

Integrating the Healthcare Enterprise



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**IHE Radiology  
Technical Framework Supplement**

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**Radiology Remote Reading Workflow  
(RRR-WF)**

15

**Draft for Public Comment**

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## Foreword

30 This is a supplement to the IHE Radiology Technical Framework V13.0. 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 June 12, 2015 for Public Comment. Comments are invited and may be submitted at [http://www.ihe.net/Radiology\\_Public\\_Comments](http://www.ihe.net/Radiology_Public_Comments). In order to be considered in development of the Trial Implementation version of the supplement, comments must be received by July 12, 2015.

35 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:*

40 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: [www.ihe.net](http://www.ihe.net).

45 Information about the IHE Radiology domain can be found at: [ihe.net/IHE\\_Domains](http://ihe.net/IHE_Domains).

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at: [http://ihe.net/IHE\\_Process](http://ihe.net/IHE_Process) and <http://ihe.net/Profiles>.

50 The current version of the IHE Radiology Technical Framework can be found at: [http://www.ihe.net/Technical\\_Frameworks](http://www.ihe.net/Technical_Frameworks).

## CONTENTS

55	Introduction to this Supplement.....	5
	Open Issues .....	5
	Closed Issues.....	6
	To do .....	7
	General Introduction .....	8
60	Appendix A - Actor Summary Definitions.....	8
	Appendix B - Transaction Summary Definitions .....	8
	Glossary .....	8
	<b>Volume 1 – Profiles.....</b>	<b>9</b>
	X Radiology Remote Reading Workflow (RRR-WF) Profile.....	9
65	X.1 RRR-WF Actors, Transactions, and Content Modules.....	9
	X.1.1 Actor Descriptions and Actor Profile Requirements.....	11
	X.1.1.1 Task Requester .....	12
	X.1.1.2 Task Manager .....	12
	X.1.1.3 Task Performer .....	12
70	X.1.1.4 Watcher.....	12
	X.2 RRR-WF Actor Options.....	13
	X.2.1 XDS Option.....	14
	X.2.2 DICOMweb Option .....	14
	X.2.3 DICOM Option.....	14
75	X.3 RRR-WF Required Actor Groupings.....	15
	X.4 RRR-WF Overview .....	15
	X.4.1 Concepts .....	15
	X.4.1.1 Reading Tasks.....	16
	X.4.1.2 Preliminary vs Final Reports .....	17
80	X.4.1.3 Urgent Reads .....	17
	X.4.1.4 "Performer" of the Reading Task .....	17
	X.4.1.5 Workitem Notifications and Subscriptions.....	18
	X.4.1.6 Over-Filtering .....	18
	X.4.1.7 Workflow vs Data Flow .....	19
85	X.4.1.8 Assigned vs Claimed .....	19
	X.4.1.9 Local vs Community IDs.....	20
	X.4.1.10 Additional Outputs .....	20
	X.4.1.11 Single Read Request vs Multiple Read Request .....	20
	X.4.1.12 Addendums .....	22
90	X.4.2 Use Cases .....	22
	X.4.2.1 Use Case #1: Open Worklist .....	22
	X.4.2.1.1 Open Worklist Use Case Description .....	22
	X.4.2.1.2 Open Worklist Process Flow .....	23
	X.4.2.2 Use Case #2: Assigned Read.....	25

95	X.4.2.2.1 Assigned Read Use Case Description.....	25
	X.4.2.2.2 Assigned Read Process Flow .....	28
	X.4.2.3 Use Case #3: Re-assignment, Cancellation and Failures.....	29
	X.4.2.3.1 Use Case Description.....	30
	X.4.2.3.2 Process Flow .....	30
100	X.5 RRR-WF Security Considerations .....	30
	X.6 RRR-WF Cross Profile Considerations .....	31
	Appendices.....	34
	Appendix A – UPS-RS Examples for Remote Reading (Informative).....	34
	A.1 CreateUPS .....	34
105	A.2 SearchForUPS .....	41
	A.3 RetrieveUPS .....	48
	A.4 ChangeUPSState (Claim UPS Workitem) .....	55
	A.5 UpdateUPS .....	56
	A.6 ChangeUPSState (Complete UPS Workitem).....	59
110	A.7 RequestUPSCancellation .....	60
	A.8 CreateSubscription .....	60
	A.9 SuspendGlobalSubscription .....	61
	A.10 DeleteSubscription .....	61
	A.11 OpenEventChannel.....	61
115	A.12 SendEventReport.....	62
	<b>Volume 2 – Transactions .....</b>	<b>65</b>
	3.Y1 Open Event Channel [RAD-Y1] .....	96
	3.Y1.1 Scope .....	96
	3.Y1.2 Actor Roles.....	96
120	3.Y1.3 Referenced Standards .....	97
	3.Y1.4 Interaction Diagram.....	97
	3.Y1.4.1 Open Event Channel.....	97
	3.Y1.4.1.1 Trigger Events.....	97
	3.Y1.4.1.2 Message Semantics .....	98
125	3.Y1.4.1.3 Expected Actions .....	98
	3.Y1.5 Security Considerations.....	98
	3.Y1.5.1 Security Audit Considerations.....	98
	30.1.1.1 Workitem Manager Actor.....	99
	30.1.1.2 Workitem Performer Actor.....	99
130	30.1.1.4 Workitem Creator Actor.....	99
	30.1.1.5 Watcher Actor .....	99
	Appendices.....	100

135 **Introduction to this Supplement**

This Supplement introduces a Radiology Remote Reading Workflow Profile. The Profile is intended to address a variety of use cases involving imaging studies that are distributed to other locations for interpretation of the study and return of a diagnostic report.

140 The workflow management transactions are based on the RESTful worklist service defined by DICOM UPS-RS. The data transactions for accessing the inputs to the reading task and storing the outputs to the reading task permit the use of XDS-I, RESTful DICOM, or Conventional DIMSE DICOM.

**Feedback is encouraged on the following Open Issues and on any comments displayed in the margin:**

145 **Open Issues**

1. Are there additional security issues that need to be explicitly addressed in this profile?

(Restricting access to Task Managers for query, or being able to access the place the results are stored, etc.)

- 150
2. Should one of the Data Access Options be made a required baseline?

(Current thinking is select any one of three is fine.)

3. Does Task Manager get configured for new Task Requesters and Task Performers?

155 When Task Performer initially manages its subscription that could make the Task Requester aware. Does the ATNA Secure Node certificates provide a useful tool?

4. What references/considerations to Sup155 can we add here ... Teri?

If using XDS-I with structured content it could be using Sup155. Note no DIMSE path for this beyond DICOM-wrapped CDA®. Access to a portal?

- 160
5. Do we need to encode credential requirements in the scheduled workitem?

To a certain degree (no pun intended) the required qualification is implicit in the Imaging Procedure Code etc. Do we need more explicit or more fine grained details?

- 165
6. Should we add a Radiology Reporting WF Option to the HPD Profile that makes certain fields required?

Could then recommend supporting that option to avoid having to deal with configuration headaches.

**Comment [OK1]:** Talk to Rob.

- 170 7. Should we add an Option for XCA transport?  
How would it differ from XDS for the Requester and Performer?
8. Should we add an Option or discussion of PDI transport?  
UPS supports a Media Retrieval Path
- 175 9. Is it an issue to require support of application/json as the baseline for UPS-RS?  
RS Event reports only do JSON right now unless we extend it. See PS 3.18 6.9.11.1.1.  
Reportedly most new implementations are focused on JSON.
10. What should the Performer update in the UPS at start of performance?
- 180 Current UPS semantics require:  
- Fill Actual Human Performer if human did work  
- Fill Performed Station Name Code Sequence with AE-Title
11. Should we set a baseline format for reports? CDA®? PDF? Text?  
Or leave that as an implementation detail?
- 185 12. What should the DICOM Option require from Requesters that claim it?  
Other options require retrieval (i.e., get the report back) using that mechanism.  
You CAN wrap a PDF or CDA® report into a DICOM instance and move it that way, but  
this option does not require the Requester to do that. It talks about our legacy report  
190 transactions. We need to start converging on Sup155 CDA®, but what transports are  
reasonable to promote?
13. Is guidance needed on how to indicate prelim/final in the various report formats?  
The mechanism may differ depending on the report document format.
- 195 14. Where should the need for preliminary/final/both reports be indicated?  
Could profile a parameter in the Scheduled Procedure Step Parameters Sequence.  
Could suggest it be precoordinated in the Workitem Code (3 codes for each type of task).
- 200 15. Should there be a flag/code in the notification to the Task Performer to distinguish  
between one triggered by an assignment to the performer and one triggered by a Filtered  
Global Subscription?  
The performer could retrieve the workitem to get the value of Scheduled Station, if any,  
but that's a bit tedious.

## 205 Closed Issues

1. Should we address both Assigned (Push) and Self-selected (Pull) Workflow?  
A: Yes.

Some communities will reasonably want one, some the other, and some might mix both.

- 210 2. Should Preliminary/Final read be a parameter or precoordinated in request codes?  
A: Parameter

indicating if preliminary/final/both reports are desired.

- 215 3. Should the named options migrate into the Actor Requirements instead?  
A: No.

Want the purchaser visibility of the named options. The rejected alternatives included having multiple rows in the Required Groupings section with a condition of "Must group with at least 1"

- 220 4. How should the Task Manager determine the NPI(s) of each Task Performer?  
A: Out of Scope.

225 Such information could be configured, could be communicated out of band, could profile a specific workitem the Task Manager (or Task Requester) creates that the Task Performer populates with NPI info, could use HPD (has credentialing and covers both individuals and institutions). The source of the credentials will vary by country/jurisdiction.

- 230 5. Can we leave enforcement of credentialing out of scope?  
A: Yes. Out of scope.

Not clear if this should be done by the Task Requester that knows the requirements, or by the Task Performer that is motivated not to claim tasks it will not get reimbursed for, or by the Task Manager which happens to be in the middle, or by some Watcher monitoring the activities.

235 **To do**

- Copy the Cancellation workflow from UPS presentations into X.4.2.3.2
- Review referencing to non-DICOM output and Table CC.2.5-2c.

## General Introduction

240 *Update the following Appendices to the General Introduction as indicated below. Note that these are not appendices to Volume 1.*

### Appendix A - Actor Summary Definitions

*Add the following actors to the IHE Technical Frameworks General Introduction list of Actors:*

Actor	Definition
Task Requester	Submits new tasks to a Task Manager
Task Manager	Manages task instances in a worklist and provides associated query access and notifications
Task Performer	Claims, performs and updates tasks managed by a Task Manager

### Appendix B - Transaction Summary Definitions

245 *Add the following transactions to the IHE Technical Frameworks General Introduction list of Transactions:*

Transaction	Definition
Open Event Channel [RAD-Y1]	Opens an event channel that can be used to send back events such as notifications.

## Glossary

250 *Add the following glossary terms to the IHE Technical Frameworks General Introduction Glossary:*

No new glossary terms



## Volume 1 – Profiles

### X Radiology Remote Reading Workflow (RRR-WF) Profile

255 The Radiology Remote Reading Workflow Profile is a workflow profile that addresses a variety of use cases involving imaging studies that are distributed to other locations for interpretation of the study and return of a diagnostic report.

The workflow management transactions are based on the RESTful worklist service defined by DICOM UPS-RS. The data transactions for accessing the inputs to the reading task and storing  
260 the outputs to the reading task permit the use of XDS-I, RESTful DICOM, or Conventional DIMSE DICOM.

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

With the introduction of cross-enterprise document and image sharing profiles, such as XDS and  
270 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.1 RRR-WF Actors, Transactions, and Content Modules

275 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 at [http://ihe.net/Technical\\_Frameworks](http://ihe.net/Technical_Frameworks).

Figure X.1-1 shows the actors directly involved in the RRR-WF Profile and the relevant transactions between them. If needed for context, other actors that may be indirectly involved  
280 due to their participation in other related profiles are shown in dotted lines. Actors which have a mandatory grouping are shown in conjoined boxes.

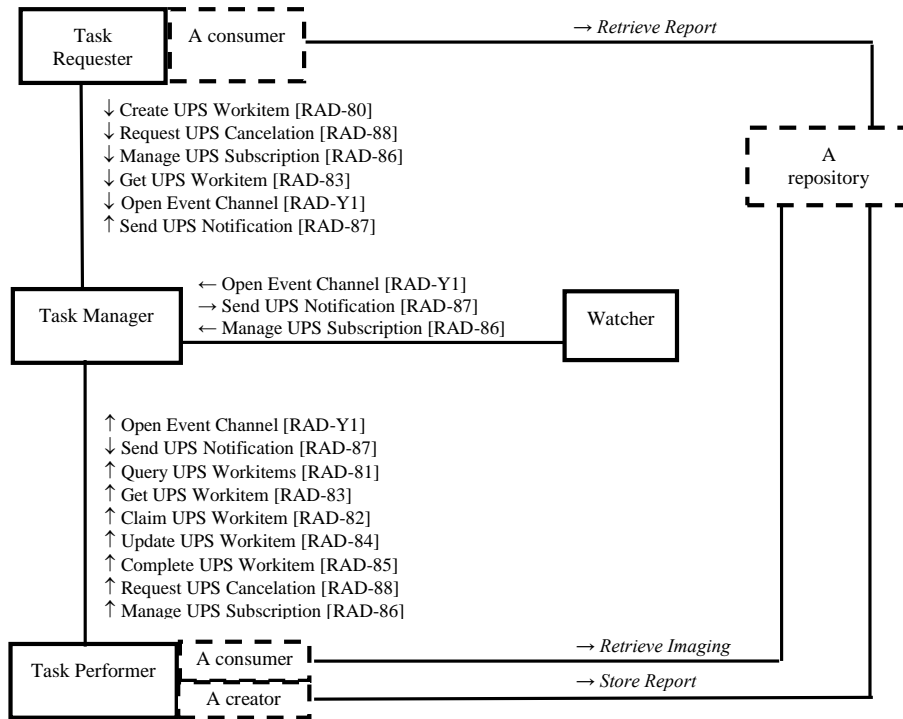


Figure X.1-1: RRR-WF Actor Diagram

285

Table X.1-1 lists the transactions for each actor directly involved in the RRR-WF Profile. To claim compliance with this Profile, an actor shall support all required transactions (labeled “R”) and may support the optional transactions (labeled “O”).

290

Table X.1-1: RRR-WF Profile - Actors and Transactions

Actors	Transactions	Optio nality	Reference
Task Requester	Create UPS Workitem [RAD-80]	R	RAD TF-3: 3.80
	Open Event Channel [RAD-Y1]	R	RAD TF-3: 3.Y1
	Send UPS Notification [RAD-87]	R	RAD TF-3: 3.87
	Get UPS Workitem [RAD-83]	R	RAD TF-3: 3.83

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

Actors	Transactions	Optio nality	Reference
	Request UPS Cancelation [RAD-88]	O	RAD TF-3: 3.88
	Manage UPS Subscription [RAD-86]	O	RAD TF-3: 3.86
	WADO-RS Retrieve [RAD-107]	O	RAD TF-3: 3.107
Task Manager	Create UPS Workitem [RAD-80]	R	RAD TF-3: 3.80
	Query UPS Workitems [RAD-81]	R	RAD TF-3: 3.81
	Get UPS Workitem [RAD-83]	R	RAD TF-3: 3.83
	Claim UPS Workitem [RAD-82]	R	RAD TF-3: 3.82
	Update UPS Workitem [RAD-84]	R	RAD TF-3: 3.84
	Complete UPS Workitem [RAD-85]	R	RAD TF-3: 3.85
	Request UPS Cancelation [RAD-88]	R	RAD TF-3: 3.88
	Manage UPS Subscription [RAD-86]	R	RAD TF-3: 3.86
	Open Event Channel [RAD-Y1]	R	RAD TF-3: 3.Y1
	Send UPS Notification [RAD-87]	R	RAD TF-3: 3.87
Task Performer	Query UPS Workitems [RAD-81]	R	RAD TF-3: 3.81
	Get UPS Workitem [RAD-83]	R	RAD TF-3: 3.83
	Claim UPS Workitem [RAD-82]	R	RAD TF-3: 3.82
	Update UPS Workitem [RAD-84]	R	RAD TF-3: 3.84
	Complete UPS Workitem [RAD-85]	R	RAD TF-3: 3.85
	Open Event Channel [RAD-Y1]	R	RAD TF-3: 3.Y1
	Send UPS Notification [RAD-87]	R	RAD TF-3: 3.87
	Request UPS Cancelation [RAD-88]	R	RAD TF-3: 3.88
	Manage UPS Subscription [RAD-86]	O	RAD TF-3: 3.86
	WADO-RS Retrieve [RAD-107]	O	RAD TF-3: 3.107
Store Instances Over the Web [RAD-108]	O	RAD TF-3: 3.108	
Watcher	Manage UPS Subscription [RAD-86]	R	RAD TF-3: 3.86
	Open Event Channel [RAD-Y1]	R	RAD TF-3: 3.Y1
	Send UPS Notification [RAD-87]	R	RAD TF-3: 3.87
	Get UPS Workitem [RAD-83]	O	RAD TF-3: 3.83

**Comment [K2]:** May want to add a note that this is currently defined in WIC which is in Trial Implementation in case people cannot find this transaction in the TF.

**X.1.1 Actor Descriptions and Actor Profile Requirements**

Most requirements are documented in Transactions (Volume 2) and Content Modules (Volume 3). This section documents any additional requirements on profile’s actors.

295 **X.1.1.1 Task Requester**

The Task Requester Actor shall implement the DICOM RESTful Message Semantics of the relevant transactions. As a baseline, a Content-Type of application/json shall be supported; application/dicom+xml may additionally be supported.

300 The Task Requester shall support configuration of the reading procedure codes which are used to populate the Scheduled Workitem Code in the reading task. Such codes may be a local codeset coordinated by the organizations participating in the reading community.

**X.1.1.2 Task Manager**

305 The Task Manager Actor shall implement the DICOM RESTful Message Semantics of the relevant transactions. As a baseline, a Content-Type of application/json shall be supported; application/dicom+xml may additionally be supported.

The Task Manager shall support configuration of the preference of each Task Requester to be automatically subscribed with a deletion lock to all tasks the Task Requester creates.

**Worklist Maintenance**

310 Implementers of Task Managers are encouraged to read the DICOM UPS specifications (see DICOM PS3.4 Annex CC) carefully. For example, practical issues such as the possibility that Task Performers go offline or Watchers that fail to release deletion locks are acknowledged there and the Task Manager (SCP) is given permission to perform certain remediations.

**X.1.1.3 Task Performer**

315 The Task Performer Actor shall implement the DICOM RESTful Message Semantics of the relevant transactions. As a baseline, a Content-Type of application/json shall be supported; application/dicom+xml may additionally be supported.

The Task Performer shall support configuration of the reading procedure codes which will be found in the Scheduled Workitem Code in the reading task. Such codes may be a local codeset coordinated by the organizations participating in the reading community.

320 The Task Performer shall support at least the Task-oriented Query, the Staff-oriented Query and the Patient-oriented Query as described in the Query UPS Workitems [RAD-81] transaction.

**Performing System Identification**

Prior to starting work on a claimed workitem, the Task Performer shall update the Performed Station Name Code Sequence as described in RAD TF-3: 4.84.4.1.2.1 to identify itself.

**Comment [K3]:** I added the Performed Station Name Code Sequence in the UpdateUPS example.

325 **X.1.1.4 Watcher**

The Watcher Actor shall implement the DICOM RESTful Message Semantics of the relevant transactions. As a baseline, a Content-Type of application/json shall be supported; application/dicom+xml may additionally be supported.

## X.2 RRR-WF Actor Options

330 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: Radiology Remote Reading Workflow - Actors and Options**

Actor	Option Name	Reference
Task Requester	XDS Option (See Note 1)	RAD TF-1:X.2.1
	DICOMweb Option (See Note 1)	RAD TF-1:X.2.2
	DICOM Option (See Note 1)	RAD TF-1:X.2.3
Task Manager	No options defined	--
Task Performer	XDS Option (See Note 1)	RAD TF-1:X.2.1
	DICOMweb Option (See Note 1)	RAD TF-1:X.2.2
	DICOM Option (See Note 1)	RAD TF-1:X.2.3
Watcher	No options defined	--

Note 1: The Task Requester and the Task Performer shall implement at least one Option.

335

These Options require that the Task Performer be symmetrically able to both retrieve and store instances using a given mechanism. Ensuring that the Task Requester has implemented an Option to retrieve a report using the same mechanism as that provided by the Option on the Task Performer is the responsibility of the purchaser of a given deployment.

340 Note that nothing prohibits an actor that supports multiple options from, for example, retrieving inputs via XDS and making outputs available by DICOMweb. Similarly, multiple mechanisms may be made available simultaneously. A Task Requester might create a read request that lists XDS, DICOMweb and DICOM Retrieval Sequences for all the input instances.

**Comment [OK4]:** Note, a new DICOM CP-1441 allows a Task Requester to specify a preferred retrieval path for the outputs of a task.

345 A sensible approach for Task Performers would be to export reports using the same mechanism and servers from which prior reports or other inputs were imported, unless otherwise configured. Typically such decisions and details are handled when the sharing community is established.

350 Note also that getting the input images to the location which the Task Requester will reference in the created read request and from which the Task Performer will retrieve, is outside the scope of this profile. The Task Requester is required to know where the input images are, but is not required to have moved the images there itself. In many cases the images will have been moved to an accessible location as part of the standard exam workflow. As a result, the role following options will describe requirements on the Task Requester to apply the mechanism to pull reports but will not require pushing images.

### **X.2.1 XDS Option**

355 This option specifies XDS as the mechanism for the Task Performer to access the data used in  
the reading task and for the Task Requester to access the resulting report.

A Task Performer that claims the XDS Option shall be grouped with both an XDS-I.b Imaging  
Document Consumer and an XDS-I.b Imaging Document Source. The XDS-I.b Imaging  
Document Consumer that is grouped with the Task Performer retrieves any instances identified  
360 with an XDS Retrieval Sequence in the workitem Input Information Sequence. The XDS-I.b  
Imaging Document Source that is grouped with the Task Performer stores any relevant output  
documents to an XDS Repository and the Task Performer then lists those output documents in  
the workitem Output Information Sequence and populates the XDS Retrieval Sequence for them.

A Task Requester that claims the XDS Option shall be grouped with an XDS-I.b Imaging  
365 Document Consumer. The XDS-I.b Imaging Document Consumer that is grouped with the Task  
Requester retrieves any reports identified with an XDS Retrieval Sequence in a workitem Output  
Information Sequence.

### **X.2.2 DICOMweb Option**

370 This option specifies DICOMweb as the mechanism for the Task Performer to access the data  
used in the reading task and for the Task Requester to access the resulting report.

A Task Performer that claims the DICOMweb Option shall implement the WADO-RS Retrieve  
[RAD-107] transaction as the Imaging Document Consumer and the Store Instances Over the  
Web [RAD-108] transaction as the Sender. The Task Performer shall be capable of retrieving  
any instances identified in the workitem Input Information Sequence with a WADO-RS  
375 Retrieval Sequence. The Task Performer shall be capable of storing any relevant output  
documents to a DICOMweb STOW-RS server and identifying them in the workitem Output  
Information Sequence with a WADO-RS Retrieval Sequence.

A Task Requester that claims the DICOMweb Option shall implement the WADO-RS Retrieve  
[RAD-107] transaction as the Imaging Document Consumer. The Task Requester shall be  
380 capable of retrieving any reports identified in a workitem Output Information Sequence with a  
WADO-RS Retrieval Sequence.

### **X.2.3 DICOM Option**

This option specifies DICOM as the mechanism for the Task Performer to access the data used in  
the reading task and for the Task Requester to access the resulting report.

385 A Task Performer that claims the DICOM Option shall implement the Retrieve Images [RAD-  
16] transaction as the Image Display and the Creator Images Stored [RAD-18] as the Evidence  
Creator. The Task Performer shall be capable of retrieving any instances identified in the  
workitem Input Information Sequence with a DICOM Retrieval Sequence. The Task Performer  
shall be capable of storing any relevant output documents to a DICOM server and identifying  
390 them in the workitem Output Information Sequence with a DICOM Retrieval Sequence. For

reports, this may involve wrapping CDA® documents into DICOM instances. Also, DICOM PS3.20 documents CDA® templates and implementation guidance for encoding Imaging Reports.

395 A Task Requester that claims the DICOM Option shall implement the Retrieve Reports [RAD-27] transaction as the Report Reader. The Task Requester shall be capable of retrieving any reports identified in a workitem Output Information Sequence with a DICOM Retrieval Sequence.

### X.3 RRR-WF Required Actor Groupings

400 An Actor from this profile (Column 1) shall implement all of the required transactions and/or content modules in this profile *in addition to* all of the transactions required for the grouped actor (Column 2).

Section X.5 describes some optional groupings that may be of interest for security considerations and section X.6 describes some optional groupings in other related profiles.

405 **Table X.3-1: Radiology Remote Reading Workflow - Required Actor Groupings**

RRR-WF Actor	Actor to be grouped with	Reference
Task Requester	Secure Node (ATNA Profile)	ITI TF-1: 9
	Time Client (CT Profile)	ITI TF-1: 7
Task Manager	Secure Node (ATNA Profile)	ITI TF-1: 9
	Time Client (CT Profile)	ITI TF-1: 7
Task Performer	Secure Node (ATNA Profile)	ITI TF-1: 9
	Time Client (CT Profile)	ITI TF-1: 7
Watcher	Secure Node (ATNA Profile)	ITI TF-1: 9
	Time Client (CT Profile)	ITI TF-1: 7

## X.4 RRR-WF Overview

### X.4.1 Concepts

Reading tasks are described in "workitem" objects.

410 Mostly, workitems are created by Task Requesters, managed by Task Managers, and claimed by Task Performers. Task Performers understand the details of the reading task by examining the contents of the workitem.

415 Once the task has been performed, the Task Performer updates the contents of the workitem to reflect the results. The Task Manager notifies interested systems, particularly the Task Requester, when the workitem is updated. The Task Requester can examine the contents of the workitem to see the list of results and where they are available for retrieval.

### X.4.1.1 Reading Tasks

Some key details which can be included the workitem for a reading task include:

Detail	Corresponding UPS Attribute
Patient name, ID	Patient's Name (0010,0010) Patient ID (0010,0020) Issuer of Patient ID (0010,0021) Other Patient IDs Sequence (0010,1002)
Scan procedure (including Body System)	Scheduled Workitem Code Sequence (0040,4018)
Sub-specialty required (e.g., NM, Neuro, etc.)	Scheduled Workitem Code Sequence (0040,4018)
Want Preliminary Report, Final Report, or both	Scheduled Processing Parameters Sequence (0074,1210)
Expected Completion Date/Time	Expected Completion Date and Time (0040,4011)
Priority/Urgency	Scheduled Procedure Step Priority (0074,1200)
Accession # and Issuing Organization	Accession Number (0008,0050) Issuer of Accession Number Sequence (0008,0051)
References to the acquired images and location	Input Information Sequence (0040,4021) Referenced SOP Sequence (0008,1199) Referenced SOP Instance UID (0008,1155) XDS Retrieval Sequence (0040,E024) WADO-RS Retrieval Sequence (0040,E025) DICOM Retrieval Sequence (0040,E021) Media Retrieval Sequence (0040,E022)
Admitting Diagnoses	Admitting Diagnoses Description (0008,1080) Admitting Diagnoses Code Sequence (0008,1084)
Reason for Exam	Reason for the Requested Procedure (0040,1002) Reason for Requested Procedure Code Sequence (0040,100A)
References to other relevant input documents	
Patient history/clinical summary, requisition, referral	Input Information Sequence (0040,4021)
Exam/Tech Notes	Input Information Sequence (0040,4021)
Prior Images	Input Information Sequence (0040,4021)
Radiation Dose Report	Input Information Sequence (0040,4021)
Claim Information	Input Information Sequence (0040,4021)
CT Radiographer	
EMR Portal Address	Pertinent Resource Sequence (0038,0101) >Retrieve URI (0040,E010)
Referring Physician	Requesting Physician (0032,1032)
Ordering Department	Requesting Service (0032,1033)
Assigned Reader	Scheduled Human Performers Sequence (0040,4034)
Assigned Organization	Scheduled Human Performers Sequence (0040,4034)
Collaboration Group	

**Comment [OK5]:** Need to profile these two more specifically, or if we'd rather not pre-coordinate this way, choose another home.

**Comment [OK6]:** Need to profile more specifically

**Comment [OK7]:** This would be in the images. What was the use case for putting it in the read request?

**Comment [OK8]:** What was this used for again?



#### **X.4.1.2 Preliminary vs Final Reports**

420 *Preliminary vs final read (preliminary might be requested for urgent/stat or Nighthawk coverage. The final read might also be scheduled or might be handled locally) – Go for P/F/Both Attribute in the task.*

#### **X.4.1.3 Urgent Reads**

425 Some reading tasks may be urgent and due to the urgency, the Task Requester may be most interested in a preliminary report.

Examples include a trauma case read for an ER department.

The reading task for such cases might have some of the following characteristics:

- Urgency = STAT
- Attending Physician = the ED physician
- 430 • Requested Report = Preliminary or Both
- Expected Completion = a specific time in the near future, e.g., two hours from now
- Some attributes normally provided, like patient history, might be absent due to lack of time to populate them.

435 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.

A system assigning read tasks might choose Task Performers contracted to handle urgent reads, or known to have a fast turnaround time.

#### **X.4.1.4 "Performer" of the Reading Task**

440 The Task Performer Actor is not necessarily the system on which the reading task will be actually performed.

445 It is expected that in some implementations the Task Performer would function as a type of proxy. For example, the Task Performer Actor system might retrieve the images referenced in the workitem, import them into local storage, add a proxy workitem onto the reading worklist on the local RIS, monitor the progress and results of the local reading task, forward the report into community accessible storage, then update the attributes of the original reading workitem appropriately and move it to the completed state. The proxy might also handle mapping any local or community identifiers (patient ID, procedure codes, accession numbers) in the clinical content produced back to the values in the workitem.

450 Alternatively, the Task Performer Actor system might be the one on which the read is actually performed.

#### **X.4.1.5 Workitem Notifications and Subscriptions**

A variety of needs call for sending notifications about workitems.

An Attending Physician may want to be notified by the Task Requester when a Report is available or if a critical finding is discovered.

455 A Task Requester will likely want to monitor the progress of the workitem or at least know when it is complete.

The Task Manager or a Watcher could receive notifications and record details for each reading task internally to perform analytics on performance, study mix, turnaround times, compliance with SLAs, etc.

460 The contract manager at a requesting site might compare local versus remote read performance (e.g., turnaround time) or might troubleshoot issues. For example: The local radiology manager receives a complaint from the oncology clinic that none of that morning's patients appear to have their reports available. The manager looks at the dashboard or radiology report status for that day's patients to evaluate the real time status of all locally and remotely performed reads, which  
465 is populated by notifications from the Task Manager. It appears that the mornings reads were all assigned to a partner facility which has not accepted/performed any work for 24 hours, and it turns out they had a natural disaster of biblical proportions.

In this profile, the Task Manager sends event notifications about the workitems it is managing. The notifications may report the creation, state change or other modification of the workitem.  
470 For example, a Task Requester may be notified that the workitem has been completed. A Task Performer may be notified of a request to cancel a workitem the Task Performer has claimed and may be working on.

Task Requesters, Task Performers and other systems (Watchers) can manage the notifications they receive by subscribing or unsubscribing globally (for all current and future workitems) or to  
475 specific workitems. Task Performers are automatically subscribed to workitems that are pre-assigned to them. Task Requesters may be automatically subscribed to workitems they create.

Filtered Subscriptions are also possible. In this case, notifications are only sent for workitems that match the filter. For example, a Task Performer might set up a filtered subscription to be notified of all current and future workitems for SPECT reads with a STAT priority which are not  
480 already assigned. This has the advantage that a Task Performer can wait for a notification rather than repeatedly querying.

#### **X.4.1.6 Over-Filtering**

When a Task Performer queries for a list of available reading tasks, it may be appropriate for the Task Manager not to return certain workitems that match the query filter. Since this involves  
485 filtering on more than the criteria provided in the query, this is referred to in this profile as "over-filtering".

This profile permits a Task Manager to implement over-filtering but it is optional.

490 Considerations that might be addressed by over-filtering include workitem confidentiality, local  
rules related to clinical credentialing, contractual relationships, load balancing, workitem  
assignment algorithms, etc. Such business logic is out of scope of this profile. Access to  
information about credentialing, specialties, human performers, etc. which could be used to drive  
such logic might be achieved with the HPD Profile discussed in X.6.

495 Such filters are expected to be configured on the Task Manager as regional rules, rather than  
conveyed in the transactions to vary order by order. For example, the Task Manager might  
maintain a list for each requesting facility which identifies which other facilities are permitted to  
see or claim workitems created by from that requesting facility. Similarly, lists of credentialed  
readers could be used to populate the Scheduled Human Performers Sequence. Of course, Task  
Requesters might also manage their own lists and simply create workitems with such details  
already populated.

500 Over-filtering can apply to filtered notifications as well as query responses.

#### **X.4.1.7 Workflow vs Data Flow**

505 This profile is focused on the workflow layer; i.e., how a system submits a request for a task to  
be done, how a performer finds/accepts/claims such a request and learns the details of the task,  
how the requester and interested observers are notified of completion and learn the details such  
as how to get the results.

510 The dataflow layer refers to how the input data and output data associated with the task are  
moved around. The UPS task object lists inputs and outputs and the corresponding retrieval  
paths, supporting a variety of dataflow mechanisms such as XDS, DICOMweb, etc. The Profile  
includes named options to allow actors to document which mechanisms they support, but the  
profile is otherwise agnostic. A Task Requester might specify multiple retrieval paths, allowing  
potential Task Performers to choose which they prefer. Correspondingly, Task Performers might  
examine the retrieval paths in a given task and choose not to claim it if they do not support those  
mechanisms or have access to those data sources.

#### **X.4.1.8 Assigned vs Claimed**

515 A workitem is assigned by setting the Scheduled Station Name Code Sequence (0040,4025) to  
identify the system that is the Task Performer Actor intended to handle performance of the task.  
At this point the state of the workitem is SCHEDULED and the Task Performer has not actually  
agreed to accept the assignment until it claims the workitem. Until a workitem is claimed, it may  
be reassigned.

520 The Profile permits a variety of systems (Task Requester, Task Manager, Watcher) to assign a  
workitem (see "Assign Workitem to Task Performer" in X.4.2.2.1), however only the Task  
Performer may Claim the workitem. In the Open Worklist case, the workitem is not assigned  
prior to being claimed.

525 The Task Performer claims the workitem to accept and take control of the associated task. When  
the workitem is claimed, the state of the workitem is changed to IN PROGRESS, however no

actual progress is recorded in the UPS Progress Information module yet. When actual work on the task begins, the progress fields of the workitem can be updated to make this visible to the Task Requester, Task Manager and Watchers.

#### **X.4.1.9 Local vs Community IDs**

530 <<Add discussion of local vs community IDs for patient, accession, etc. and mechanisms such as PIX for resolving, and the use of Issuer of XXX tags that tell you the name space of the numbers. Also consider discussion of shared codesets for procedure codes, etc.>>

#### **X.4.1.10 Additional Outputs**

535 <<Describe the "Overachieving" Performer who produces KIN, CPI, Secondary Capture objects etc. These should be stored in an accessible place and listed in the output information sequence of the workitem. This can be described as additional groupings with appropriate actors. Really it's an expanded data access layer. Because then the Task Requester really ought to be retrieving those extra things too.  
540 (Chris text says " 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.">>

#### **X.4.1.11 Single Read Request vs Multiple Read Request**

There are several scenarios where a Task Requester might want the same study to be read by more than one person. It is important to recognize, however, that the Task Requester may need some important constraints met which distinguish these scenarios:

- 545
- Whether the readers can be at the same facility
  - Whether either reader is aware that the study will be read by someone else
  - Whether the second reader knows who the first reader was
  - Whether the second reader has access to the first readers report

Creating two reading requests for the same study is technically easy.

550 Meeting some of these constraints may be challenging in an environment where the clinical records of the patient are made conveniently available for to the radiologist reading their case.

Assigning two reads simultaneously in different facilities may help cases where one read should not influence the other, but it doesn't guarantee it.

555 It should also be noted that the Task Requester will end up with two Image Reports, one associated with each of two reading tasks. How the Task Requester site deals with the two reports depends on the reason two reads were requested and on the local policies and workflows of the site, and as such are out of scope for this Profile.

#### **Consult Read Request (Sequential)**

- 560 A reading radiologist wants to consult a colleague about a difficult case. Similarly, a referring physician wants to seek out a second opinion or consult a specialist after getting the initial radiology report. In these cases:
- The reads are inherently done sequentially.
  - It is typically not relevant whether or not the second reader is at the same facility.
  - The second reader will know they are reading a previously read case and will likely have access to the original report (listed in the input data or available through the medical record) which in turn identifies the original reader.
  - The reader might be specifically assigned in the second request; otherwise care must be taken so it does not end up on back on the worklist of the original reader which would defeat the purpose.
  - 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.

**QA Read Request (Peer Review) - Sequential, Mammography - Parallel)**

- 575 A site may wish to use this remote reading system to request peer review of some number of cases. In these cases:
- The reads are inherently done sequentially.
  - The original reader is likely aware that this given study might be read by someone else. The second reader may or may not know that the study was read previously.
  - The second reader should likely not know who the first reader was.
  - The second reader may (unblinded) or may not (blinded) have access to the first readers report.
  - The second reader might be at the same facility, although requiring the read to be done at a different facility might make it easier to achieve independence.
  - The reader might be specifically assigned in the second request; otherwise care must be taken so it does not end up on back on the worklist of the original reader which would defeat the purpose.
  - The second reader might be presented with the original readers report at the end and 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.

590 It is possible for the Task Requester to drive many of these constraints directly by setting certain details in the two workitems it creates. For example, the Task Requester or a business logic layer above the Task Requester can decide the second read request should specifically assign a different facility; if the Task Requester wishes the second read to be blinded, it can omit the

**Comment [OK9]:** Kinson: I could see an argument for doing "remote peer review" as a separate profile in its own right.

**Comment [K10R9]:** Sure. This profile provides the baseline mechanism to communicate a read task and the subsequent results. How the task(s) should be created are only in the informative text. I can see another profile that is the orchestration layer that has a declarative orchestration language to drive the workflow.

**Comment [OK11]:** Martin: I cannot imagine this happening unless it is part of a peer review process which is a whole other process which requires different pathways which have not yet been standardized  
Chris: Will keep needed for other use cases such as Mammography

**Comment [OK12]:** Should we Profile a specific UPS parameter or reading code that the Task Requester could put in the second workitem to communicate to the Performer Actor that this is a blinded overread. We could also require specific behaviors on the Performer or Task Manager in response to the flag.  
Or, as Kinson wonders, should we defer Peer Review to a future option or profile?

**Comment [K13R12]:** I think this is where the generic tag like the workitem label can come in handy as long as there are defined well known values within the community that shared work.

595 original report and omit links to the patient record; to fully obscure the source of the study, copies of the images could be generated that have been anonymized or pseudonymized. Somewhat similar to Peer Review, an imaging facility might simultaneously post two requests for reads on the same acquired image study. This is often done in Mammography for purposes of quality assurance.

**Comment [OK14]:** David - suggest a "gap analysis" against the Mammo remote read white paper that the Italians produced, to make sure that everything they required is covered

#### 600 X.4.1.12 Addendums

Periodically a reader may wish to add an addendum to a reading task.

If the original workitem has not yet been set to COMPLETED (for example because it is still pending finalization of the draft report), it is fairly simple for the additional report to be listed in the Output Information Sequence.

605 If the original workitem has already been COMPLETED, it is no longer permitted to update it and the Task Requester has already been notified that the reading task is complete. One approach would be for the Task Performer to create, populate and complete a new reading workitem for the study which references the new report and subscribe the original Task Requester to the new workitem so the Task Manager will notify the Task Requester of the new work.

**Comment [OK15]:** Should we suggest a procedure code for "Add Addendum"

#### 610 X.4.2 Use Cases

##### X.4.2.1 Use Case #1: Open Worklist

Reading tasks are submitted by a Task Requester to a community worklist to be claimed and performed by any available Task Performer.

**Comment [OK16]:** Somewhat hokey options:

Get the Performer to somehow trigger an additional notification about the "Completed" workitem from the Task Manager to the Task Requester without updating the State. The understanding would be that the Performer stores the addendum in the same place as the original report and the Task Requester knows to look for something new there.

##### X.4.2.1.1 Open Worklist Use Case Description

615 A group of imaging facilities (hospitals, imaging centers, etc.) have established a community business agreement to allow radiology studies acquired at one facility to be read remotely. A data sharing infrastructure is in place and a community worklist has been established where Task Requesters can submit reading tasks.

620 An imaging facility initiates the workflow when they have a study they need read. A Task Requester creates a read task request with details described in X.4.1.1 and puts in on the worklist.

Task Performers in the community query the worklist periodically for reading tasks they are capable of fulfilling. Alternatively the performer may set up a "filtered subscription" to be notified when reading tasks matching certain criteria are created.

625 The Task Performer claims workitems, retrieves the images referenced in the workitem, and produces a report which is stored back into the community data sharing infrastructure.

The Task Manager notifies the Task Requester when the task is complete so the Task Requester can retrieve the relevant report. Billing is out of scope of this profile.

Examples of situations where an open worklist might be used include:

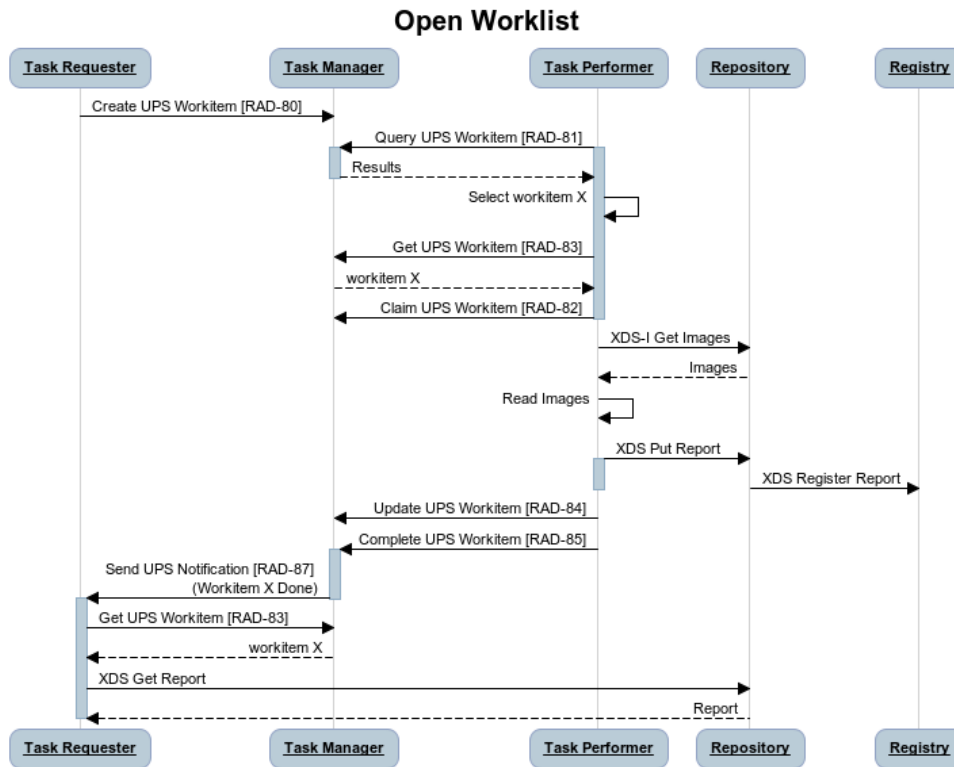
- 630
- Afterhours ("Nighthawk") reading where an Imaging Facility does not have credentialed Radiologists to read studies after hours
  - Specialty reading where a small Imaging Facility may have staff to perform SPECT scans but does not have an NM Physician on staff to interpret the images

635 The diagram shows data access (retrieval of the images to be read, and storage and retrieval of the resulting report) based on the XDS Option (See X.2.1). The use case could be similarly performed based on the DICOMweb Option (See X.2.2) or the DICOM Option (See X.2.3).

640 The profile requires that the Task Requester must be capable of retrieving the report and the diagram shows the Task Requester doing so. Whether the Task Requester actually retrieves any given report and what the Task Requester does with the report if it does retrieve it is beyond the scope of the Profile.

#### **X.4.2.1.2 Open Worklist Process Flow**

645 The details used to create the UPS workitem include a list of the images to be read and how they can be retrieved. How the images got there is out of scope of this Profile and is not shown in the diagram. For example, the images may have been uploaded to a community repository as standard procedure upon completion of acquisition.



**Figure X.4.2.1-1: Open Worklist Process Flow in RRR-WF Profile**

650 The text in Figure X.4.2.1-2 was used to generate the diagram in Figure X.4.2.1-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.



```
title Open Worklist
Task Requester->Task Manager: Create UPS Workitem [RAD-80]
Task Performer->Task Manager: Query UPS Workitem [RAD-81]
Activate Task Performer
Activate Task Manager
Task Manager-->Task Performer: Results
Deactivate Task Manager
Task Performer->Task Performer: Select workitem X
Task Performer->Task Manager: Get UPS Workitem [RAD-83]
Task Manager->Task Performer: workitem X
Task Performer->Task Manager: Claim UPS Workitem [RAD-82]
Deactivate Task Performer
Task Performer->Repository: XDS-I Get Images
Repository-->Task Performer: Images
Task Performer->Task Performer: Read Images
Task Performer->Repository: XDS Put Report
Activate Task Performer
Repository->Registry: XDS Register Report
Deactivate Task Performer
Task Performer->Task Manager: Update UPS Workitem [RAD-84]
Task Performer->Task Manager: Complete UPS Workitem [RAD-85]
Activate Task Manager
Task Manager->Task Requester: Send UPS Notification [RAD-87] \n (Workitem X Done)
Deactivate Task Manager
Activate Task Requester
Task Requester->Task Manager: Get UPS Workitem [RAD-83]
Task Manager->Task Requester: workitem X
Task Requester->Repository: XDS Get Report
Repository-->Task Requester: Report
Deactivate Task Requester
```

**Figure X.4.2.1-2: Diagram Pseudocode for Open Worklist Process Flow**

#### **X.4.2.2 Use Case #2: Assigned Read**

655 Reading tasks submitted by a Task Requester are assigned to a specific Task Performer.

##### **X.4.2.2.1 Assigned Read Use Case Description**

660 In one variation of this use case the assigned Task Performer is determined by the Task Requester. In a second variation, the assigned Task Performer is determined by the Task Manager. In a third variation, a privileged Watcher is notified of new reading tasks and updates them with assigned Task Performers. In all cases, the created workitem exists and is managed on the Task Manager. The only difference is which system sets the value of the Scheduled Performer to be the assigned system.

The business logic used to decide on a Task Performer, the data on which that decision is made, and how that data is obtained are all outside the scope of this Profile.

665 The Profile defines how the assignment is recorded, how the assigned Task Performer is informed of the assignment and how the assigning system can monitor the progress (or lack thereof) of the assigned reading task.

Examples of situations where an assigned read might occur include:

- 670 • The Task Manager might assign reads to different Task Performers across a community to balance the reading load across the available resources
- The Task Requester might assign a read to a specific Task Performer with whom they are familiar or have a business relationship
- The Task Requester might assign a read to a specific Task Performer who is known to have a particular skill set or credential relevant to the study being read.

675 The assigned performer does not become the performing system until it accepts the assignment by claiming the workitem. See X.4.2.3 Re-assignment, Cancellation and Failures for further details.

**Example:**

680 Northern Community Hospital (NCH) has an attending physician overseeing imaging procedures performed by a qualified Radiographer but after 5:00PM does not have a credentialed Radiologist to perform the read.

Capital Health Alliance (CHA) is a community Health Information Exchange that allows members to share image studies and to share reading workload. As infrastructure it has set up an XDS Registry, XDS-I Repository and RRR-WF Task Manager.

685 NCH is a member of CHA and has a business agreement with CHA to share clinical images and reading workload.

Greater City Hospital (GCH) has a Reading Facility with credentialed Radiologists. It is a member of the CHA Health Information Exchange, participates in the image sharing services and has a business agreement to provide, pending staff availability, reading services.

690 **Create Workitem for Read Request:**

After the afterhours scan is completed and the images published and registered via the XDS-I Imaging Document Source (not shown), the Task Requester at NCH creates a workitem on the Task Manager with the relevant clinical information and references to the published images.

695 **Assign Workitem to Task Performer:**

Rather than leave the workitem open for the first available resource, CHA has chosen to assign reading workitems to specific performers, in this example GCH. It is assigned by updating the workitem to list the GCH Task Performer as the scheduled performer. The Task Manager then sends a notification to the GCH Task Performer alerting it to the assignment.

700 In this example, the logic to assign workitems was implemented as an additional feature of the Task Manager system. Alternatively, logic at the Task Requester could have created the

705 task with the scheduled performer specified. The third alternative would be to implement the logic in a Watcher with a global subscription; it is notified of new workitems which it inspects and updates the scheduled performer field, triggering the Task Manager to notify the assigned Task Performer.

**Claim Workitem:**

710 GCH's Task Performer retrieves the workitem identified in the notification from the CHA Task Manager. Internally, it confirms that credentialed Radiology staff is available to perform the read, and that it recognizes the referenced XDS-I Repository where the images are stored. The Task Performer then formally claims the workitem, taking control of the task. Upon successfully claiming the task, GCH's Task Performer might proxy (not shown) the read into local systems. For example, it could move copies of the images from XDS-I into the local PACS, creating a local patient ID and accession number, and create a workitem in the local reading worklist, at which point the reading process is managed as if the study was  
715 acquired locally. See X.4.1.4 for additional discussion.  
If the Task Performer did not claim the task (because it was offline or too busy) the task would need to be reassigned. See X.4.2.3.

**Update Workitem:**

720 Using the Reading Facility's normal workflow processes, the Radiologist performs the read. The GCH Task Performer may update the workitem with the name of the Radiologist and progress note that the Radiologist has begun reviewing the study, or may wait until the work is finished.  
The Radiologist creates the report which is stored and registered into the community XDS Repository operated by CHA. The GCH Task Performer system updates the workitem with  
725 the reference to report instance in the XDS Repository.

**Complete Workitem:**

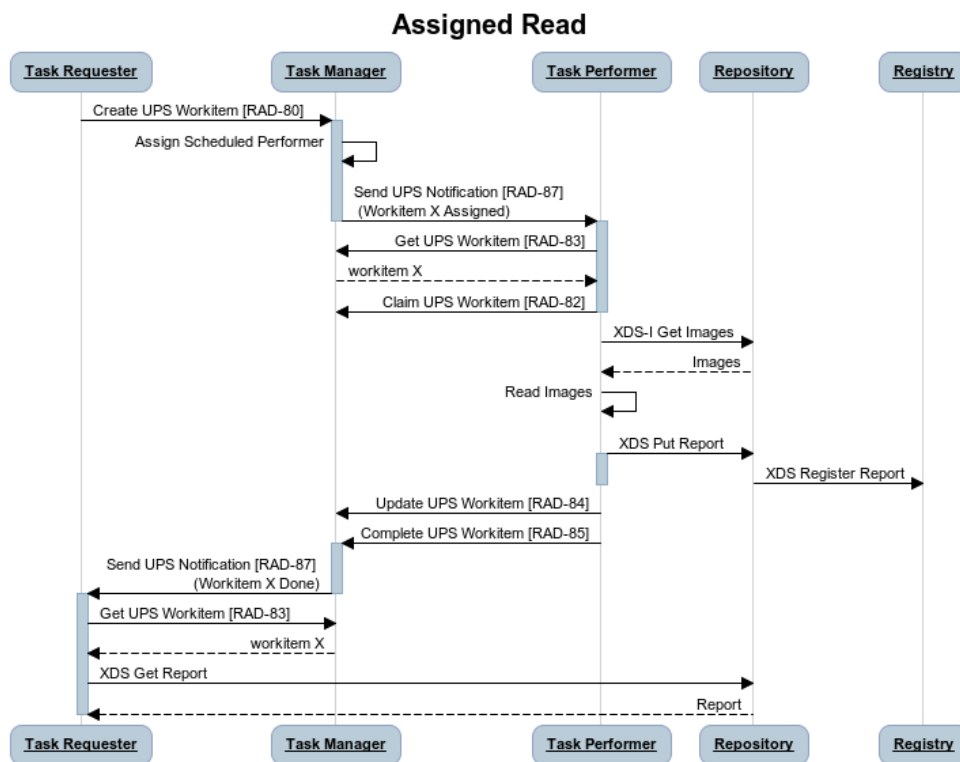
730 The GCH Task Performer sets the workitem to the Completed state which triggers a notification to the NCH Task Requester that a specific workitem is complete. NCH's Task Requester gets the workitem to find the path to the report. Depending on the local infrastructure, the Task Requester may notify the referring physician to access the report directly from the XDS Repository, or the Task Requester may proxy (not shown) by importing the report into the local RIS/PACS. It may include the business transactions to reimburse the Reading Facility for services rendered.

735 Although omitted from this use case for simplicity, the Task Requester can receive notifications as the status and contents of the workitem change as it proceeds through the process. The Task Requester might get the contents of the workitem to inform local users of details like which facility is performing the read, when it was claimed and when (based on the service agreement) the report can be expected.

**X.4.2.2.2 Assigned Read Process Flow**

740 Setting the assigned performer in the workitem may be done by the Task Requester when creating the workitem, or may be done by the Task Manager when the workitem is created.

745 The main Process Flow difference from the Open Worklist Use Case is that the Get UPS Workitem transaction by the Task Performer is triggered by the reception of the Send UPS Notification transaction, rather than by selection from the results of the Query UPS Workitems transaction. All the subsequent Process Flow is the same.



**Figure X.4.2.2-1: Assigned Read Process Flow in RRR-WF Profile**

750 The text in Figure X.4.2.2-2 was used to generate the diagram in Figure X.4.2.2-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.

```
title Assigned Read
Task Requester->Task Manager: Create UPS Workitem [RAD-80]
Activate Task Manager
Task Manager->Task Manager: Assign Scheduled Performer
Task Manager->Task Performer: Send UPS Notification [RAD-87] \n (Workitem X Assigned)
Deactivate Task Manager
Activate Task Performer
Task Performer->Task Manager: Get UPS Workitem [RAD-83]
Task Manager->Task Performer: workitem X
Task Performer->Task Manager: Claim UPS Workitem [RAD-82]
Deactivate Task Performer
Task Performer->Repository: XDS-I Get Images
Repository->Task Performer: Images
Task Performer->Task Performer: Read Images
Task Performer->Repository: XDS Put Report
Activate Task Performer
Repository->Registry: XDS Register Report
Deactivate Task Performer
Task Performer->Task Manager: Update UPS Workitem [RAD-84]
Task Performer->Task Manager: Complete UPS Workitem [RAD-85]
Activate Task Manager
Task Manager->Task Requester: Send UPS Notification [RAD-87] \n (Workitem X Done)
Deactivate Task Manager
Activate Task Requester
Task Requester->Task Manager: Get UPS Workitem [RAD-83]
Task Manager->Task Requester: workitem X
Task Requester->Repository: XDS Get Report
Repository->Task Requester: Report
Deactivate Task Requester
```

**Figure X.4.2.2-2: Diagram Pseudocode for Assigned Read Process Flow**

755 One can imagine the process flow in Figure X.4.2.2-1 repeating a second time with the same requester, same images, same manager, but assigning a different performer to carry out one of the over-read scenarios described in X.4.1.11.

### **X.4.2.3 Use Case #3: Re-assignment, Cancelation and Failures**

#### **Reassignment**

A task may need to be re-assigned for various reasons. If the workitem has not been claimed, the Task Manager or Task Requester can change the assigned system.

760 For example, the workitem may have been assigned but the Task Performer has not claimed it for some time. Observing the time passed without notification of the task being claimed, a timeout might trigger the original assigner to re-assign the task by changing the scheduled performer.

765 An assigned Task Performer that is unable to accept the assignment (e.g., because the necessary staff is not available or their local workload is too high, or they have lost connection to the data sharing infrastructure) can help by communicating that it has no intention of claiming the assigned task. Doing so in a timely fashion will help get the task reassigned more quickly than if

the Task Performer did nothing and the task languished until a timeout was reached. Such unnecessarily long turnaround times are to be avoided.

770 *Q. Does the Task Performer do this by requesting cancellation with the Reason set to "unable to accept assignment because ...", or should it be more direct and Claim the workitem and cancel it, forcing the Task Requester to create a new request?*

#### **Cancellation**

775 A task may also be cancelled for various reasons. For example, local staff might arrive just after the read request was sent out for a Nighthawk read, or the patient might expire (although many sites will still want the read for the post-mortem evaluation), or the request might have been placed by mistake, or the site might find itself unable to make the input images available.

780 A Task Requester can request cancellation using the Request UPS Cancellation [RAD-88] transaction. If the task is unclaimed, it is simply moved to the cancelled state by the Task Manager. If, however, a Task Performer has already claimed it, the Task Manager can only notify the Task Performer of the cancel request. The cancellation request notification can contain useful details like the reason and contact information of the cancel requester so the performer can communicate with them if that would help.

785 Similarly, once the task is in progress, the Task Performer may have populated the workitem with the contact details of the person doing the work, so the Task Requester might also be able to call them directly.

If the Task Performer does choose to actually cancel the task, Task Requesters and Watchers that are subscribed will be notified of the cancellation.

#### **Failure**

790 A related situation is when the Task Performer finds itself unable to successfully complete a task. In this case, the Task Performer changes the workitem state to CANCELED without an external request. Otherwise the notification message flow is similar.

At their discretion, and if they are able to resolve the cause of the original failure, the Task Requester, Task Manager or Watchers might choose to create a replacement task.

#### 795 **X.4.2.3.1 Use Case Description**

#### **X.4.2.3.2 Process Flow**

### **X.5 RRR-WF Security Considerations**

800 *<Describe Profile-specific security considerations. This should include the outcomes of a risk assessment. This likely will include profile groupings, and residual risks that need to be assigned to the product design, system administration, or policy. See the ITI document titled 'Cookbook: Preparing the IHE Profile Security Section' at [http://ihe.net/Technical\\_Frameworks/](http://ihe.net/Technical_Frameworks/) for suggestions on risk assessment, risk mitigation, and IT and security profiles.>*

## **X.6 RRR-WF Cross Profile Considerations**

### **XDS-I.b – Cross-Enterprise Document Sharing for Imaging**

805 The most relevant XDS-I.b Actor groupings are discussed in X.2.1 XDS Option.

### **XDS.b – Cross-Enterprise Document Sharing**

The most relevant XDS.b Actor groupings are discussed in X.2.1 XDS Option.

### **MHD-I – Mobile Health Documents for Imaging**

The most relevant MHD-I Actor groupings are discussed in X.2.2 DICOMweb Option.

810 **WIC – Web Image Capture**

The most relevant WIC Actor groupings are discussed in X.2.2 DICOMweb Option.

### **XCA-I – Cross-Community Access for Imaging**

An Imaging Document Consumer in XCA-I might be grouped with a Task Performer to be able to accept reading tasks that involve the retrieval of images located in another affinity domain.

815 **XCDR – Cross-Community Document Reliable Interchange**

The Requesting organization might use XCDR to push data to a server local to the Performer(s) and then reference them in the Input list.

### **PDI – Portable Data for Imaging**

820 A Portable Media Importer in PDI might be grouped with a Task Requester to submit a read request for the imported images on the media (CD, DVD, etc.).

### **IUA – Internet User Authorization**

An Authorization Client in IUA might be grouped with a Task Manager to authorize users that are querying for reading workitems and might filter the query results based on what the user is authorized to see.

825 **PIX – Patient Identifier Cross-Referencing**

A PIX Consumer in PIX might be grouped with a Task Requester to obtain alternate patient IDs to include in requested reading workitems.

### **MRRT – Management of Radiology Report Templates**

830 A Report Creator in MRRT might be grouped with a Task Performer so the report template a Task Requester has referenced in the workitem can be retrieved and used to generate the report for the reading task.

### **XDW – Cross-Enterprise Document Workflow**

835 An XDW Content Creator in XDW might be grouped with a Task Manager or a Watcher to record details of a completed reading task in a persistent workflow document in the patient's record.

Alternatively, the Task Manager or a Watcher could record details from each reading task internally to perform analytics on performance, study mix, turnaround times, compliance with SLAs, etc.

#### **HPD – Healthcare Provider Directory**

840 A Provider Information Consumer in HPD might be grouped with a Task Manager or Task Requester to access provider information associated with different Task Performers (such as credentials, specialties, etc.) that may guide task assignment decisions by the Task Manager or Task Requester. For further discussion, see X.4.1.6 Over-Filtering.

845 **HPD Discussion** *<the rest of this material should either be properly worked into the profile or removed>*

Implementation of the Healthcare Provider Directory Profile can provide a variety of details useful to remote reporting workflow.

850 HPD Table 3.58.4.1.2.2.3-1: Organizational Provider Mapping has Names, IDs (including NPI), Specialties (Cardiology, Radiology, Neuroradiology, etc.), Credentials, Sub-organizations (e.g., departments linked as other Organizational Providers), Relationship Groups (links this OP to other OPs or IPs), Certificates, Electronic Service URI (which then lists other access points). The specialties codes can be drawn from ISO 21298 or defined locally.

855 HPD Table 3.58.4.1.2.2.2-1: Individual Provider Mapping has Names, IDs (including NPI), Specialties (Cardiology, Radiology, Neuroradiology, etc.), Credentials, Relationship Groups (links this IP to OPs), Certificates, Electronic Service URI (which then lists other access points)

When a departmental Organizational Provider is a member of another Organizational Provider, such as a hospital it is controlled by the Organizational Provider Type.

IDs have Issuing Authority:Type:ID:Status per ISO 21091

HPD Table 3.58.4.1.2.2.1-2 describes HPDProviderCredential Mandatory Attributes.

860 Credentials have Credential UID (w issuing authority), name of credential, issue date, valid dates.

It is intended that the information comes from State licensing bureaus, National Associations, Commercial registries, Delivery Networks, Information Exchanges, etc. Parent organizations can credential their individuals.

865 HPD Table 3.58.4.1.2.2.1-6 describes HPDElectronicService Mandatory Attributes

ElectronicService can have strings that identify which Integration Profile it is expecting transactions from, or which Content Profile it is expecting payloads formatted as.

870 Task Requesters, Task Performers and Watchers initiate all communications (except for notifications but those occur on a channel they initiated) so they need no public endpoints. It would be good to list the Task Manager in the HPD registry as a service that is a member of the community (organization) that coordinates the remote reading service.



**How does the Task Manager correlate a Performers AE-Title and Provider Details?**

When a Performer initially does RAD-Y1 Open Event Channel, it provides its AE-Title.

875 If the AE-Title is one of the identifiers for a Provider in the HPD, the Task Manager could use that to query and get the NPI, Specialty, Credentials, and HTTP Endpoint for the Performer.

But this really means AE-Titles ought to be managed across the community.

880 The scope of the Provider that contains this could be the ExternalRadiologyReadingGroup which is a member of the Radiology Department, or the Hospital as a whole. Alternatively such mapping could be a configuration task on the Task Manager. Or should AE-TITLE be formatted as a URI and put in the Electronic Service URIs slot? Or should AE-Title be in a new specific or general field added to the HPDElectronicService structure.

Or should we use a system URI or OID?

885 Alternatively, is there something in the Secure Node TLS establishment we could use, like the certificate? Is it likely that the libraries handling the Secure Node can pass out such details as the certificate? ATNA may say you shouldn't verify with the hostname.

## Appendices

### Appendix A – UPS-RS Examples for Remote Reading (Informative)

890 IMPORTANT: In the examples below, the comments (lines starting with #) are for clarification purposes only. Comments are not allowed in JSON.

In the examples, it is assumed that the worklist is service being hosted at radiology.hospital.com

Some elements below are not set in the example but are still required to be present in the message. These are shown in grey to make it easier to focus on the interesting elements in black.

#### 895 A.1 CreateUPS

The Task Requester requests creation of a UPS instance for a reading task

```
900 POST https://radiology.hospital.com/ups-rs/workitems?2.25.1.2.3.4 HTTP/1.1
Content-type: application/json

[
  {
    # Transaction UID - Set later when task is claimed
    "00081195": {
      "vr": "UI",
    905     "Value": [
        {}
      ]
    },
    # Scheduled Procedure Step Priority
    910     "00741200": {
        "vr": "CS",
        "Value": [
          "MEDIUM"
        ]
      },
    915     # Scheduled Procedure Step Modification Date and Time - Set by Server
        "00404010": {
          "vr": "DT",
    920     "Value": [
        {}
      ]
    },
    # Procedure Step Label
    925     "00741204": {
        "vr": "LO",
        "Value": [
          "Cardiac SPECT Read Request"
        ]
      ]
  }
]
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow  
(RRR-WF)

---

```
930     },
        # Worklist Label - Left blank unless community has organized subworklists
        "00741202": {
            "vr": "LO",
            "Value": [
935         ]
        },
        # Scheduled Processing Parameters Sequence
        "00741210": {
940     "vr": "SQ",
            "Value": [
                {}
            ]
        },
        # The following elements can be used to assign a task to a specific
945     # station, location or person
        # Scheduled Station Name Code Sequence
        "00404025": {
950     "vr": "SQ",
            "Value": [
                {}
            ]
        },
        # Scheduled Station Class Code Sequence
955     "00404026": {
            "vr": "SQ",
            "Value": [
                {}
            ]
        },
960     # Scheduled Station Geographic Location Code Sequence
        "00404027": {
            "vr": "SQ",
            "Value": [
965         {
                # Code Value
                "00080100": {
                    "VR": "SH",
                    "Value": [
970             "12345"
                    ]
                },
                # Coding Scheme Designator
                "00080102": {
975     "VR": "SH",
                    "Value": [
                        "RadReadingGroup"
                    ]
                },
                # Code Meaning
980     "00080104": {
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow  
(RRR-WF)

---

```

    "vr": "LO",
    "Value": [
      "Specialty Hospital"
    ]
  }
}
],
# Scheduled Human Performers Sequence
990 "00404034": {
    "vr": "SQ",
    "Value": [
      {}
    ]
  },
995 # Scheduled Procedure Step Start Date and Time - Earliest schedulable
"00404005": {
    "vr": "DT",
    "Value": [
1000     "20150623082200.000000+0500"
    ]
  },
# Expected Completion Date and Time
1005 "00404011": {
    "vr": "DT",
    "Value": [
      "20150623150000.000000+0500"
    ]
  },
1010 # Scheduled Workitem Code Sequence
# This code is general. Communities can coordinate a more specific set of
# codes, e.g., Cardiac SPECT Interpretation, etc.
"00404018": {
1015   "vr": "SQ",
   "Value": [
     {
       # Code Value
1020       "00080100": {
         "vr": "SH",
         "Value": [
           "110005"
         ]
       },
1025       # Coding Scheme Designator
       "00080102": {
         "vr": "SH",
         "Value": [
           "RadReadingGroup"
         ]
       }
     ],
1030     # Code Meaning
     "00080104": {
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1035         "vr": "LO",
           "Value": [
             "Cardiac SPECT Interpretation"
           ]
         }
       ]
     },
1040     # Comments on Scheduled Procedure Step
     "00400400": {
       "vr": "LT",
1045       "Value": [
         {}
       ]
     },
     # Input Readiness State
1050     "00404041": {
       "vr": "CS",
       "Value": [
         "READY"
       ]
     },
1055     # Input Information Sequence
     "00404021": {
       "vr": "SQ",
       "Value": [
1060         {
           # Type of Instances
           "0040E020": {
             "vr": "CS",
             "Value": [
1065               "DICOM"
             ]
           },
           # Study Instance UID
           "0020000D": {
             "vr": "UI",
             "Value": [
1070               "2.25.1.35.0.9.28"
             ]
           },
           # Series Instance UID
           # Each Series goes in a separate item in the Input Info Seq.
1075           "0020000E": {
             "vr": "UI",
             "Value": [
               "2.25.1.35.0.9.28.1"
1080             ]
           },
           # Referenced SOP Sequence
           # This sequence contains an item for each instance in the series
           "00081199": {
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1085     "VR": "SQ",
        "Value": [
          # Referenced SOP Class UID
1090     "00081150": {
          "VR": "UI",
          "Value": [
            "1.2.840.10008.5.1.4.1.1.1"
          ]
        },
1095     # Referenced SOP Instance UID
        "00081155": {
          "VR": "UI",
          "Value": [
            "2.25.1.1.35.0.9.28.1.1"
          ]
        }
1100   ]
},
# XDS Retrieval Sequence
1105 "0040E024": {
  "VR": "SQ",
  "Value": [
    {
      # Repository Unique ID
1110     "0040E030": {
      "VR": "UI",
      "Value": [
        "2.25.99.88.77.66"
      ]
    },
1115     # Home Community ID
        "0040E031": {
          "VR": "UI",
          "Value": [
            "2.25.1.1.0.9.8.35.6"
          ]
        }
    ]
  }
},
1125 # WADO-RS Retrieval Sequence
# In this case the images are available for retrieval via either
# XDS or WADO-RS so both Retrieval Sequences are included
"0040E025": {
  "VR": "SQ",
1130  "Value": [
    {
      # Retrieve URL
1135     "00081190": {
      "VR": "UR",
      "Value": [
        "https://community.practice.com/studies/2.25.1.35.0.9.28"
      ]
    }
  ]
}
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow  
(RRR-WF)

---

```
1140         ]
1141     }
1142 }
1143 ],
1144 # Patient's Name
1145 "00100010": {
1146     "vr": "PN",
1147     "Value": [
1148         {
1149             "Alphabetic": "Johnson^Mary"
1150         }
1151     ]
1152 },
1153 # Patient ID
1154 "00100020": {
1155     "vr": "LO",
1156     "Value": [
1157         "12345"
1158     ]
1159 },
1160 # Issuer of Patient ID
1161 "00100021": {
1162     "vr": "LO",
1163     "Value": [
1164         "CommunityHospital"
1165     ]
1166 },
1167 # Issuer of Patient ID Qualifiers Sequence
1168 "00100024": {
1169     "vr": "SQ",
1170     "Value": [
1171         {}
1172     ]
1173 },
1174 # Other Patient IDs Sequence
1175 "00101002": {
1176     "vr": "SQ",
1177     "Value": [
1178         {}
1179     ]
1180 },
1181 # Patient's Birth Date
1182 "00100030": {
1183     "vr": "DA",
1184     "Value": [
1185         "19820101"
1186     ]
1187 },
1188 ],
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow  
(RRR-WF)

---

```
1190 # Patient's Sex
      "00100040": {
        "vr": "CS",
        "Value": [
          "F"
1195       ]
      },
      # Admission ID
      "00380010": {
        "vr": "LO",
        "Value": [
1200         {}
        ]
      },
      # Issuer of Admission ID Sequence
      "00380014": {
        "vr": "SQ",
        "Value": [
1205         {}
        ]
      },
      # Admitting Diagnoses Description
      "00081080": {
        "vr": "LO",
        "Value": [
1210         "Chest pain"
1215       ]
      },
      # Admitting Diagnoses Code Sequence
      # Can be used to convey ICD-10 codes, etc.
      "00081084": {
        "vr": "SQ",
        "Value": [
1220         {}
        ]
      },
      # Referenced Request Sequence
      # Can be used to convey Accession Number, other order numbers, the
      # requested imaging procedure and reason for request, intended recipients
      # of results, referring physician, time the original order was placed,
1225      "0040A370": {
        "vr": "SQ",
        "Value": [
1230         {}
        ]
      },
      # Procedure Step State
      "00741000": {
        "vr": "CS",
        "Value": [
1235         "SCHEDULED"
1240       ]
      }
```



```
1245     },  
        # Progress Information Sequence  
        # Performer can update later with details about intermediate progress  
        # and how to contact the performer  
        "00741002": {  
            "vr": "SQ",  
            "Value": [  
                {}  
            ]  
        },  
        # Unified Procedure Step Performed Procedure Sequence  
        # This will be updated later with results  
        "00741216": {  
            "vr": "SQ",  
            "Value": [  
                {}  
            ]  
        }  
    ]  
}
```

The Task Manager responds

```
HTTP/1.1 201 Created  
Content-Location: https://radiology.hospital.com/ups-rs/workitems/11.22.33.44
```

1265

## A.2 SearchForUPS

There are many useful queries that could be performed based on the type of read, the urgency, the expected completion time, etc.

The Task Performer could query for reading tasks of a specific type (e.g., Cardiac SPECT Interpretation)

1270

```
GET https://radiology.hospital.com/ups-rs/workitems?ScheduledWorkitemCodeSequence.CodeValue=110005&ScheduledWorkitemCodeSequence.CodingSchemeDesignator=RadReadingGroup&includeField=all&limit=10  
HTTP/1.1  
Accept: application/json  
Cache-control: no-cache
```

1275

The Task Performer could also query for reading tasks for a specific patient

```
GET https://radiology.hospital.com/ups-rs/workitems?PatientID=12345&IssuerOfPatientID=CommunityHospital&includeField=all&limit=10  
HTTP/1.1  
Accept: application/json
```

1280

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

Cache-control: no-cache

The Task Manager responds

```
1285 HTTP/1.1 200 OK
Content-Type: application/json
[
  {
    # SOP Class UID
1290     "00080016": {
        "vr": "UI",
        "Value": [
1295           "1.2.840.10008.5.1.4.34.6.1"
        ]
    },
    # SOP Instance UID
1300     "00080018": {
        "vr": "UI",
        "Value": [
            "2.25.1.2.3.4"
        ]
    },
    # Scheduled Procedure Step Priority
1305     "00741200": {
        "vr": "CS",
        "Value": [
            "MEDIUM"
        ]
    },
    # Scheduled Procedure Step Modification Date and Time
1310     "00404010": {
        "vr": "DT",
        "Value": [
1315           "20150623082300.000000+0500"
        ]
    },
    # Procedure Step Label
1320     "00741204": {
        "vr": "LO",
        "Value": [
            "Cardiac SPECT Read Request"
        ]
    },
    # Worklist Label
1325     "00741202": {
        "vr": "LO",
        "Value": [
            {}
        ]
    },
1330     },
  ],
],
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1335 # Scheduled Processing Parameter Sequence
    "00741210": {
      "vr": "SQ",
      "Value": [
        {}
      ]
    },
1340 # Scheduled Station Name Code Sequence
    "00404025": {
      "vr": "SQ",
      "Value": [
        {}
      ]
    },
1345 # Scheduled Station Class Code Sequence
    "00404026": {
      "vr": "SQ",
      "Value": [
        {}
      ]
    },
1350 # Scheduled Station Geographic Location Code Sequence
    "00404027": {
      "vr": "SQ",
      "Value": [
        {
          # Code Value
          "00080100": {
            "VR": "SH",
            "Value": [
              "12345"
            ]
          },
          # Coding Scheme Designator
          "00080102": {
            "VR": "SH",
            "Value": [
              "RadReadingGroup"
            ]
          },
          # Code Meaning
          "00080104": {
            "VR": "LO",
            "Value": [
              "Specialty Hospital"
            ]
          }
        ]
      ]
    },
1380 # Scheduled Human Performers Sequence
    "00404034": {
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1385     "vr": "SQ",
        "Value": [
            {}
        ]
    },
    # Scheduled Procedure Step Start Date and Time
1390    "00404005": {
        "vr": "DT",
        "Value": [
            "20150623082200.000000+0500"
        ]
    },
1395    # Expected Completion Date and Time
    "00404011": {
        "vr": "DT",
        "Value": [
            "20150623150000.000000+0500"
        ]
1400    },
    # Scheduled Workitem Code Sequence
    "00404018": {
1405        "vr": "SQ",
        "Value": [
            {
                # Code Value
                "00080100": {
1410                    "vr": "SH",
                    "Value": [
                        "110005"
                    ]
                },
                # Coding Scheme Designator
1415                "00080102": {
                    "vr": "SH",
                    "Value": [
                        "RadReadingGroup"
                    ]
                },
1420                # Code Meaning
                "00080104": {
                    "vr": "LO",
                    "Value": [
1425                        "Cardiac SPECT Interpretation"
                    ]
                }
            }
        ]
1430    },
    # Input Readiness State
    "00404041": {
        "vr": "CS",
        "Value": [
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1435     "READY"
1436   ]
1437 },
1438 # Input Information Sequence
1439 "00404021": {
1440   "vr": "SQ",
1441   "Value": [
1442     {
1443       # Type of Instances
1444       "0040E020": {
1445         "VR": "CS",
1446         "Value": [
1447           "DICOM"
1448         ]
1449       },
1450       # Study Instance UID
1451       "0020000D": {
1452         "VR": "UI",
1453         "Value": [
1454           "2.25.1.35.0.9.28"
1455         ]
1456       },
1457       # Series Instance UID
1458       "0020000E": {
1459         "VR": "UI",
1460         "Value": [
1461           "2.25.1.35.0.9.28.1"
1462         ]
1463       },
1464       # Referenced SOP Sequence
1465       "00081199": {
1466         "VR": "SQ",
1467         "Value": [
1468           # Referenced SOP Class UID
1469           "00081150": {
1470             "VR": "UI",
1471             "Value": [
1472               "1.2.840.10008.5.1.4.1.1.1"
1473             ]
1474           },
1475           # Referenced SOP Instance UID
1476           "00081155": {
1477             "VR": "UI",
1478             "Value": [
1479               "2.25.1.35.0.9.28.1.1"
1480             ]
1481           }
1482         ]
1483       }
1484     ],
1485     # XDS Retrieval Sequence
1486     "0040E024": {
1487       "VR": "SQ",
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1490         "Value": [
1495             {
1500                 # Repository Unique ID
1505                 "0040E030": {
1510                     "VR": "UI",
1515                     "Value": [
1520                         "2.25.99.88.77.66"
1525                     ]
1530                 },
1535                 # Home Community ID
1540                 "0040E031": {
1545                     "VR": "UI",
1550                     "Value": [
1555                         "2.25.1.0.9.8.35.6"
1560                     ]
1565                 }
1570             ]
1575         },
1580         # WADO-RS Retrieval Sequence
1585         "0040E025": {
1590             "VR": "SQ",
1595             "Value": [
1600                 {
1605                     # Retrieve URL
1610                     "00081190": {
1615                         "VR": "UR",
1620                         "Value": [
1625                             "https://community.practice.com/studies/2.25.1.35.0.9.28"
1630                         ]
1635                     }
1640                 }
1645             ]
1650         }
1655     ],
1660     # Patient's Name
1665     "00100010": {
1670         "vr": "PN",
1675         "Value": [
1680             {
1685                 "Alphabetic": "Johnson^Mary"
1690             }
1695         ]
1700     },
1705     # Patient ID
1710     "00100020": {
1715         "vr": "LO",
1720         "Value": [
1725             "12345"
1730         ]
1735     }
1740 ]
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow  
(RRR-WF)

---

```
1540     },
        # Issuer of Patient ID
        "00100021": {
            "vr": "LO",
            "Value": [
1545             "CommunityHospital"
            ]
        },
        # Issuer of Patient ID Qualifiers Sequence
        "00100024": {
1550         "vr": "SQ",
            "Value": [
                {}
            ]
        },
        # Other Patient IDs Sequence
1555     "00101002": {
            "vr": "SQ",
            "Value": [
                {}
            ]
        },
1560     },
        # Patient's Birth Date
        "00100030": {
1565         "vr": "DA",
            "Value": [
                "19820101"
            ]
        },
        # Patient's Sex
1570     "00100040": {
            "vr": "CS",
            "Value": [
                "F"
            ]
        },
1575     },
        # Admission ID
        "00380010": {
1580         "vr": "LO",
            "Value": [
                {}
            ]
        },
        # Issuer of Admission ID Sequence
1585     "00380014": {
            "vr": "SQ",
            "Value": [
                {}
            ]
        },
        # Admitting Diagnoses Description
1590     "00081080": {
```

```
1595     "vr": "LO",
        "Value": [
            "Chest pain"
        ]
    },
    # Admitting Diagnoses Code Sequence
    "00081084": {
        "vr": "SQ",
        "Value": [
            {}
        ]
    },
    # Referenced Request Sequence
    "0040A370": {
        "vr": "SQ",
        "Value": [
            {}
        ]
    },
    # Procedure Step State
    "00741000": {
        "vr": "CS",
        "Value": [
            "SCHEDULED"
        ]
    },
    # Progress Information Sequence
    "00741002": {
        "vr": "SQ",
        "Value": [
            {}
        ]
    },
    # Unified Procedure Step Performed Procedure Sequence
    "00741216": {
        "vr": "SQ",
        "Value": [
            {}
        ]
    }
}
]
```

### A.3 RetrieveUPS

1635 The Task Performer requests to retrieve the details of a specific task

```
GET https://radiology.hospital.com/ups-rs/workitems/2.25.1.2.3.4 HTTP/1.1
Accept: application/json
```



IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

Cache-control: no-cache

1640 The Task Manager responds

```
HTTP/1.1 200 OK
Content-Type: application/json
[
  {
    # Scheduled Procedure Step Priority
    "00741200": {
      "vr": "CS",
      "Value": [
        "MEDIUM"
      ]
    },
    # Scheduled Procedure Step Modification Date and Time
    "00404010": {
      "vr": "DT",
      "Value": [
        "20150623082300.000000+0500"
      ]
    },
    # Procedure Step Label
    "00741204": {
      "vr": "LO",
      "Value": [
        "Cardiac SPECT Read Request"
      ]
    },
    # Worklist Label
    "00741202": {
      "vr": "LO",
      "Value": [
        {}
      ]
    },
    # Scheduled Processing Parameter Sequence
    "00741210": {
      "vr": "SQ",
      "Value": [
        {}
      ]
    },
    # Scheduled Station Name Code Sequence
    "00404025": {
      "vr": "SQ",
      "Value": [
        {}
      ]
    }
  ]
},
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1690 # Scheduled Station Class Code Sequence
    "00404026": {
      "vr": "SQ",
      "Value": [
        {}
      ]
    },
1695 # Scheduled Station Geographic Location Code Sequence
    "00404027": {
      "vr": "SQ",
      "Value": [
1700       # Code Value
          "00080100": {
            "VR": "SH",
            "Value": [
              "12345"
            ]
          },
1705       # Coding Scheme Designator
          "00080102": {
            "VR": "SH",
            "Value": [
1710               "RadReadingGroup"
            ]
          },
          # Code Meaning
          "00080104": {
1715             "VR": "LO",
            "Value": [
              "Specialty Hospital"
            ]
          }
1720       ]
    },
    ],
1725 # Scheduled Human Performers Sequence
    "00404034": {
      "vr": "SQ",
      "Value": [
        {}
      ]
    },
1730 # Scheduled Procedure Step Start Date and Time
    "00404005": {
      "vr": "DT",
      "Value": [
1735         "20150623082200.000000+0500"
      ]
    },
    ],
    # Expected Completion Date and Time
    "00404011": {
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1740     "vr": "DT",
        "Value": [
            "20150623150000.000000+0500"
        ]
    },
    # Scheduled Workitem Code Sequence
1745 "00404018": {
        "vr": "SQ",
        "Value": [
            {
1750         # Code Value
            "00080100": {
                "VR": "SH",
                "Value": [
                    "110005"
                ]
            },
1755         # Coding Scheme Designator
            "00080102": {
                "VR": "SH",
                "Value": [
1760                 "RadReadingGroup"
                ]
            },
            # Code Meaning
            "00080104": {
1765         "VR": "LO",
            "Value": [
                "Cardiac SPECT Interpretation"
            ]
        ]
    }
1770 ]
    },
    # Comments on Scheduled Procedure Step
1775 "00400400": {
        "vr": "LT",
        "Value": [
            {}
        ]
    },
1780 # Input Readiness State
    "00404041": {
        "vr": "CS",
        "Value": [
            "READY"
1785 ]
    },
    # Input Information Sequence
1790 "00404021": {
        "vr": "SQ",
        "Value": [
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1795 {
    # Type of Instances
    "0040E020": {
        "VR": "CS",
        "Value": [
            "DICOM"
        ]
    },
1800 # Study Instance UID
    "0020000D": {
        "VR": "UI",
        "Value": [
            "2.25.1.35.0.9.28"
        ]
1805 },
    # Series Instance UID
    "0020000E": {
        "VR": "UI",
        "Value": [
1810             "2.25.1.35.0.9.28.1"
        ]
    },
    # Referenced SOP Sequence
1815 "00081199": {
        "VR": "SQ",
        "Value": [
            # Referenced SOP Class UID
1820             "00081150": {
                "VR": "UI",
                "Value": [
                    "1.2.840.10008.5.1.4.1.1.1"
                ]
            },
            # Referenced SOP Instance UID
1825             "00081155": {
                "VR": "UI",
                "Value": [
                    "2.25.1.35.0.9.28.1.1"
1830             ]
            }
        ]
    },
    # XDS Retrieval Sequence
1835 "0040E024": {
        "VR": "SQ",
        "Value": [
            {
1840             # Repository Unique ID
                "0040E030": {
                    "VR": "UI",
                    "Value": [
                        "2.25.99.88.77.66"
                    ]
                }
            }
        ]
    }
}
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1845         ],
1850         # Home Community ID
1855         "0040E031": {
1860             "VR": "UI",
1865             "Value": [
1870                 "2.25.1.0.9.8.35.6"
1875             ]
1880         }
1885     ],
1890     # WADO-RS Retrieval Sequence
1895     "0040E025": {
1900         "VR": "SQ",
1905         "Value": [
1910             {
1915                 # Retrieve URL
1920                 "00081190": {
1925                     "VR": "UR",
1930                     "Value": [
1935                         "https://community.practice.com/studies/2.25.1.35.0.9.28"
1940                     ]
1945                 }
1950             }
1955         ]
1960     }
1965 ],
1970 },
1975 # Patient's Name
1980 "00100010": {
1985     "vr": "PN",
1990     "Value": [
1995         {
2000             "Alphabetic": "Johnson^Mary"
2005         }
2010     ]
2015 },
2020 # Patient ID
2025 "00100020": {
2030     "vr": "LO",
2035     "Value": [
2040         "12345"
2045     ]
2050 },
2055 # Issuer of Patient ID
2060 "00100021": {
2065     "vr": "LO",
2070     "Value": [
2075         "CommunityHospital"
2080     ]
2085 }
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
1895 },
      # Issuer of Patient ID Qualifiers Sequence
      "00100024": {
1900         "vr": "SQ",
           "Value": [
             {}
           ]
        },
      # Other Patient IDs Sequence
1905      "00101002": {
           "vr": "SQ",
           "Value": [
             {}
           ]
        },
1910      # Patient's Birth Date
      "00100030": {
           "vr": "DA",
           "Value": [
1915             "19820101"
           ]
        },
      # Patient's Sex
1920      "00100040": {
           "vr": "CS",
           "Value": [
             "F"
           ]
        },
1925      # Admission ID
      "00380010": {
           "vr": "LO",
           "Value": [
             {}
           ]
        },
1930      # Issuer of Admission ID Sequence
      "00380014": {
1935         "vr": "SQ",
           "Value": [
             {}
           ]
        },
      # Admitting Diagnoses Description
1940      "00081080": {
           "vr": "LO",
           "Value": [
             "Chest pain"
           ]
        },
1945      # Admitting Diagnoses Code Sequence
      "00081084": {
```

```
1950     "vr": "SQ",
        "Value": [
          {}
        ]
    },
    # Referenced Request Sequence
    "0040A370": {
1955     "vr": "SQ",
        "Value": [
          {}
        ]
    },
    # Procedure Step State
1960     "00741000": {
        "vr": "CS",
        "Value": [
          "SCHEDULED"
        ]
1965     },
    # Progress Information Sequence
    "00741002": {
1970     "vr": "SQ",
        "Value": [
          {}
        ]
    },
    # Unified Procedure Step Performed Procedure Sequence
1975     "00741216": {
        "vr": "SQ",
        "Value": [
          {}
        ]
1980     }
  }
]
```

#### A.4 ChangeUPSState (Claim UPS Workitem)

1985 The Task Performer claims the UPS Instance by updating the state to In Progress and providing a Transaction UID which will be used to give the Task Performer exclusive write access to the task going forward.

```
1990 PUT https://radiology.hospital.com/ups-rs/workitems/2.25.1.2.3.4/state
HTTP/1.1
Content-Type: application/json

[
  {
```

1995     # Procedure Step State  
          "00741000": {  
            "vr": "CS",  
            "Value": [  
              "IN PROGRESS"  
            ]  
          },  
2000     # Transaction UID  
          "00081195": {  
            "vr": "UI",  
            "Value": [  
2005        "2.25.1.1.1.1"  
            ]  
          }  
          }  
          ]  
          ]

2010     The Task Manager responds

HTTP/1.1 200 OK

## A.5 UpdateUPS

2015     Prior to start working on a claimed task, the Task Performer updates the task with the details of who performs the task and on which station.

2020     POST https://radiology.hospital.com/ups-  
          rs/workitems/2.25.1.2.3.4?2.25.1.1.1.1 HTTP/1.1  
          Content-type: application/json

2025     [  
          {  
            # Unified Procedure Step Performed Procedure Sequence  
            "00741216": {  
              "vr": "SQ",  
              "Value": [  
2030            # Actual Human Performers Sequence  
              "00404035": {  
                "vr": "SQ",  
                "Value": [  
2035             {  
                  # Human Performer's Name  
                  "00404037": {  
                    "vr": "PN",  
                    "Value": [  
                      {  
                        "Alphabetic": "Lambert^Peter^^Dr."  
                      }  
                    ]  
                  }  
                ]  
              }  
            ]  
          }  
          ]



IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
2040         },
           # Human Performer's Organization
           "00404036": {
             "vr": "LO",
             "Value": [
2045               "Specialty Hospital"
             ]
           }
         ]
       },
       # Performed Station Name Code Sequence
       "00404028": {
         "vr": "SQ",
         "Value": [
2055           {
             # Code Value
             "00080100": {
               "VR": "SH",
               "Value": [
2060                 "12345"
               ]
             },
             # Coding Scheme Designator
             "00080102": {
               "VR": "SH",
               "Value": [
2065                 "RadReadingGroup"
               ]
             },
             # Code Meaning
             "00080104": {
               "VR": "LO",
               "Value": [
2070                 "PerformerAE"
               ]
             }
           ]
         ]
       }
     ]
   }
 }
 ]
```

The Task Manager responds

```
2085 HTTP/1.1 200 OK
```

When the task is completed, the Task Performer updates the task with the details of the work performed, in particular, where the resulting report can be obtained.

```
2090 POST https://radiology.hospital.com/ups-  
rs/workitems/2.25.1.2.3.4?2.25.1.1.1.1 HTTP/1.1  
Content-type: application/json  
  
2095 [  
  {  
    # Unified Procedure Step Performed Procedure Sequence  
    "00741216": {  
      "vr": "SQ",  
      "Value": [  
2100         # Output Information Sequence  
          "00404033": {  
            "vr": "SQ",  
            "Value": [  
2105               {  
                # Type of Instances  
                "0040E020": {  
                  "VR": "CS",  
                  "Value": [  
2110                     "CDA"  
                  ]  
                },  
                # XDS Retrieval Sequence  
                "0040E024": {  
2115                  "VR": "SQ",  
                  "Value": [  
                    {  
                      # Repository Unique ID  
                      "0040E030": {  
2120                        "VR": "UI",  
                        "Value": [  
                          "2.25.99.88.77.66"  
                        ]  
                      },  
                      # Home Community ID  
                      "0040E031": {  
2125                        "VR": "UI",  
                        "Value": [  
                          "2.25.1.0.9.8.35.6"  
                        ]  
2130                      }  
                    }  
                ]  
              }  
            ]  
          }  
        ]  
      }  
    ]  
  ]
```

2140 ]

```
    }
  }
}
```

The Task Manager responds

```
HTTP/1.1 200 OK
```

2145

### A.6 ChangeUPSState (Complete UPS Workitem)

The Task Performer updates the state of a task to be Completed

2150 PUT https://radiology.hospital.com/ups-rs/workitems/2.25.1.2.3.4/state  
HTTP/1.1  
Content-Type: application/json

```
[
  {
    # Procedure Step State
    "00741000": {
      "vr": "CS",
      "Value": [
        "COMPLETED"
      ]
    },
    # Transaction UID
    "00081195": {
      "vr": "UI",
      "Value": [
        "2.25.1.1.1.1"
      ]
    }
  ]
}
```

2155  
2160  
2165  
2170 ]

The Task Manager responds

```
HTTP/1.1 200 OK
```

## A.7 RequestUPSCancellation

2175 The Task Requester requests cancellation of a task

```
POST https://radiology.hospital.com/ups-rs/workitems/2.25.1.2.3.4/cancelrequest HTTP/1.1
Content-Type: application/json
```

```
2180 [
      {
        # Reason for Cancellation
        "00741238": {
          "vr": "LT",
          "Value": [
2185             "Patient died."
          ]
        }
      }
2190 ]
```

The Task Manager responds

```
HTTP/1.1 202 Accepted
```

2195 Note: this means the Task Manager will attempt to notify the Performer of the cancellation request. Actual cancellation is at the discretion of the Performer. The requester can watch for a notification that the task has either been cancelled or completed.

## A.8 CreateSubscription

An auditing Watcher could create a global subscription for all tasks with deletion lock set so it can retrieve the final state details.

```
2200 POST https://radiology.hospital.com/ups-rs/workitems/
1.2.840.10008.5.1.4.34.5/subscribers/WatcherAE?deletionlock=true HTTP/1.1
Content-Length: 0
```

The Task Manager responds

```
HTTP/1.1 201 Created
```

```
2205 Content-Locator: wss://radiology.hospital.com/ups-rs/subscribers/WatcherAE
```

The Performer creates a global subscription for all tasks that are assigned to the Specialty Hospital which is where the Performer resides

```
2210 POST https://radiology.hospital.com/ups-rs/workitems/
1.2.840.10008.5.1.4.34.5.1/subscribers/PerformerAE?ScheduledStationGeographic
LocationCodeSequence.CodeValue=12345&ScheduledStationGeographicLocationCode
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
Sequence.CodingSchemeDesignator=RadReadingGroup HTTP/1.1  
Content-Length: 0
```

The Task Manager responds

2215 

```
HTTP/1.1 201 Created  
Content-Locator: wss://radiology.hospital.com/ups-rs/subscribers/PerformerAE
```

### A.9 SuspendGlobalSubscription

A Watcher suspends its global subscription to stop being subscribed to new tasks

2220 

```
POST https://radiology.hospital.com/ups-rs/workitems/  
1.2.840.10008.5.1.4.34.5/subscribers/WatcherAE/suspend HTTP/1.1  
Content-Length: 0
```

The Task Manager responds

2225 

```
HTTP/1.1 200 OK
```

### A.10 DeleteSubscription

A Task Requester or a Task Watcher deletes its subscription for a specific task. This also releases any deletion lock it may have placed on the task record.

2230 

```
DELETE https://radiology.hospital.com/ups-  
rs/workitems/2.25.1.2.3.4/subscribers/RequesterAE HTTP/1.1
```

The Task Manager responds

2235 

```
HTTP/1.1 200 OK
```

### A.11 OpenEventChannel

A Task Requester or Task Performer opens an event channel with the Task Manager for receiving future notifications.

2240 

```
GET wss://radiology.hospital.com/ups-rs/subscribers/RequesterAE HTTP/1.1
```

The Task Manager responds

```
HTTP/1.1 101 Switching Protocols
```

## A.12 SendEventReport

2245 The Task Manager sends an event notification to the Task Requester that the task is now completed.

The following is the websocket payload. The websocket opcode should be %x1 for text frame.

```
{
  # Affected SOP Class UID
  "00000002": {
    "vr": "UI",
    "Value": [
      "1.2.840.10008.5.1.4.34.6.4"
    ]
  },
  # Command Field
  "00000100": {
    "vr": "US",
    "Value": [
      256
    ]
  },
  # Message ID
  "00000110": {
    "vr": "US",
    "Value": [
      32
    ]
  },
  # Command Data Set Type
  "00000800": {
    "vr": "US",
    "Value": [
      257
    ]
  },
  # Affected SOP Instance UID
  "00001000": {
    "vr": "UI",
    "Value": [
      "2.25.1.2.3.4"
    ]
  },
  # Event Type ID (UPS State Report)
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow (RRR-WF)

---

```
2285  "00001002": {
      "vr": "US",
      "Value": [
        1
      ]
2290  },
      # Procedure Step State
      "00741000": {
        "vr": "CS",
        "Value": [
2295  "COMPLETED"
        ]
      }
    }
  }
```

2300 Notifications are also used by the Task Manager to inform a Task Performer that a task is now scheduled that has been assigned to the Task Performer.

The following is the websocket payload. The websocket opcode should be %x1 for text frame.

```
{
  # Affected SOP Class UID
2305  "00000002": {
    "vr": "UI",
    "Value": [
      "1.2.840.10008.5.1.4.34.6.4"
    ]
2310  },
  # Command Field
  "00000100": {
    "vr": "US",
    "Value": [
2315  256
    ]
  },
  # Message ID
2320  "00000110": {
    "vr": "US",
    "Value": [
      46
    ]
  },
2325  # Command Data Set Type
  "00000800": {
    "vr": "US",
```

IHE Radiology Technical Framework Supplement – Radiology Remote Reading Workflow  
(RRR-WF)

---

```
2330     "Value": [
        257
    ],
    # Affected SOP Instance UID
    "00001000": {
2335     "vr": "UI",
        "Value": [
            "2.25.1.1.2.3.4"
        ]
    },
    # Event Type ID (UPS State Report)
2340    "00001002": {
        "vr": "US",
        "Value": [
            1
        ]
    },
2345 },
    # Procedure Step State
    "00741000": {
2350     "vr": "CS",
        "Value": [
            "SCHEDULED"
        ]
    }
}
```



## Volume 2 – Transactions

2355 *Most of the changes below involve adding RESTful Semantics to each UPS transaction. The unchanged text was previously reviewed/approved as part of the PAWF Profile.*

*Modify Create UPS Workitem [RAD-80]*

### 4.80 Create UPS Workitem [RAD-80]

#### 2360 4.80.1 Scope

This transaction is used to create a new workitem.

The contents of the workitem describe both the task to be performed and associated information such as references to the input data, the order and accession number with which the task is associated, etc.

2365 In a typical “pull workflow” this transaction allows a **Requestor Workitem Creator** (such as a RIS or Departmental Workflow Manager) to instruct a ~~workitem manager (e.g., a Workitem Manager)~~ to add a new workitem to a worklist. When a manager adds a new workitem to its worklist based on internal business logic, it would comply with the semantics of this transaction although it would not actually send itself a message.

2370 In an unscheduled or append case, this transaction allows a ~~Workitem~~ Performer to instruct a ~~m~~Manager to create a new workitem for unscheduled or appended work being performed by the ~~Workitem~~ Performer. This ~~UPS N-CREATE~~ is directly analogous (and similar in structure) to the MPPS N-CREATE used for unscheduled acquisition work.

#### 4.80.2 Use Case Roles

2375 The Roles in this transaction are defined in the following table and may be played by the actors shown here:

<b>Role:</b>	Requestor:  Submits the relevant details and requests the creation of a new workitem.
<b>Actor(s):</b>	The following actors may play the role of Requestor:  <b><u>Task Requester: when requesting workitems</u></b> Workitem Creator: when requesting workitems Workitem Performer: when performing unscheduled workitems

<b>Role:</b>	<p>Manager:</p> <p>Creates and manages a Unified Procedure Step instance for the requested workitem.</p>
<b>Actor(s):</b>	<p>The following actors may play the role of Manager:</p> <p><del>Workitem Manager: when receiving a new workitem for its worklist.</del>  <u>Task Manager</u></p>

2380 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.

#### 4.80.3 Referenced Standards

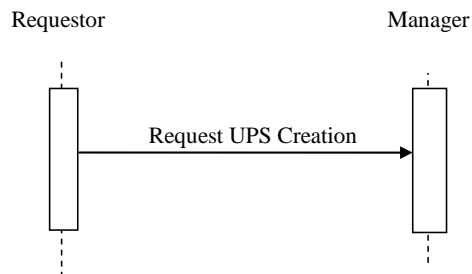
DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

DICOM ~~2011~~ PS 3.3: Unified Procedure Step Information Object

DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)

2385 **DICOM PS 3.18: DICOM UPS-RS Worklist Service**

#### 4.80.4 Interaction Diagram



##### 4.80.4.1 Request UPS Creation Message

2390 The Requestor sends a request to the Manager to create a new UPS instance representing the new workitem. The request contains the details for the requested workitem.

The Manager shall support handling such messages from more than one Requestor. The Requestor may choose to support making requests to more than one Manager.

#### 4.80.4.1.1 Trigger Events

A user or an automated function on the Requestor determines that a new workitem is required.

- 2395 The Requestor shall not request creation of a workitem unless the full list of input instances is known and those instances are available for retrieval.

#### 4.80.4.1.2 Message Semantics

##### DICOM RESTful Message Semantics

- 2400 **The message is a CreateUPS Action of the DICOM UPS-RS Worklist Service. The Requestor is the User-Agent, and the Manager is the Origin-Server.**

##### DICOM DIMSE Message Semantics

The message is an N-CREATE Request of the DICOM UPS Push SOP Class. The Requestor is the SCU, and the Manager is the SCP.

- 2405 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

#### 4.80.4.1.2.1 UPS Attribute Requirements

- 2410 In addition to the UPS N-CREATE requirements described in DICOM PS 3.4, the Requestor shall comply with the following requirements.

The Scheduled Workitem Code Sequence (0040,4018) shall contain a single code that identifies the task to be performed. Requestors shall allow sites to configure the code to be used for the various tasks the Requestor can request.

Note: DICOM CID 9231 provides a handful of very generic codes.

- 2415 Requestors may specify the intended performing system by populating the Scheduled Station Name Code Sequence (0040,4025). The Code Value (0008,0100) shall contain the AE-Title of the designated system. The Code Meaning (0008,0104) shall contain either the AE-Title of the designated system or a human-readable name for the designated system.

- 2420 Note: The Coding Scheme Designator (0008,0102) will likely have a value of “L” or a value beginning with “99”. See DICOM PS3.3 Section 8.2.

The Input Readiness State (0040,4041) shall have a value of READY, indicating that the list of instances in the Input Information Sequence (0040,4021) is complete, and the instances are all available for retrieval.

- 2425 See Appendix W for details on the correspondence between attribute values in unscheduled UPS instances and associated DICOM objects.

#### 4.80.4.1.2.2 Examples for the Use of Attributes

2430 Requestors may provide a flat list of processing parameters in the Scheduled Processing Parameters Sequence (0074,1210); however, coordination of the parameters and their value codings is outside the scope of this transaction. Creators of workitems should look to the documentation provided by the Workitem Performer for such details.

#### 4.80.4.1.3 Expected Actions

The Manager shall attempt to create the requested UPS instance as described in DICOM PS 3.4 Annex CC and return appropriate success or failure codes to the Requestor.

Note: This includes the DICOM requirement to send out notifications of the UPS creation based on subscription settings.

#### 2435 4.80.5 Security Considerations

Local policy should consider what users and systems have permission to create a workitem and configure appropriately.

##### 4.80.5.1 Security Audit Considerations

This transaction is not associated with an ATNA Trigger Event.

2440

<i>Modify Query UPS Workitems [RAD-81]</i>
--

## 4.81 Query UPS Workitems [RAD-81]

### 4.81.1 Scope

This transaction is used to find workitems of interest.

2445 The contents of workitems describe both the task to be performed and related information such as references to the input data, the order and accession number with which the task is associated.

2450 Typically the workitems have been scheduled by the **Workitem** Manager and the querying system intends to then select, claim and perform one or more of the workitems. Workitems on the worklist might include imaging tasks such as computer-aided diagnosis/detection, clinical image analysis/measurement or the generation of 3D views.

The querying system might also be a Watcher trying to select workitems of interest to which it will then subscribe for notifications.

2455 This transaction focuses on attributes relevant to filtering/selection. Matching key values are used to perform filtering on the **Manager**; Return key values can be used to perform additional filtering and sorting on the **Requestor**. Once a workitem of interest is selected, access to all the workitem details can be obtained using the Get UPS Workitem [RAD-83] transaction.

#### 4.81.2 Use Case Roles

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

<b>Role:</b>	Requestor:  Query the Manager for Procedure Steps.
<b>Actor(s):</b>	The following actors may play the role of Requestor:  Workitem Performer <b><u>Task Performer</u></b> Watcher
<b>Role:</b>	Manager:  Manage Unified Procedure Steps for workitems; accept query requests for Worklist items, return an appropriately filtered list of workitems.
<b>Actor(s):</b>	The following actors may play the role of Manager:  Workitem Manager <b><u>Task Manager</u></b>

2460 Transaction text specifies behavior for each Role. The behavior of specific Actors are only specified when it goes beyond that of the general Role.

#### 4.81.3 Referenced Standards

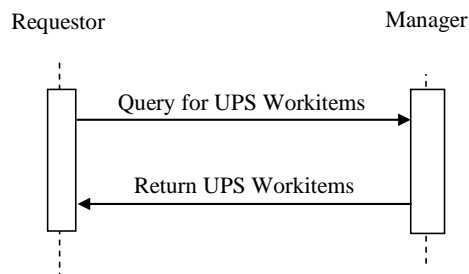
DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

DICOM ~~2011~~ PS 3.3: Unified Procedure Step Information Object

2465 DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)

**DICOM PS 3.18: DICOM UPS-RS Worklist Service**

#### 4.81.4 Interaction Diagram



##### 4.81.4.1 Query for UPS Workitems Message

2470 The Requestor queries the Manager for UPS instances representing workitems.

The Manager shall support handling such messages from more than one Requestor. The Requestor may choose to support querying more than one Manager.

##### 4.81.4.1.1 Trigger Events

2475 A user or an automated function on the Requestor wishes to identify workitems of interest and retrieve associated details of the workitems.

##### 4.81.4.1.2 Message Semantics

###### DICOM RESTful Message Semantics

**The message is a SearchForUPS Action of the DICOM UPS-RS Worklist Service. The Requestor is the User-Agent, and the Manager is the Origin-Server.**

2480 **DICOM DIMSE Message Semantics**

The message is a C-FIND Request of the DICOM UPS Pull SOP Class. The Requestor is the SCU, and the Manager is the SCP.

2485 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

See DICOM PS 3.4 Annex CC for further details.

#### 4.81.4.1.2.1 Matching Keys and Return Keys

2490 The Requestor shall be capable of performing ~~each of~~ the following query types **as required by the Profile in which this transaction is being used.**

Note: It is likely that various combinations of these queries will be useful to the user or the application. Implementers are advised to consider such combinations.

##### 1. Patient-oriented Query: Query for workitems associated with a specific patient.

2495 The Requestor shall support all of the matching key attributes listed in Table 4.81.4.1.2.1-1 in a query. Support for the keys individually or in combinations is at the discretion of the Requestor.

**Table 4.81.4.1.2.1-1: UPS Keys for Patient-oriented Workitem Queries**

Matching Key Attributes	Tag
Patient's Name	(0010,0010)
Patient ID	(0010,0020)
Issuer of Patient ID	(0010,0021)
Procedure Step State	(0074,1000)

Note: UPS instances are permitted to be created with the Issuer of Patient ID value left blank. A blank value can be presumed to match the local institution.

##### 2500 2. Procedure-oriented Query: Query for workitems associated with a specific procedure.

The Requestor shall support all of the matching key attributes listed in Table 4.81.4.1.2.1-2 in a query. Support for the keys individually or in combinations is at the discretion of the Requestor.

Sequence attributes denoted in the italics are not matching keys on their own but have to be included in a query to convey the value of the attributes contained within them.

2505

**Table 4.81.4.1.2.1-2: UPS Keys for Procedure-oriented Workitem Queries**

Matching Key Attributes	Tag
<i>Referenced Request Sequence</i>	<i>(0040,A370)</i>
>Accession Number	(0008,0050)
> <i>Issuer of Accession Number Sequence</i>	<i>(0008,0051)</i>
>>Local Namespace Entity ID	(0040,0031)
>>Universal Entity ID	(0040,0032)
>>Universal Entity ID Type	(0040,0033)
>Requested Procedure ID	(0040,1001)
<i>Scheduled Workitem Code Sequence</i>	<i>(0040,4018)</i>
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
Procedure Step State	(0074,1000)

**3. Station-oriented Query:** Query for workitems associated with a particular workstation.

The Requestor shall support all of the matching key attributes listed in Table 4.81.4.1.2.1-3 in a query. Support for the keys individually or in combinations is at the discretion of the Requestor.

2510 Sequence attributes denoted in the italics are not matching keys on their own but have to be included in a query to convey the value of the attributes contained within them.

The Code Value of the Scheduled Station Name Code Sequence, if valued, shall be set to the AE Title of the Requestor's UPS SCU.

2515 **Table 4.81.4.1.2.1-3: UPS Keys for Station-oriented Workitem Queries**

Matching Key Attributes	Tag
<i>Scheduled Station Name Code Sequence</i>	(0040,4025)
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
Scheduled Procedure Step Start DateTime	(0040,4005)
Procedure Step State	(0074,1000)

**4. Class-oriented Query:** Query for workitems associated with a class of workstations.

The Requestor shall support all of the matching key attributes listed in Table 4.81.4.1.2.1-4 in a query. Support for the keys individually or in combinations is at the discretion of the Requestor.

2520 Sequence attributes denoted in the italics are not matching keys on their own but have to be included in a query to convey the value of the attributes contained within them.

**Table 4.81.4.1.2.1-4: UPS Keys for Class-oriented Workitem Queries**

Matching Key Attributes	Tag
<i>Scheduled Station Class Code Sequence</i>	(0040,4026)
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
Scheduled Procedure Step Start DateTime	(0040,4005)
Procedure Step State	(0074,1000)

2525 **5. Task-oriented Query: Query for workitems to perform a specific type of task.**

**The Requestor shall support all of the matching key attributes listed in Table 4.81.4.1.2.1-5 in a query. Support for the keys individually or in combinations is at the discretion of the Requestor.**



2530

**Table 4.81.4.1.2.1-5: UPS Keys for Task-oriented Workitem Queries**

<u>Matching Key Attributes</u>	<u>Tag</u>
<u>Scheduled Workitem Code Sequence</u>	<u>(0040,4026)</u>
<u>&gt;Code Value</u>	<u>(0008,0100)</u>
<u>&gt;Coding Scheme Designator</u>	<u>(0008,0102)</u>

**6. Staff-oriented Query: Query for workitems associated with a specific person or organization.**

2535

**The Requestor shall support all of the matching key attributes listed in Table 4.81.4.1.2.1-5 in a query. Support for the keys individually or in combinations is at the discretion of the Requestor.**

**Table 4.81.4.1.2.1-6: UPS Keys for Staff-oriented Workitem Queries**

<u>Matching Key Attributes</u>	<u>Tag</u>
<u>Human Performer Code Sequence</u>	<u>(0040,4026)</u>
<u>&gt;Code Value</u>	<u>(0008,0100)</u>
<u>&gt;Coding Scheme Designator</u>	<u>(0008,0102)</u>
<u>Human Performer's Organization</u>	<u>(0040,4036)</u>

2540 **Additional Filtering**

Although not mandated, implementers of Requestors are advised to review the full list of available Matching and Return Keys listed in DICOM PS3.4 Table CC.2.5-3 for attributes that would help in identifying workitems of interest.

2545

Some possibilities include: Expected Completion DateTime (0040,4011), Expiration DateTime, Scheduled Procedure Step Priority (0074,1200), Procedure Step Label (0074,1204), Worklist Label (0074,1202), Scheduled Station Geographic Location Code Sequence (0040,4027), Scheduled Human Performers Sequence (0040,4034), Patients Birth Date (0010,0030), Patients Sex (0010,0040), Admission ID (0038,0010), Issuer of Admission ID Sequence (0038,0014), Requesting Service (0032,1033), Replaced Procedure Step Sequence (0074,1224).

2550 **4.81.4.1.2.2 Examples for the Use of Matching Key Attributes**

- Scheduled Procedure Step Start DateTime supports a query for tasks scheduled to be performed today.
- Scheduled Workitem Code Sequence supports a query for specific types of computer-aided detection (CAD) tasks.

- 2555
- Scheduled Station Name Code Sequence supports a query for tasks scheduled for this workstation.
  - Scheduled Procedure Step Start DateTime, Scheduled Workitem Code and Scheduled Station Class Code together support a query for surface rendering tasks scheduled for today on 3D reconstruction workstations.
- 2560
- Note: Requestors are recommended to append a wildcard "\*" at the end of each component of the structured Patient Name to facilitate matching with both structured and unstructured Patient Names.

#### 4.81.4.1.3 Expected Actions

The Manager shall execute the query and send the matching UPS Workitems to the Requestor that originated the query as described in DICOM PS3.4.

#### 2565 4.81.4.2 Return UPS Workitems Message

The Manager returns workitems matching the query.

##### 4.81.4.2.1 Trigger Events

The Manager receives a query for workitems.

##### 4.81.4.2.2 Message Semantics

#### 2570 DICOM RESTful Message Semantics

**The message is a SearchForUPS Action Response Message of the DICOM UPS-RS Worklist Service. The Requestor is the User-Agent, and the Manager is the Origin-Server.**

#### DICOM DIMSE Message Semantics

2575 The message is a set of C-FIND Responses from the DICOM UPS Pull SOP Class. The Requestor is the SCU, and the Manager is the SCP.

The details available in the ~~C-FIND~~ Responses are intended to facilitate filtering and selection of a workitem for some purpose. The workitem itself contains many additional details that might affect actual performance of the workitem or that might be useful to an observing application. Such details can be obtained using the Get UPS Contents transaction.

2580 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

##### 4.81.4.2.3 Expected Actions

2585 The Requestor typically provides the worklist to the user to select and start work based on the task details in the selected workitem, or does the selection and processing automatically. The

Requestor is permitted to do additional “client-side” filtering prior to presenting the list to the user. Such filtering might be based on the values of Return Keys, access controls or other logic.

#### 4.81.5 Security Considerations

##### 2590 4.81.5.1 Security Audit Considerations

Managers that support the ATNA Profile shall audit this transaction.

This transaction corresponds to a Query Information ATNA Trigger Event.

*Modify Claim UPS Workitem [RAD-82]*

#### 4.82 Claim UPS Workitem [RAD-82]

##### 2595 4.82.1 Scope

This transaction is used to take “ownership” of a selected workitem by telling the managing system to change the state to IN PROGRESS. This permits other worklist users to detect that this workitem has been claimed and locks out others from claiming or modifying the workitem.

2600 The workitem is still held by the Manager, but only the “owner” of the workitem is permitted to submit updates to the workitem. In some scenarios a single system might be both the Manager and the Performer of the workitem.

##### 4.82.2 Use Case Roles

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

<b>Role:</b>	Performer:  Takes ownership of a workitem for the purpose of updating it.
<b>Actor(s):</b>	The following actors may play the role of Performer:  Workitem Performer <b><u>Task Performer</u></b>
<b>Role:</b>	Manager:  Confirms/grants ownership of a workitem to the Performer.
<b>Actor(s):</b>	The following actors may play the role of Manager:  Workitem Manager

<b><u>Task Manager</u></b>
----------------------------

2605 Transaction text specifies behavior for each Role. The behavior of specific Actors are only specified when it goes beyond that of the general Role.

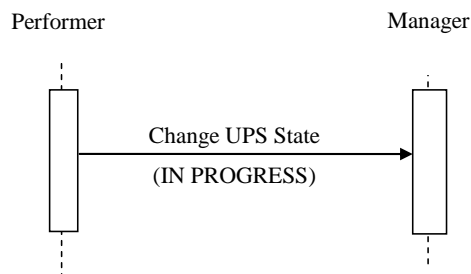
#### 4.82.3 Referenced Standards

DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)

2610 **DICOM PS 3.18: DICOM UPS-RS Worklist Service**

#### 4.82.4 Interaction Diagram



##### 4.82.4.1 Change UPS State Message

2615 The Performer asks the Manager of a UPS instance to change the workitem state to IN PROGRESS.

The Manager shall support handling such messages from more than one Performer (although for an individual workitem this message will typically only be received from one Performer). The Performer may choose to support interacting with workitems on multiple Managers.

##### 4.82.4.1.1 Trigger Events

2620 A user or an automated function on the Performer wishes to take control of the workitem to begin work or otherwise modify it.

The Performer shall not claim a workitem if the contents of the Scheduled Station Name Code Sequence (0040,4025) indicate that the workitem was not intended for the Performer. See 4.80.4.1.2.1 for details on populating this sequence.

2625 The Performer shall not claim a workitem for which Input Readiness State has a value of INCOMPLETE. Doing so would prevent the remaining references from being added to the Input Information Sequence.

Note: If it is useful for the Performer to start working on a workitem with an incomplete list in the Input Information Sequence, it may still use the Get UPS Workitem transaction (RAD-83) without claiming the workitem.

2630 The Performer may claim a workitem for which Input Readiness State has a value of UNAVAILABLE; however, the Performer then has the responsibility for determining when the instances in the Input Information Sequence are available.

2635 Once claimed, the Locking UID feature of UPS means that only the Performer that claimed it and the Manager have the key necessary to update the contents or modify the state of the UPS workitem, although other systems can still view the state and the contents.

#### **4.82.4.1.2 Message Semantics**

##### **DICOM RESTful Message Semantics**

**The message is a ChangeUPSState Action of the DICOM UPS-RS Worklist Service. The Performer is the User-Agent, and the Manager is the Origin-Server.**

2640 **DICOM DIMSE Message Semantics**

The message is a Change UPS State N-ACTION request of the DICOM UPS Pull SOP Class. The Performer is the SCU, and the Manager is the SCP.

2645 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

The Performer shall generate a Locking UID and request that the UPS State be changed to IN PROGRESS as described in DICOM PS 3.4 Annex CC. The Locking UID is conveyed in the Transaction UID (0008,1195) attribute.

2650 The Performer shall retain the Locking UID for use in future transactions on this Workitem. Future modification requests for this Workitem will be denied by the Manager (See DICOM PS 3.4) if the correct Locking UID is not provided.

2655 By claiming the workitem, the Performer shall take responsibility for the performance of the task defined by the code contained in the Scheduled Workitem Code Sequence (0040,4018) of the workitem. The Performer shall be configurable to allow sites to map codes to the various tasks the Performer can perform. Performer may perform the task directly or may coordinate performance of the task by another system (e.g., by “sub-contracting” all or part of it or by using a hosted application).

#### 4.82.4.1.3 Expected Actions

2660 The Manager shall handle the N-ACTION state change request as described in DICOM PS 3.4 Annex CC and return appropriate success or failure codes to the Requester. This includes the DICOM requirement to send out notifications of the UPS creation based on subscription settings if the Profile requires the Manager to support the Send UPS Notification transaction.

#### 4.82.5 Security Considerations

2665 Local policy should consider what users and systems have permission to claim a workitem and configure appropriately.

##### 4.82.5.1 Security Audit Considerations

This transaction is not associated with an ATNA Trigger Event.

<i>Modify Get UPS Workitem Contents [RAD-83]</i>
--

#### 2670 4.83 Get UPS Workitem Contents [RAD-83]

##### 4.83.1 Scope

This transaction is used to retrieve the contents (i.e., values of a requested list of attributes) from a workitem.

##### 4.83.2 Use Case Roles

2675 The Roles in this transaction are defined in the following table and may be played by the actors shown here:

<b>Role:</b>	Requestor:  Requests details for a workitem.
<b>Actor(s):</b>	The following actors may play the role of Requestor:  <b><u>Task Performer</u></b> Workitem Performer Watcher
<b>Role:</b>	Manager:  Provides the requested details for the requested UPS instance that it manages.
<b>Actor(s):</b>	The following actors may play the role of Manager:

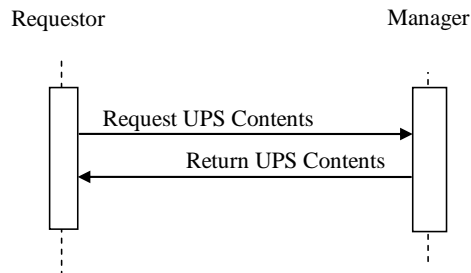
	<p><b><u>Task Manager</u></b> Workitem Manager</p>
--	--

Transaction text specifies behavior for each Role. The behavior of specific Actors are only specified when it goes beyond that of the general Role.

**4.83.3 Referenced Standards**

- 2680 DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes  
 DICOM ~~2011~~ PS 3.3: Unified Procedure Step Information Object  
 DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)  
**DICOM PS 3.18: DICOM UPS-RS Worklist Service**

**4.83.4 Interaction Diagram**



2685

**4.83.4.1 Request UPS Contents Message**

The Requestor sends a request for the Manager of a UPS instance to provide the values for a specific set of attributes for a specific UPS instance.

2690 The Manager shall support handling such messages from more than one Requestor. The Requestor may choose to support making requests to more than one Manager.

**4.83.4.1.1 Trigger Events**

A user or an automated function on the Requestor wishes to obtain attribute values for a workitem.

Two typical usages are for:

- 2695
- a Workitem Performer to get the full contents of a workitem prior to starting to perform it
  - a Watcher to get specific details of interest upon notification that the contents of a workitem have changed.

#### 4.83.4.1.2 Message Semantics

##### DICOM RESTful Message Semantics

2700 **The message is a RetrieveUPS Action of the DICOM UPS-RS Worklist Service. The Requestor is the User-Agent, and the Manager is the Origin-Server.**

##### DICOM DIMSE Message Semantics

The message is an N-GET Request of the DICOM UPS Pull SOP Class (or the DICOM UPS Watch SOP Class). The Requestor is the SCU, and the Manager is the SCP.

2705 Note: The N-GET Request in the two SOP Classes is equivalent. Pay particular attention to the discussion of SOP Class UIDs, Association Negotiation and DIMSE Implications for UPS in DICOM PS 3.4.

**The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

2710

#### 4.83.4.1.2.1 UPS Attribute Requirements

See RAD TF-3: Appendix V for details on the required correspondence between attribute values in UPS instances and associated DICOM objects.

2715 The content and usage of the Scheduled Processing Parameter Sequence (0074,1210) is not constrained by IHE beyond what is specified in DICOM. If a Workitem Performer supports retrieving and using this sequence, the onus is on the Workitem Performer to provide documentation of the details so that creators of workitems can be configured to populate it appropriately.

#### 4.83.4.1.3 Expected Actions

2720 The Manager shall handle the request and respond with a Return UPS Contents message.

#### 4.83.4.2 Return UPS Contents Message

The Manager returns the requested values from the specified UPS instance to the Requestor.

##### 4.83.4.2.1 Trigger Events

The Manager receives a Request UPS Contents Message.

2725 **4.83.4.2.2 Message Semantics**

##### DICOM RESTful Message Semantics

**The message is a RetrieveUPS Action Response Message of the DICOM UPS-RS Worklist Service. The Requestor is the User-Agent, and the Manager is the Origin-Server.**



**DICOM DIMSE Message Semantics**

2730 The message is an N-GET Response Primitive of the DICOM UPS Pull SOP Class (which is equivalent to the N-GET Response Primitive of the DICOM UPS Watch SOP Class). The Requestor is the SCU, and the Manager is the SCP.

2735 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

**4.83.4.2.3 Expected Actions**

The Manager shall provide the requested attributes to the best of its ability and return appropriate success or failure codes to the Requestor.

2740 **4.83.5 Security Considerations**

Local policy should consider what users and systems have permission to retrieve workitem contents and configure appropriately.

**4.83.5.1 Security Audit Considerations**

This transaction is not associated with an ATNA Trigger Event.

2745

*Modify Update UPS Workitem Contents [RAD-84]*

**4.84 Update UPS Workitem [RAD-84]**

**4.84.1 Scope**

2750 This transaction is used by a workitem performer to request that the workitem manager modify the contents of a workitem it manages.

This is generally done to update details describing progress, or to finalize the attribute values prior to completing the workitem.

In the case where a system is also managing a UPS instance that it is performing, it will update the instance directly rather than use this transaction.

2755 **4.84.2 Use Case Roles**

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

<b>Role:</b>	Performer:
--------------	------------

	Provides updated attribute values for a workitem it is performing.
<b>Actor(s):</b>	The following actors may play the role of Performer:  <b><u>Task Performer</u></b> Workitem Performer
<b>Role:</b>	Manager:  Modifies the attribute values as instructed for a workitem it is managing.
<b>Actor(s):</b>	The following actors may play the role of Manager:  <b><u>Task Manager</u></b> Workitem Manager

Transaction text specifies behavior for each Role. The behavior of specific Actors are only specified when it goes beyond that of the general Role.

2760 **4.84.3 Referenced Standards**

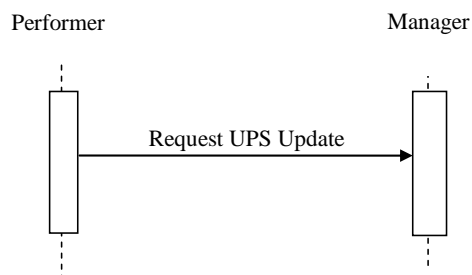
DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

DICOM ~~2011~~ PS 3.3: Unified Procedure Step Information Object

DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)

**DICOM PS 3.18: DICOM UPS-RS Worklist Service**

2765 **4.84.4 Interaction Diagram**



**4.84.4.1 Request UPS Update Message**

The Performer sends a request for the Manager of a UPS instance to update the attribute values.

2770 The Manager shall support handling such messages from more than one Performer. The Performer may choose to support making requests to more than one Manager.

#### 4.84.4.1.1 Trigger Events

A user or an automated function on the Performer has updated attribute values for a workitem.

2775 Upon starting actual work on a workitem, the Performer shall submit a Request UPS Update Message to update the Performed Procedure Step Start DateTime (0040,0244) and the contents of the Performed Station Name Code Sequence (0040,4028).

2780 In general, the frequency and “timeliness” of other updates is at the discretion of the Performer, unless otherwise specified in the Profile. Implementations might find it useful to provide a user configurable parameter for the frequency of updates (e.g., if set to 5 minutes, the information in the UPS instance is no more than 5 minutes old). This could serve as a useful “heartbeat” mechanism to determine that the Performer is still running.

#### 4.84.4.1.2 Message Semantics

##### DICOM RESTful Message Semantics

**The message is an UpdateUPS Action of the DICOM UPS-RS Worklist Service. The Performer is the User-Agent, and the Manager is the Origin-Server.**

2785 DICOM DIMSE Message Semantics

The message is an N-SET Request of the DICOM UPS Pull SOP Class. The Performer is the SCU, and the Manager is the SCP.

2790 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

2795 As described in DICOM PS 3.4, the Performer needs to have the Locking UID for the UPS instance; otherwise the Manager will reject the N-SET Request. The Locking UID is conveyed in the Transaction UID (0008,1195) attribute. Generally the Performer will have generated the Locking UID when it claimed the workitem using RAD-82; however, it is possible it might have the Locking UID due to being grouped with another actor, or may have been provided the Locking UID some other way.

#### 4.84.4.1.2.1 UPS Attribute Requirements

2800 In addition to the UPS N-SET requirements described in DICOM PS 3.4, the SCU shall comply with the requirements defined here.

The Actual Human Performers Sequence (0040,4035) shall be populated if a human has performed the workitem.

2805 The Performed Station Name Code Sequence (0040,4028) shall be encoded as follows:  
The Code Value (0008,0100) shall contain the AE-Title of the designated system. The Code Meaning (0008,0104) shall contain either the AE-Title of the designated system or a human-readable name for the designated system. If the system has multiple AE-Titles, the value should reflect the AE-Title on which Send UPS Notification transactions could be received (e.g., notifying that a cancelation request has been submitted).

2810 Note: The Coding Scheme Designator (0008,0102) will likely have a value of “L” or a value beginning with “99”. See DICOM PS3.3 Section 8.2.

See RAD TF-3: Appendix V for details on the required correspondence between attribute values in UPS instances and associated DICOM objects.

#### 4.84.4.1.2.2 Examples for the Use of Attributes

2815 Guidance on the use of the Unified Procedure Step Progress Information Module may be found in DICOM PS3.3 C.30.1.

Informative material may be found in DICOM PS3.17 GGG.3.1 on updating workitem contents to reflect partial completion or performance of something that differs from what was requested.

#### 4.84.4.1.3 Expected Actions

2820 The Manager shall attempt to update the UPS instance as requested (and as described in DICOM PS 3.4) and return appropriate success or failure codes to the Performer.

### 4.84.5 Security Considerations

#### 4.84.5.1 Security Audit Considerations

This transaction is not associated with an ATNA Trigger Event.

2825 

<i>Modify Complete UPS Workitem [RAD-85]</i>
--

## 4.85 Complete UPS Workitem [RAD-85]

### 4.85.1 Scope

2830 This transaction is used by a work performer to tell the managing system (~~e.g., a Post Processing Manager~~) that the contents of the selected workitem (e.g., references to result objects, etc.) have been finalized and the state should be changed to a Final State of either COMPLETED or CANCELED. Once in a Final State, further updates to the workitem are not permitted.

Subscribed actors will be notified of the state change and may choose to retrieve further details from the managing system.

2835 **4.85.2 Use Case Roles**

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

<b>Role:</b>	Performer:  Finalizes and gives up ownership of a workitem.
<b>Actor(s):</b>	The following actors may play the role of Performer:  <u><b>Task Performer</b></u> Workitem Performer
<b>Role:</b>	Manager:  Confirms/finalizes the workitem.
<b>Actor(s):</b>	The following actors may play the role of Manager:  <u><b>Task Manager</b></u> Workitem Manager

Transaction text specifies behavior for each Role. The behavior of specific Actors are only specified when it goes beyond that of the general Role.

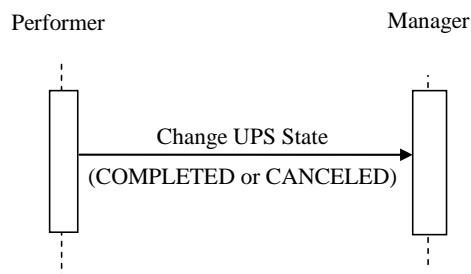
2840 **4.85.3 Referenced Standards**

DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)

**DICOM PS 3.18: DICOM UPS-RS Worklist Service**

**4.85.4 Interaction Diagram**



2845

#### 4.85.4.1 Change UPS State Message

2850 The Performer informs the Manager of a UPS instance that it has finished working on the workitem, has finished updating the UPS, and that the Manager should change the UPS state to COMPLETED or CANCELED (based on the value provided by the Performer for the Procedure Step State (0074,1000)).

The Manager shall support handling such messages from more than one Performer (although for an individual workitem this message will typically only be received from one Performer). The Performer may choose to support interacting with workitems on multiple Managers.

##### 4.85.4.1.1 Trigger Events

2855 A user or an automated function on the Performer determines that the task represented by the workitem is completed or canceled and the UPS instance has met the final state requirements described in DICOM PS 3.4 Table CC.2.5-3.

2860 Since the UPS instance contains references to the generated output objects and where they are available from, and since the contents of a UPS instance cannot be updated after it is completed, it is recommended that the results have been successfully stored before this transaction is triggered.

##### 4.85.4.1.2 Message Semantics

###### DICOM RESTful Message Semantics

2865 **The message is a ChangeUPSState Action of the DICOM UPS-RS Worklist Service. The Performer is the User-Agent, and the Manager is the Origin-Server.**

###### DICOM DIMSE Message Semantics

The message is a Change UPS State N-ACTION request of the DICOM UPS Pull SOP Class. The Performer is the SCU, and the Manager is the SCP.

2870 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

2875 The Performer shall not send the ~~N-ACTION~~ request **to change state** unless it has already met the Final State requirements, including listing all Instances created, if any, in the Output Information Sequence (0040,4033).

##### 4.85.4.1.3 Expected Actions

2880 The Manager shall handle the N-ACTION state change request as described in DICOM PS 3.4 Annex CC and return appropriate success or failure codes to the Requestor. This includes the DICOM requirement to send out notifications of the UPS completion based on subscription settings.

If the Manager has internal logic to “override” remaining deletion locks and delete instances that have reached a Final State anyway based on internal logic, it shall be capable of waiting at least 24 hours before such deletions. This capability may be configurable.

#### 4.85.5 Security Considerations

##### 2885 4.85.5.1 Security Audit Considerations

This transaction is not associated with an ATNA Trigger Event.

*Modify Manage UPS Subscription [RAD-86]*

### 4.86 Manage UPS Subscription [RAD-86]

#### 2890 4.86.1 Scope

This transaction is used by an interested actor to subscribe (or unsubscribe) to notifications for one or more UPS workitems.

When an actor becomes subscribed to a workitem, it will be sent notifications (See RAD-87) of events such as changes in the state or contents of the UPS instance that represents the workitem.

2895 In addition to subscribing to specific instances, an actor may subscribe to all instances (“global subscription”) managed by another actor. An actor may also place a “deletion lock” on a subscription, which provides time for the subscribing actor to retrieve final details from a UPS instance after it has been moved to the COMPLETED or CANCELED state. See DICOM PS 3.4 and PS 3.17 for more details.

2900 **An actor may also subscribe to all instances that match certain keys (“filtered global subscription”). For example, a Task Performer might subscribe to all instances with the Workitem Code that corresponds to the task it is able to perform. Or a performance auditing Watcher might subscribe to all tasks with a priority of STAT.**

#### 4.86.2 Use Case Roles

2905 The Roles in this transaction are defined in the following table and may be played by the actors shown here:

<b>Role:</b>	Subscriber:  Requests to change its subscription status to one or more UPS workitems.
<b>Actor(s):</b>	The following actors may play the role of Subscriber:  Watcher

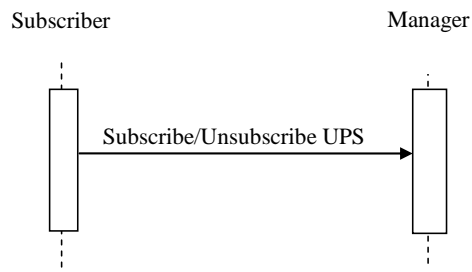
	<b><u>Task Requester</u></b> <b><u>Task Performer</u></b>
<b>Role:</b>	Manager:  Modify subscription record as requested.
<b>Actor(s):</b>	The following actors may play the role of Manager:  <b><u>Task Manager</u></b> Workitem Manager

Transaction text specifies behavior for each Role. The behavior of specific Actors are only specified when it goes beyond that of the general Role.

#### 4.86.3 Referenced Standards

- 2910 DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes  
 DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)  
**DICOM PS 3.18: DICOM UPS-RS Worklist Service**

#### 4.86.4 Interaction Diagram



##### 2915 4.86.4.1 Subscribe/Unsubscribe UPS Message

The Subscriber asks the Manager to change the state of the Subscriber’s subscription. An active subscription means that the subscriber will receive notification events from the Manager with the associated workitem(s) change state or contents.

- 2920 The Manager shall support handling such messages from more than one Subscriber. The Subscriber may choose to support interacting with workitems on multiple Managers.



As described in DICOM PS 3.4, Subscribers may choose to subscribe (or unsubscribe) from individual workitems or from all workitems managed by the Manager to which the request is sent (See Global Subscriptions in DICOM PS 3.4 and PS 3.17).

2925 As described in DICOM PS 3.4, Subscribers may choose to place a Deletion Lock on workitem(s). Workitems are typically deleted by the Manager when the workitem is COMPLETED or CANCELED; however, the Manager will attempt to delay deletion of a workitem until Deletion Locks are removed, to allow Subscribers time to retrieve final state details for the workitem.

#### **4.86.4.1.1 Trigger Events**

2930 A user or an automated function on the Subscriber determines that it would like to start receiving or stop receiving notifications associated with one or more workitems (UPS Instances).

Also, a user or an automated function on the Subscriber may determine that it would like to place a deletion lock on one or more workitems. For details on deletion locks, refer to DICOM PS 3.4.

#### **4.86.4.1.2 Message Semantics**

##### **DICOM RESTful Message Semantics**

**The message is one of three actions of the DICOM UPS-RS Worklist Service. The Subscriber is the User-Agent, and the Manager is the Origin-Server.**

- **The CreateSubscription Action is used to create a new subscription.**
- **The SuspendGlobalSubscription Action is used to stop being subscribed to new workitems.**
- **The DeleteSubscription Action is used to stop receiving notifications.**

##### **DICOM DIMSE Message Semantics**

2945 The message is a Subscribe/Unsubscribe to Receive UPS Event Reports N-ACTION request of the DICOM UPS Watch SOP Class. The Subscriber is the SCU, and the Manager is the SCP.

**The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

2950 The semantics of Deletion Locks and Global Subscriptions are described in DICOM PS3.4 CC.2.3.

The Manager shall support the use of Deletion Locks and Global Subscriptions. Usage of Deletion Locks and Global Subscriptions by the Performer will depend on the nature of the application.

2955 **4.86.4.1.3 Expected Actions**

The Manager shall respond to the ~~N-ACTION~~ request as described in DICOM PS 3.4 and return appropriate success or failure codes to the Subscriber.

**4.86.5 Security Considerations**

2960 Local policy should consider what users and systems have permission to subscribe to workitem notifications and configure appropriately.

**4.86.5.1 Security Audit Considerations**

Managers that support the ATNA Profile shall audit this transaction.  
This transaction corresponds to a Query Information ATNA Trigger Event.

2965 *Modify Send UPS Notification [RAD-87]*

**4.87.1 Scope**

This transaction is used to notify systems of the state or contents of a given UPS workitem.

**4.87.2 Use Case Roles**

2970 The Roles in this transaction are defined in the following table and may be played by the actors shown here:

<b>Role:</b>	Subscriber:  Accepts notifications.
<b>Actor(s):</b>	The following actors may play the role of Subscriber:  Watcher <b><u>Task Performer</u></b> Workitem Performer
<b>Role:</b>	Manager:  Sends notifications about a workitem based on trigger events (such as changes in the state of the workitem).
<b>Actor(s):</b>	The following actors may play the role of Manager:  <b><u>Task Manager</u></b>

	Workitem Manager
--	------------------

Transaction text specifies behavior for each Role. The behavior of specific Actors are only specified when it goes beyond that of the general Role.

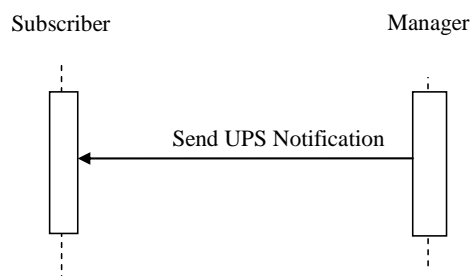
#### 4.87.3 Referenced Standards

DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

2975 DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)

#### DICOM PS 3.18: DICOM UPS-RS Worklist Service

#### 4.87.4 Interaction Diagram



##### 4.87.4.1 Send UPS Notification Message

2980 The Manager sends the Subscriber a notification that a given workitem has changed. The notification provides basic state/progress information. For more detail, the Subscriber must retrieve the contents of the UPS instance.

2985 The Manager shall support sending such messages to more than one Subscriber for each workitem instance. The Subscriber shall support receiving such messages from each Manager it is configured to interact with.

As described in DICOM PS 3.4, if a Subscriber has a Global Subscription, it shall be prepared to receive notifications for workitems it has not individually subscribed to. The Subscriber may choose to unsubscribe from specific instances as it is notified of their creation.

2990 Similarly, Workitem Performers shall be prepared to receive notifications for workitems not individually subscribed to when a new workitem is assigned to the Performer, or when there is a cancellation request for a workitem the Performer has claimed.

#### 4.87.4.1.1 Trigger Events

Several events may trigger a Send UPS Notification Message

- 2995 • The state or contents of a workitem is modified by the Manager. See DICOM PS 3.4 for a more complete description of the various modifications which require a notification.
- A Subscriber is newly subscribed to a workitem instance (See RAD TF3: 4.86). The Manager sends an initial notification, which provides the current state of the workitem to the Subscriber.
- 3000 • A cancelation request is received for a workitem being performed (See RAD TF3: 4.88). The Manager notifies subscribers *and the performer of the workitem* of the cancelation request. This notification of the performer does not depend on the performer having previously subscribed to the workitem.
- 3005 • A workitem has been assigned to a specific performer (by a workitem creator or the Manager setting the value of the Scheduled Station Name Code Sequence). The Manager notifies the assigned performer. This notification of the performer does not depend on the performer having previously subscribed to the workitem. The notified performer may, but is not mandated to, claim the workitem.

#### 4.87.4.1.2 Message Semantics

##### DICOM RESTful Message Semantics

3010 **The message is a SendEventReport Action of the DICOM UPS-RS Worklist Service. The Subscriber is the User-Agent, and the Manager is the Origin-Server.**

**Note: The RESTful mechanism used for this message depends on the Subscriber having an open WebSocket channel for the Manager to send the notification over. A Subscriber opens such a channel using RAD-Y1.**

##### DICOM DIMSE Message Semantics

3015 The message is a Report a Change in UPS Status N-EVENT-REPORT of the DICOM UPS Event SOP Class. The Subscriber is the SCU, and the Manager is the SCP.

3020 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

#### 4.87.4.1.3 Expected Actions

The Subscriber is not required to take any specific action upon receipt of a notification.

3025 Specifically, in the case of notification of a cancelation request, the Performer of the Workitem is not required to honor the request. See DICOM PS 3.4 and PS 3.17 for further discussion of UPS cancelation.

The Subscriber may choose to perform a Get UPS Workitem Contents to obtain details beyond the brief set included in the notification event message.

#### 4.87.5 Security Considerations

##### 4.87.5.1 Security Audit Considerations

3030 This transaction is not associated with an ATNA Trigger Event.

<i>Modify Request UPS Cancellation [RAD-88]</i>
---

### 4.88 Request UPS Workitem Cancellation [RAD-88]

#### 4.88.1 Scope

3035 This transaction is used by an interested actor to request that a workitem be canceled.

There is no guarantee that the system performing the workitem will be successfully notified of the cancellation request, and there is no obligation for the system performing the workitem to honor the cancellation request.

3040 It is recommended that a system requesting cancellation of a workitem provide as much detail as possible related to the cancellation request. The request itself is asynchronous, so the requesting system is advised to subscribe to the workitem in question if it wishes to know the outcome of the request.

3045 This transaction would not be used by the system performing the workitem since it can simply use the Complete UPS Workitem transaction [RAD-85] to change the workitem to the Canceled state.

#### 4.88.2 Use Case Roles

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

<b>Role:</b>	Requestor:  Requests cancellation of a UPS workitem.
<b>Actor(s):</b>	The following actors may play the role of Requestor:  <b><u>Task Requester</u></b> <b><u>Task Performer</u></b> Workitem Creator Watcher

<b>Role:</b>	<p>Manager:</p> <p>Responds to the request directly if the workitem is not being performed by another system, otherwise notifies the workitem performer of the cancelation request.</p>
<b>Actor(s):</b>	<p>The following actors may play the role of Manager:</p> <p><u>Task Manager</u> Workitem Manager</p>

3050 Transaction text specifies behavior for each Role. The behavior of specific Actors are only specified when it goes beyond that of the general Role.

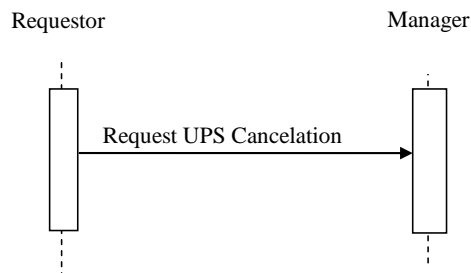
#### 4.88.3 Referenced Standards

DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

DICOM ~~2011~~ PS 3.17: Unified Worklist and Procedure Step - UPS (Informative)

**DICOM PS 3.18: DICOM UPS-RS Worklist Service**

#### 3055 4.88.4 Interaction Diagram



##### 4.88.4.1 Request UPS Cancellation Message

The Requestor sends a request to the Manager of a UPS instance that the workitem be canceled. The actions will depend on what system (if any) is performing the UPS in question.

3060 For workitems still in the SCHEDULED state, the Manager will handle the cancelation request itself as described in DICOM PS 3.4 Annex CC (i.e., typically it will set the workitem state to IN PROGRESS then to CANCELED with appropriate attribute adjustments; however, it is permitted to ignore the request based on its internal logic).

3065 For workitems that are IN PROGRESS, the Manager will attempt to notify the Performer of the cancellation request using a Send UPS Notification [RAD-87] message to the Performer of the workitem.

For workitems that are already in the CANCELED or COMPLETED state, the Request will fail.

The Requestor does not necessarily know which system is actually performing the workitem.

3070 The Manager shall support handling such messages from more than one Requestor. The Requestor may choose to support interacting with workitems on multiple Managers.

#### 4.88.4.1.1 Trigger Events

A user or an automated function on the Requestor determines that it would like a workitem to be canceled.

3075 **A user or an automated function on a Task Performer to which the workitem has been assigned but not yet claimed determines that it does not intend to claim the workitem and wishes to communicate its rejection of the workitem.**

#### 4.88.4.1.2 Message Semantics

##### DICOM RESTful Message Semantics

3080 **The message is a RequestUPSCancellation Action of the DICOM UPS-RS Worklist Service. The Subscriber is the User-Agent, and the Manager is the Origin-Server.**

##### DICOM DIMSE Message Semantics

The message is a Request UPS Cancel N-ACTION request of the DICOM UPS Push SOP Class. The Requestor is the SCU, and the Manager is the SCP.

3085 **The rest of the message semantics and expected actions in this transaction are stated in terms of DICOM Attributes and DIMSE Services. The requirements also apply to RESTful implementations with the correspondence to RESTful semantics described in DICOM PS 3.18 Section 6.9.**

3090 **A Requestor that is rejecting a workitem to which it has been assigned shall set the Procedure Step Discontinuation Reason Code Sequence (0074,100e) to (NONONO, DCM, "Workitem assignment rejected by assigned resource").**

**Comment [OK17]:** TODO Submit a DICOM CP to add this code. Else create an IHE code.

3095 The successful completion of the message means that the request was received, not that the workitem was necessarily canceled. The workitem might not be canceled, and even if it is canceled, it might take some time. If the workitem is canceled, the Requestor will receive a report of the cancellation in the form of a Send UPS Notification message (See RAD TF-3: 4.87) if the Requestor is subscribed to the workitem.

#### 4.88.4.1.3 Expected Actions

The Manager shall respond to the ~~N-ACTION~~ request as described in DICOM PS 3.4 CC.2.2.3 and return appropriate success or failure codes to the Requestor.

The Manager shall notify the performer of the Workitem as described in 4.83.

#### 3100 4.88.5 Security Considerations

Local policy should consider what users and systems have permission to cancel a workitem and configure appropriately.

##### 4.88.5.1 Security Audit Considerations

This transaction is not associated with an ATNA Trigger Event.

3105

<i>Add transaction 3.Y1</i>
-----------------------------

### 3.Y1 Open Event Channel [RAD-Y1]

#### 3.Y1.1 Scope

3110 This transaction is used to open an event channel that can be used to send back events such as notifications.

#### 3.Y1.2 Actor Roles

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

3115

**Table 3.Y1.2-1: Actor Roles**

<b>Role:</b>	Subscriber:  Initiates the channel on which it will receive events.
<b>Actor(s):</b>	The following actors may play the role of Subscriber:  Watcher Workitem Performer Workitem Creator
<b>Role:</b>	Manager:



	Keeps the channel open and uses it to send events to the Subscriber.
<b>Actor(s):</b>	The following actors may play the role of Manager:  Workitem Manager

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.Y1.3 Referenced Standards

- 3120 DICOM PS 3.18: DICOM UPS-RS Worklist Service  
IETF RFC-6455: The WebSocket Protocol

### 3.Y1.4 Interaction Diagram



#### 3.Y1.4.1 Open Event Channel

- 3125 The Subscriber opens a channel to the Manager over which the Manager may subsequently send events such as notifications.

The Subscriber shall support sending such Open Event Channel messages to more than one Manager. The Manager shall support receiving such Open Event Channel messages from each Subscriber it interacts with.

#### 3130 3.Y1.4.1.1 Trigger Events

Several events may trigger an Open Event Channel Message

- The Subscriber intends to subscribe to events from the Manager. (See RAD-86)
  - The Subscriber needs or expects to receive unsolicited events from the Manager.
  - The Subscriber detects that a previously established Event Channel has closed and needs to be re-opened.
- 3135

The Manager is not necessarily buffering/queueing events when the channel is not open. It is in the best interest of the Subscriber that the event channel be opened promptly and maintained.

### 3.Y1.4.1.2 Message Semantics

#### DICOM RESTful Message Semantics

3140 The message is an OpenEventChannel Action of the DICOM UPS-RS Worklist Service. The Subscriber is the User-Agent, and the Manager is the Origin-Server.

#### DICOM DIMSE Message Semantics

There are no DICOM DIMSE Message Semantics. An equivalent of this message is not required before a DIMSE N-EVENT-REPORT message is sent.

3145 For the Manager to be able to associate the correct events with the open channel, it is important that the Subscriber pass the same **AE Title** in the Open Event Channel message that is being passed in the associated transactions, such as Manage UPS Subscription [RAD-86], Create UPS Workitem [RAD-80] and Claim UPS Workitem [RAD-82].

**Comment [OK18]:** Do we need to profile ways to avoid AE Title collisions across the community or perhaps profile HPD as discussed at the top of this document?

### 3.Y1.4.1.3 Expected Actions

3150 The Manager shall respond to the OpenEventChannel Action as described in DICOM PS 3.18 6.9.10. This involves switching to the WebSocket protocol and keeping the connection open for use as an event channel.

The Manager shall use the opened channel when sending subsequent events and notifications (such as RAD-87) to the Subscriber.

### 3155 3.Y1.5 Security Considerations

*<Description of the transaction specific security consideration; such as use of security profiles.>*

**Comment [OK19]:** Advice is welcome.

#### 3.Y1.5.1 Security Audit Considerations

This transaction is not associated with an ATNA Trigger Event.

3160

*This change does not affect RRR-WF. Modify Actor Requirement Sections in the TI Draft of Post-Acquisition Workflow Profile Supplement as shown to align with the new semantics introduced below:*

3165

#### **30.1.1.1 Workitem Manager Actor**

**The Workitem Manager Actor shall implement the DICOM DIMSE Message Semantics of the relevant transactions.**

#### **3170 Workitem Creation**

The Workitem Manager is permitted to create workitems based on its internal logic (and in some installations that may be the primary source of new workitems).

...

#### **30.1.1.2 Workitem Performer Actor**

3175

**The Workitem Performer Actor shall implement the DICOM DIMSE Message Semantics of the relevant transactions.**

#### **Performing System Identification**

3180 Prior to starting work on a claimed workitem, the Workitem Performer shall update the Performed Station Name Code Sequence as described in RAD TF-3: 4.84.4.1.2.1 to identify itself.

...

*Add Actor Requirement Sections in the TI Draft of Post-Acquisition Workflow Profile as shown:*

3185

#### **30.1.1.4 Workitem Creator Actor**

**The Workitem Creator Actor shall implement the DICOM DIMSE Message Semantics of the relevant transactions.**

#### **30.1.1.5 Watcher Actor**

3190

**The Watcher Actor shall implement the DICOM DIMSE Message Semantics of the relevant transactions.**

## Appendices

None