors

| Workflow Definition  Actor | Shall be grouped with: |
| --- | --- |
| Service Requester actor | XDW Content Creator  XDW Content Consumer  XDW Content Updater |
| Service Dispatcher actor | XDW Content Updater  XDW Content Consumer |
| Service Performer actor | XDW Content Updater  XDW Content Consumer |
| Workflow Monitor actor | XDW Content Updater  XDW Content Consumer |

### X.3.2 XRi-WD Profile Grouping with Image Sharing Profiles

The grouping of XDS-I actors of each Table X.3-2: XRi-WD workflow definition actors grouping with XDS-I Profile Actors for Image Sharing.

Table X.3-2: XRi-WD Workflow Definition Actors grouping with XDS-I Actors

| Workflow Definition  Actor | Shall be grouped with: |
| --- | --- |
| Service Requester actor | XDS-I Image Document Source  XDS-I Image Document Consumer |
| Service Performer actor | XDS-I Image Document Source  XDS-I Image Document Consumer |

### X.3.3 XRi-WD Profile Grouping for XDS Task Status Update Notification Profiles

Table X.3-3: XRi-WD workflow definition actors grouping with DSUB Profile Actors for Task Status Update Notifications

Table X.3-3: XRi-WD Workflow Definition Actors, for grouping with DSUB Actors

| Workflow Definition  Actor | Shall be grouped with: |
| --- | --- |
| Service Requester actor | Document Notification Metadata Subscription |
| Service Dispatcher actor | Document Notification Metadata Subscription( CP 613 new option) |
| Service Performer actor | Document Notification Metadata Subscription(CP 613 new option) |
| Workflow Monitor actor | Document Notification Metadata Subscription(CP 613 new option) |

### X.3.4 XRi-WD Profile Grouping for XDS Query for Open Assignments

Table X.3-4: XRi-WD workflow definition actors grouping with MPQ Profile Actors for Query for Open Assignments

Table X.3-4: XRi-WD Workflow Definition Actors, for grouping with MPQ Actors for Task/status based RR-WD Documents.

| Workflow Definition  Actor | Shall be grouped with: |
| --- | --- |
| Performer actor | MPQ Document Consumer |

## X.4 XDi-WD Overview

Cross-enterprise management of the workflow related to clinical image procedure processes is a fundamental topic with the increasing use by different sectors of cross-enterprise image sharing.

The goal of the profile is to improve the throughput and efficiencies of imaging centers and radiology departments, which acquire imaging studies, but lack the resources to efficiently read the images. Other facilities, which do have the necessary and available resources to include this work in their workload, are enabled by this profile to perform the read.

### X.4.1Concepts

#### X.4.1.1 Collaboration Group

As this is a cross-institutional workflow model, the Collaboration Group is a group of legal entities bound by a business agreement, which provide the remote read requests, manage the cross-enterprise Dispatching and perform the remote read.

The exact content of this agreement may vary based on regional regulations and institutional policies. While these agreements are important to the actual deployment and usage of this profile, it is out-of-scope to for this profile to define the business relationship. This activity is left to the implementation guidelines for the image read sharing collaboration group.

The collaboration group may have an M:N relationship between the read requestor and read performer. Typically, there is a single scheduler with the Collaboration group. This relationship may be characterized by the image acquisition capabilities of a requestor and the credentialed reading capabilities of a performer. As an example, the Collaboration Group may be characterized by sub-specialty like reading NM studies. In this example the collaboration group may have Read Requestors who have members who are credentialed NM Physicians and may have Read Performers who have members who are NM Radiologists.

#### X.4.1.2 Workflow Stakeholders

In this section we present the Workflow Stakeholders involved in the Remote Read process. The stakeholders are users and systems involved in the use cases.

A Workflow Stakeholder is an abstraction of the systems and users involved in the Remote Read process. They can be identified, based on their roles in the process. Each of these workflow stakeholders has specific rights and duties in the process. They drive the process from one step to another, performing determinate actions on the workflow.

|  |  |
| --- | --- |
| Workflow Stakeholder | Definition |
| Attending Physician | Physician who oversees the care of the patient. |
| Radiographer | Qualified Individual to perform an imaging procedure. |
| Referring Physician | Physician who referred the patient for the imaging procedure. |
| Imaging Facility | Facility where clinical imaging procedures are preformed. |
| Reading Facility | Facility where clinical imaging procedures are read. |
| Community Health Information Exchange | Cloud-based services managed on half of a healthcare community for the purpose of exchanging clinical records. |
| Radiologist | A clinical physician who is credentialed to read clinical images per local regulations. |
| Read Requestor | Application software entity, which initiates and completes the Cross-Enterprise Read process.  As an example, the software may be edge system software provided by the HIE and hosted by the Imaging Facility or an integrated feature of the Imaging Facility’s RIS/PACS managing image acquisition workflow. |
| Cross-Enterprise Dispatcher (X-Dispatcher) | Application software entity, which dispatches the Cross-Enterprise Read activities.  As an example, the software may an integrated feature of the HIE infrastructure core services or an edge system capability of a Tele-radiology system. |
| Read Performer | Application software entity, which performs the Cross-Enterprise Read activity.  As an example, the software may be edge system software provided by the HIE and hosted by the Imaging Facility or an integrated feature of the Imaging Facility’s RIS/PACS managing reporting workflow. |
| Workflow Monitor | Application software entity, which tracks progress of the read workflow and reacts to certain exception conditions.  As an example, the software may be an edges system hosted by the Imaging Facility for the sole purpose of monitoring requests initiated by this facility. Another example would be the HIE providing an overall dashboard and performance analytics. |

#### X.4.1.3 Remote Read Documents

In this section we present the Workflow Documents involved in the Remote Read process.

The Remote Read process specifies the usage of six document types in the table below:

|  |  |
| --- | --- |
| Document Types | Definition |
| **Final Report** | Final Report is the clinical imaging report signed by a credentialed Radiologist. |
| **Preliminary Report** | Preliminary Report is the clinical imaging report, which may be provided in advance of a Final Report. |
| **Image Manifest** | Document identifying the image set relevant to an Image Procedure and how these images are accessible. |
| **Image Set** | Clinical images referenced in the Image Manifest. |
| **Read Request** | Request for a Radiologist to perform a clinical read of images acquired for a Requested Procedure. |
| **Relevant Clinical Documents** | Relevant Clinical Documents is a reference to any Clinical Document deemed to be relevant for the remote read. This may include the original Referral or a supporting Laboratory Report, as examples. It may include Image Manifests and image reports of prior image studies |

#### X.4.1.4 Remote Read Process Flow

##### X.4.1.4.1 Common Workflow Scenario

A common workflow pathway that best illustrates the basic process enabled by the XRi-WD is afterhours reading. This is where am Imaging Facility, which performs imaging procedures does not have credentialed Radiologists to read performed image studies after hours.

For this example, the Northern Community Hospital NCH) has an Imaging Facility, which performs imaging procedures on patients after 5:00 PM. There is an attending physician overseeing the imaging procedures performed by a qualified Radiographer. However, after hours, the site’s Reading Facility lacks the credentialed Radiologists to perform the read.

Capital Health Alliance (CHA) is a community Health Information Exchange. The charter of this exchange is to provide the infrastructure and services for the purpose of sharing clinical patient records among its members. The members of this cooperative are clinical institutions and facilities, which provide patient care in this community. CHA includes the infrastructure and services for sharing image studies between its members. The services include reading workload sharing of images.

NCH is a member of CHA. NCH has a business agreement with CHA to share clinical images with its members. It is also has a business agreement with a collaboration group within CHA to share reading workload.

Greater City Hospital (GCH) has a Reading Facility with credentialed Radiologist, which performs reading of radiographic images. It is a member of the CHA Health Information Exchange. It participates in the image sharing services. This group has a business agreement to provide, pending staff availability, reading workload sharing of radiographic images.

This use case is initiated by a patient arriving at the Northern Community Hospital referred for a CT head scan. The CT Radiographer preps the patient, performs and completes the scan.

The workflow to have this Image Study remotely read is conducted in the following steps:

**Create Read Request:**

Once the scan s complete, the relevant clinical information is gathered and the read request is created. This read request includes:

* Scan procedure and protocol
* CT Radiographer
* Attending Physician
* Referring physician
* Urgency
* Collaboration Group
* Sub-specialty required
* Preliminary Read, if needed

Attached to the read request:

* Image Manifest, referencing the images acquired
* Referral, if available containing the reason for exam, patient history, requisition
* Exam/Tech Notes, to include observations during the scan

**Submit Read Request:**

The Read Request is submitted to the Capital Health Alliance (CHA) with NCH’s Read Requester software. CHA has cross-enterprise Dispatcher software, which validates the read request.

**Dispatch Read Request to Read Performers:**

Once validated the dispatcher notifies the Collaboration Group Read Performers of the open read request.

**Confirm Availability:**

Greater City Hospital’s (GCH) Read Performer software receives the notification from the Dispatcher software. Internally, it confirms that it has the available credentialed Radiology staff to perform the read request. GCH’s Read Performer software notifies CHA’s X-Dispatcher that it can perform the read.

**Assign Read Performer(s):**

CHA’s X-Dispatcher software receives the notification and assigns the Remote Read to GCH. The assignment is submitted to GCH’s Read Performer software. The assignment status is updated.

**Perform Read-Ready:**

GCH’s Read Performer Software, upon receipt of the assignment to the site, preps the reading facility’s software systems for the read at the site. The prep process may include moving the images into it’s local PACS and creating a local patient ID and local workitem with its own accession number. The reading workflow is managed as if the study was acquired locally.

**Perform Read-InProgress:**

The Radiologist performs the remote read. While the Radiologist is performing the remote read, additional evidence documents may be created, such as CAD reports or Key Image Notes or Presentation States. The Radiologists completes the read by creating the final report. Using the Reading Facility’s normal workflow processes.

**Perform Read-Complete:**

Upon completion of the read, a Final Report is submitted by the Radiologist. The Reading Facility’s Read Performer software gathers the Final Report and other evidence Documents created and submits it to the CHA HIE for distribution back to NCA’s Read Request Software. All clinical content submitted will include the originating patient and procedure identifiers and the original Accession tracking number.

**Perform Read, Preliminary Report**

If Preliminary Report is requested in the Remote Read Request, then this Preliminary Report is expected in advance to the Final Read. It should be created in parallel to the Perform Read task. The Preliminary Read is expected to be provided to the Attending Physician before the Final Report is provided. If the Preliminary Report is performed, the Final Report should include confirmation of the Preliminary Report.

**Complete Image Procedure**

NCH’s Read Requester software receives the final report and the relevant Evidence Documents submitted by GCH. NCH completes the imaging procedure workflow. This may include importing the evidence documents and Final Report into the local RIS/PACS. It may include the business transactions to reimburse the Reading Facility for services rendered.

Once the Imaging Study Procedure is completed, the Read Request Workflow process is closed.

**Notifications**

**Read Requester:** Once the Read Request is submitted, the Requester monitors the read progress.

**Read Performer:** The Performer monitors the Read Request assignment status it is qualified to perform.

**Attending Physician:** Receives notifications when a Report is available or if a critical finding is discovered.

##### X.4.1.4.2 Common Workflow Scenario, Direct Assign

The Common Workflow Scenario, Direct Assign is a specialization variant of X.4.1.4.1 Common Workflow Scenario. In this case, the dispatcher proceeds to assign read requests without consent to the Reading Facility’s capacity to perform the read, based on other knowledge, such as load balancing or single source perform capabilities.

The Direct Assign Common Workflow Scenarion is a specialized scenario of the Common Workflow Scenario described in section X.4.1.4.1 with the following exceptions:

1. ***Notify Read Performers*** step is omitted.
2. Dispatcher proceeds directly to ***Assign Read Performer***.

##### X.4.1.4.3.Remote Read, Preliminary Urgent Read Request Scenario

A Preliminary Urgent Read Request workflow pathway is where an Imaging Facility, which performs imaging procedures has an urgent for a Preliminary Report of the performed image studies in advance of a Final Report. This pathway may be a trauma case read for an ER department.

The Urgent Read Request pathway is a specialized scenario of the Common Workflow Scenario described in section X.2.1 with the following exceptions:

1. Emergency Department physician is the attending physician identified in the read request.
2. The Read Request includes an Urgency code of STAT and a request for a preliminary read.
3. The Collaboration Group may be constrained to include only Read Performers capable of handling Urgent Read Requests.
4. The ***Notify Read Performers*** is identified as critical.
5. A preliminary report is provided back to the Read Requestor and the attending physician before a Final Report is created.
6. The Final report will be created as described in the Common Workflow Scenario process. Note that reconciliation of the Preliminary Read with the Final Read will need to be done. However, this would be considered part of the Perform Read process step.

##### X.4.1.4.4 Remote Read, Sub-Specialty Read Request Scenario

A Sub-Specialty Read Request workflow pathway is the scenario where am imaging facility has a need to request a Sub-specialist to perform the read.

The Sub-Specialty Remote Read Request pathway is a specialized scenario of the Common Workflow Scenario described in Section X.4.1.4.1. To illustrate, as an example, a community hospital has an Attending Physician who is providing the oversight of the radiographer performing a Nuclear Medicine (NM) SPECT procedure. The Imaging Facility lacks a credentialed NM Radiologist to read NM SPECT. A read by a credentialed NM Radiologist is required. The pathway follows the Common Workflow Scenario with the following exceptions:

1. The Read Request identifies sub-specialty reader qualifications as NM Radiologist.
2. The Collaboration Group may be constrained to include only Read Performers with credentialed NM Radiologists
3. The X-Dispatcher assigns only to a Read Performer, which has credentialed NM Radiologist as members of their staff.
4. A credentialed NM Radiologist authors the Final Report.

##### X. 4.1.4.5 Remote Read Over Read Consult Scenario

The Remote Over Read Consult Request pathway is the scenario where am imaging facility has an imaging Report and needs to request an Over Read Consult. This is often done for purposes of quality assurance. As an example, a requesting physician has a Final Report but a particular study, but is concerned regarding the quality. The pathway follows the Common Workflow Scenario described in X.4.1.4.1 with the following exceptions:

1. The Read Request type is Over Read Consult. The original author of the initial Final Report is identified in the request.
2. The Read Performer must ensure that the original author of the initial Final Report does not perform this workitem.
3. The over read consulting physician either agrees or disagrees with the original report’s content. In the case of an agreement, an additional ‘Verifying Observer’ is added to the original report. In the case of a disagreement, a discrepancy report is generated.

##### X. 4.1.4.6 Remote Read, Double Read Request

The Double Remote Read Request pathway is the scenario where am imaging facility has a need to request two reads on the same acquired image study.

Similar to the Common Workflow Scenario described in X.4.1.4.1 with the following exceptions:

1. The Read Request type is Double Read. The Read Requester may require the reads to be performed by two separate Reading Facilities.
2. The Dispatcher creates and assigns two Open Read Requests.
3. The Read Requester will receive two Image Reports, one from each of the assigned readers.
4. The Read Requester may introduce additional processing of the results, which is beyond the scope of this profile.

##### X. 4.1.4.7 Remote Read, Request Cancellation

The Remote Read, Request Cancellation is the pathway scenario where a requesting imaging facility has a need to cancel a request.

It the Assign Request is Complete or the Perform Read is Ready and not in-progress, the Read Request may be cancelled.

If the Perform Read is in-process, the Perform Read will be completed and won’t be accessible to Cancel.

##### X. 4.1.4.8 Remote Read, Assign Cancellation

The Read Performer may cancel the Assign Read at anytime during the Perform Read. The Perform Read would return to the Dispatcher for Assign Read.

## X.5 XRi-WD Security Considerations

For this section please refer to the section ITI TF-1: 30.5.

## X.6 XRi-WD Cross Profile Considerations

### X.6.1 XBeR Cross-Enterprise eReferral Workflow Definition

The XRi-WD Profile, when grouping X-eReferral for Image Procedures with X-Read for Images should group with the following actors in the Table below:

Table X.6-1: XRi-WD Workflow Definition Actors, when grouping with XBeR-WD Actors

| Workflow Definition  Actor | Grouped with: |
| --- | --- |
| XRi Service Performer actor | XBeR Service Scheduler Actor |

### X.6.2 Tumor Board Review Workflow Definition

The Tumor Board Workflow Definition Profile may be considered when the Tumor Board workflow includes a Remote Read Request for Imaging Procedures.

Table X.6-2: XRi-WD Workflow Definition Actors, when grouping with XTB-WD Actors

| XRi Workflow Definition  Actor | Grouped with: |
| --- | --- |
| XRi Service Requester actor | XTB Service Preparer |

### X.6.3 IHE Document Content Profiles

IHE QRPH, Laboratory, Pharmacy, Radiology, PCC, Eye-care, Cardiology and Anatomic Pathology have created numerous document content profiles which should be considered, when document content relevant to the Requested Read for Images is available to include as content input of the Remote Read submission set.

Table X.6-3: XRi-WD Workflow Definition Actors, when grouping with IHE Document Content Profile Actors

| XRi Workflow Definition  Actor | Grouped with: |
| --- | --- |
| XRi Service Requester actor | Content Consumer |
| XRi Service Performer actor | Content Consumer |

### X.6.4 IHE Imaging Acquisition Workflow

IHE QRPH, Laboratory, Pharmacy, Radiology, PCC, Eye-care, etc have created numerous Imaging Department Workflow profiles which, should be considered, when a Request for Remote Read may be initiated and Completed.

Table X.6-4: XRi-WD Workflow Definition Actors, when grouping with IHE Imaging Acquisition Workflow Profile Actors for Inatiating and Completing the Remote Read

| XRi Workflow Definition  Actor | Grouped with: |
| --- | --- |
| XRi Service Requester actor | Order Filler |

### X.6.5 IHE Imaging Report Workflow

IHE QRPH, Laboratory, Pharmacy, Radiology, PCC, Eye-care, etc have created numerous Imaging Report Workflow profiles which, should be considered, when an Imaging Report Workflow may be applied for Read Service Performing.

Table X.6.x.x: XRi-WD Workflow Definition Actors, when grouping with IHE Imaging Department Profile Actors for Fulfilling Remote Read Requests

| XRi Workflow Definition  Actor | Grouped with: |
| --- | --- |
| XRi Service Performer actor | Report Manager |

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