

Integrating the Healthcare Enterprise



5

**IHE Radiology
Technical Framework Supplement**

10

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

15

Trial Implementation

20 Date: December 14, 2015
Author: IHE Radiology Technical Committee
Email: radiology@ihe.net

25

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

Foreword

30 This is a supplement to the IHE Radiology Technical Framework V14.0. 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 December 14, 2015 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the Radiology
35 Technical Framework. Comments are invited and may be submitted at http://ihe.net/Radiology_Public_Comments.

This supplement describes changes to the existing technical framework documents.

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

40

<i>Amend Section X.X by the following:</i>
--

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.

45

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

Information about the IHE Radiology domain can be found at: 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 and
50 <http://ihe.net/Profiles>.

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

CONTENTS

55	Introduction to this Supplement.....	8
	Open Issues	8
	Closed Issues	8
	General Introduction	12
60	Appendix A - Actor Summary Definitions	12
	Appendix B - Transaction Summary Definitions	12
	Glossary	12
	Volume 1 – Profiles	13
40	Radiology Remote Reading Workflow (RRR-WF) Profile.....	13
65	40.1 RRR-WF Actors, Transactions, and Content Modules.....	13
	40.1.1 Actor Descriptions and Actor Profile Requirements.....	15
	40.1.1.1 Task Requester	15
	40.1.1.2 Task Manager	16
	40.1.1.3 Task Performer	16
70	40.1.1.4 Watcher.....	17
	40.2 RRR-WF Actor Options.....	17
	40.2.1 XDS Option.....	18
	40.2.2 DICOMweb Option.....	19
	40.2.3 DICOM Option	20
75	40.3 RRR-WF Required Actor Groupings.....	21
	40.4 RRR-WF Overview.....	21
	40.4.1 Concepts.....	21
	40.4.1.1 Reading Tasks.....	21
	40.4.1.2 Codesets	23
80	40.4.1.3 Preliminary vs Final Reports	25
	40.4.1.4 Urgent Reads.....	25
	40.4.1.5 "Performer" of the Reading Task.....	26
	40.4.1.6 Workitem Notifications and Subscriptions.....	26
	40.4.1.7 Over-Filtering	27
85	40.4.1.8 Workflow vs Data Flow.....	28
	40.4.1.9 Assigned vs Claimed.....	28
	40.4.1.10 Multiple Patient ID Domains.....	28
	40.4.1.11 Locations of Inputs and Outputs.....	30
	40.4.1.12 Additional Outputs	30
90	40.4.1.13 Single Read Request vs. Multiple Read Request	31
	40.4.1.14 Addendums.....	32
	40.4.1.15 Community Worklists	33
	40.4.2 Use Cases	33
	40.4.2.1 Use Case #1: Open Worklist	33
95	40.4.2.1.1 Open Worklist Use Case Description.....	33
	40.4.2.1.2 Open Worklist Process Flow	34

	40.4.2.2 Use Case #2: Assigned Read.....	36
	40.4.2.2.1 Assigned Read Use Case Description.....	36
	40.4.2.2.2 Assigned Read Process Flow.....	38
100	40.4.2.3 Use Case #3: Report Addendum.....	40
	40.4.2.3.1 Report Addendum Use Case Description.....	40
	40.4.2.3.2 Report Addendum Process Flow.....	40
	40.4.2.4 Use Case #4: Re-assignment.....	42
	40.4.2.4.1 Re-assignment Use Case Description.....	42
105	40.4.2.4.2 Re-assignment Process Flow.....	43
	40.4.2.5 Use Case #5: Cancelation.....	44
	40.4.2.5.1 Cancelation Use Case Description.....	44
	40.4.2.5.2 Cancelation Process Flow.....	45
	40.4.2.6 Use Case #6: Failure.....	46
110	40.4.2.6.1 Failure Use Case Description.....	46
	40.4.2.6.2 Failure Process Flow.....	46
	40.5 RRR-WF Security Considerations.....	48
	40.6 RRR-WF Cross Profile Considerations.....	49
	Volume 3 – Transactions.....	51
115	4.80 Create UPS Workitem [RAD-80].....	51
	4.80.1 Scope.....	51
	4.80.2 Use Case Roles.....	51
	4.80.3 Referenced Standards.....	52
	4.80.4 Interaction Diagram.....	52
120	4.80.4.1 Request UPS Creation Message.....	52
	4.80.4.1.1 Trigger Events.....	53
	4.80.4.1.2 Message Semantics.....	53
	4.80.4.1.2.1 UPS Attribute Requirements.....	53
	4.80.4.1.2.2 Examples for the Use of Attributes.....	54
125	4.80.4.1.2.3 Work Items for Remote Radiology Reporting Tasks.....	54
	4.80.4.1.3 Expected Actions.....	54
	4.80.5 Security Considerations.....	55
	4.80.5.1 Security Audit Considerations.....	55
	4.81 Query UPS Workitems [RAD-81].....	55
130	4.81.1 Scope.....	55
	4.81.2 Use Case Roles.....	55
	4.81.3 Referenced Standards.....	56
	4.81.4 Interaction Diagram.....	56
	4.81.4.1 Query for UPS Workitems Message.....	57
135	4.81.4.1.1 Trigger Events.....	57
	4.81.4.1.2 Message Semantics.....	57
	4.81.4.1.2.1 Matching Keys and Return Keys.....	57
	4.81.4.1.2.2 Examples for the Use of Matching Key Attributes.....	60
	4.81.4.1.3 Expected Actions.....	61
140	4.81.4.2 Return UPS Workitems Message.....	61

	4.81.4.2.1 Trigger Events	61
	4.81.4.2.2 Message Semantics.....	61
	4.81.4.2.3 Expected Actions	62
	4.81.5 Security Considerations.....	62
145	4.81.5.1 Security Audit Considerations.....	62
	4.82 Claim UPS Workitem [RAD-82].....	62
	4.82.1 Scope	62
	4.82.2 Use Case Roles.....	62
	4.82.3 Referenced Standards.....	63
150	4.82.4 Interaction Diagram.....	63
	4.82.4.1 Change UPS State Message.....	64
	4.82.4.1.1 Trigger Events	64
	4.82.4.1.2 Message Semantics.....	64
	4.82.4.1.3 Expected Actions	65
155	4.82.5 Security Considerations.....	65
	4.82.5.1 Security Audit Considerations.....	65
	4.83 Get UPS Workitem Contents [RAD-83].....	66
	4.83.1 Scope	66
	4.83.2 Use Case Roles.....	66
160	4.83.3 Referenced Standards.....	66
	4.83.4 Interaction Diagram.....	67
	4.83.4.1 Request UPS Contents Message.....	67
	4.83.4.1.1 Trigger Events	67
	4.83.4.1.2 Message Semantics.....	67
165	4.83.4.1.2.1 UPS Attribute Requirements.....	68
	4.83.4.1.3 Expected Actions	68
	4.83.4.2 Return UPS Contents Message.....	68
	4.83.4.2.1 Trigger Events	68
	4.83.4.2.2 Message Semantics.....	68
170	4.83.4.2.3 Expected Actions	69
	4.83.5 Security Considerations.....	69
	4.83.5.1 Security Audit Considerations.....	69
	4.84 Update UPS Workitem [RAD-84].....	69
	4.84.1 Scope	69
175	4.84.2 Use Case Roles.....	69
	4.84.3 Referenced Standards.....	70
	4.84.4 Interaction Diagram.....	70
	4.84.4.1 Request UPS Update Message	70
	4.84.4.1.1 Trigger Events	71
180	4.84.4.1.2 Message Semantics.....	71
	4.84.4.1.2.1 UPS Attribute Requirements.....	71
	4.84.4.1.2.2 Examples for the Use of Attributes.....	72
	4.84.4.1.3 Expected Actions	72
	4.84.5 Security Considerations.....	72

185	4.84.5.1 Security Audit Considerations.....	72
	4.85 Complete UPS Workitem [RAD-85].....	72
	4.85.1 Scope	72
	4.85.2 Use Case Roles.....	73
	4.85.3 Referenced Standards.....	73
190	4.85.4 Interaction Diagram.....	74
	4.85.4.1 Change UPS State Message.....	74
	4.85.4.1.1 Trigger Events	74
	4.85.4.1.2 Message Semantics.....	74
	4.85.4.1.3 Expected Actions	75
195	4.85.5 Security Considerations.....	75
	4.85.5.1 Security Audit Considerations.....	75
	4.86 Manage UPS Subscription [RAD-86].....	75
	4.86.1 Scope	75
	4.86.2 Use Case Roles.....	76
200	4.86.3 Referenced Standards.....	76
	4.86.4 Interaction Diagram.....	77
	4.86.4.1 Subscribe/Unsubscribe UPS Message	77
	4.86.4.1.1 Trigger Events	77
	4.86.4.1.2 Message Semantics.....	77
205	4.86.4.1.3 Expected Actions	78
	4.86.5 Security Considerations.....	78
	4.86.5.1 Security Audit Considerations.....	78
	4.87 Send UPS Notification [RAD-87]	79
	4.87.1 Scope	79
210	4.87.2 Use Case Roles.....	79
	4.87.3 Referenced Standards.....	79
	4.87.4 Interaction Diagram.....	80
	4.87.4.1 Send UPS Notification Message	80
	4.87.4.1.1 Trigger Events	80
215	4.87.4.1.2 Message Semantics.....	81
	4.87.4.1.3 Expected Actions	81
	4.87.5 Security Considerations.....	82
	4.87.5.1 Security Audit Considerations.....	82
	4.88 Request UPS Workitem Cancellation [RAD-88].....	82
220	4.88.1 Scope	82
	4.88.2 Use Case Roles.....	82
	4.88.3 Referenced Standards.....	83
	4.88.4 Interaction Diagram.....	83
	4.88.4.1 Request UPS Cancellation Message.....	83
225	4.88.4.1.1 Trigger Events	84
	4.88.4.1.2 Message Semantics.....	84
	4.88.4.1.3 Expected Actions	85
	4.88.5 Security Considerations.....	85

	4.88.5.1 Security Audit Considerations.....	85
230	3.109 Open Event Channel [RAD-109].....	85
	3.109.1 Scope	85
	3.109.2 Actor Roles.....	85
	3.109.3 Referenced Standards	86
	3.109.4 Interaction Diagram.....	86
235	3.109.4.1 Open Event Channel.....	86
	3.109.4.1.1 Trigger Events	86
	3.109.4.1.2 Message Semantics	87
	3.109.4.1.3 Expected Actions	87
	3.109.5 Security Considerations.....	87
240	3.109.5.1 Security Audit Considerations.....	87

Introduction to this Supplement

245 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.

250 The profile specifies transactions for workflow management that are based on the RESTful worklist service defined by DICOM^{®1} UPS-RS. The profile also specifies (as Named Options) transactions for accessing the inputs to the reading task and storing the outputs from the reading task. The Named Options permit the use of XDS-I, RESTful DICOM, or Conventional DIMSE DICOM.

Several DICOM Change Proposals related to this profile are in progress and should be tracked by implementers:

- CP1534 - Add DICOM Code for Workitem Assignment Rejection.
- 255 • CP1555 - Add DICOM Codes for Requested Report Types; these will supercede the codes in section 40.4.1.2
- CP1556 - Add DICOM Codes for Modality/Specialty Reads; these will supercede the codes in section 40.4.1.2
- CP1557 - Add UPS Assigned Notification Event Type
- 260 • CP1558 - Add UPS Requesting Station Name Code Sequence

Open Issues

1. IHE Radiology is working on a second profile for 2016. When completed, it will also address distributed reporting of DICOM images but will manage the workflow using documents (XDW) rather than the RESTful worklist mechanism profiled here. Care will
265 be taken to maintain alignment/coherence between the two profiles.

Closed Issues

1. Should we address both Assigned (Push) and Self-selected (Pull) Workflow?
A: Yes.
270 Some communities will reasonably want one, some the other, and some might mix both.
2. Should Preliminary/Final read be a parameter or pre-coordinated in request codes?
A: Parameter

¹ DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

275 Profile usage of SPS Parameters Sequence to indicate if preliminary/final/both reports are desired. Pre-coordinating in the Workitem Code would triple the list (3 codes for each type of task) and it's likely to be a second order filter.

2. Should the named options migrate into the Actor Requirements instead?

A: No.

280 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"

3. How should the Task Manager determine the NPI(s) of each Task Performer?

A: Out of Scope.

285 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
290 country/jurisdiction.

4. Should one of the Data Access Options be made a required baseline?

A: Yes. Make DICOM baseline.

295 Most XDS-I implementations support DICOM DIMSE, many as their primary data transfer mechanism. Pre-XDS implementations use DICOM DIMSE by default so it's a good place to start.

We do encourage support of XDS and DICOMweb as the path forward and as those get adopted we can relax the DIMSE baseline requirement.

- 300 5. Can we leave enforcement of credentialing out of scope?

A: Yes. Out of scope.

305 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.

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

A: Yes.

310 Additional text provided by Kinson added to 40.5

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

A: Yes

315 To the extent that the Task Manager needs to be aware of Task Requesters and Task Performers before they interact with the Task Manager, it is less complex to handle it initially by configuration. In a sense, the Task Performer "registers" when it sets up a filtered subscription for itself. DHCP or HPD might provide more automated solutions.

8. What references/considerations to Sup155 should we add here?

320 A: None for now.

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

9. Do we need to encode reader credential requirements in the scheduled workitem?

325 A: No.

To a certain degree (no pun intended) the required qualification is implicit in the Imaging Procedure Code etc. The use of HPD might be tackled as a separate profile or option.

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

330 A: No. Not right now.

11. Should we add an option for XCA transport?

How would it differ from XDS for the Task Requester and Performer?

335 A: No. Not right now.

12. Should we add an option or discussion of PDI transport?

UPS supports a Media Retrieval Path.

A: No option right now. Can mention the mechanism.

13. Is it an issue to require support of application/json as the baseline for UPS-RS?

340 A: No issue. JSON should be required.

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.

14. What should the Performer update in the UPS at start of performance?

345 A: Human Performer's Organization (0040,4036) in addition to Human Performer Code Sequence and Performed Station Name Code Sequence.

Current UPS semantics require:

- Fill Actual Human Performer if human did work

350 - Fill Performed Station Name Code Sequence with AE-Title

15. Should we set a baseline format for reports? CDA®? PDF? Text?

Or leave that as an implementation detail?

A: No baseline.

355 There is not a clear basis currently for choosing one as the baseline.

16. What should the DICOM Option require from Task Requesters that claim it?

360 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 Task Requester to do that. It talks about our legacy report transactions. We need to start converging on Sup155 CDA®, but what transports are reasonable to promote?

17. Is guidance needed on how to indicate prelim/final in the various report formats?

365 A: No.

 The mechanism may differ depending on the report document format. Such guidance belongs where those formats are profiled.

18. 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?

370 A: Yes.

375 DICOM CP1557 will add Event Type (5) - UPS Assigned which gets sent when assignment parameters (station, organization, human) are set. A receiver of a Type 5 notification is advised to Get the UPS and either claim it or reject the assignment. Notifications of new instance creation (filtered, global or otherwise) will continue to be Event Type (1).

 Advise performers to set up an initial filtered subscription for their AETitle, Organization Name, and potentially Human Names/Codes as a way of "registering".

380

General Introduction

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

385 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

390

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

Transaction	Definition
Open Event Channel [RAD-109]	Opens an event channel that can be used to send back events such as notifications.

Glossary

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

395 None

Volume 1 – Profiles

40 Radiology Remote Reading Workflow (RRR-WF) Profile

400 The Radiology Remote Reading Workflow Profile 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.

405 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.

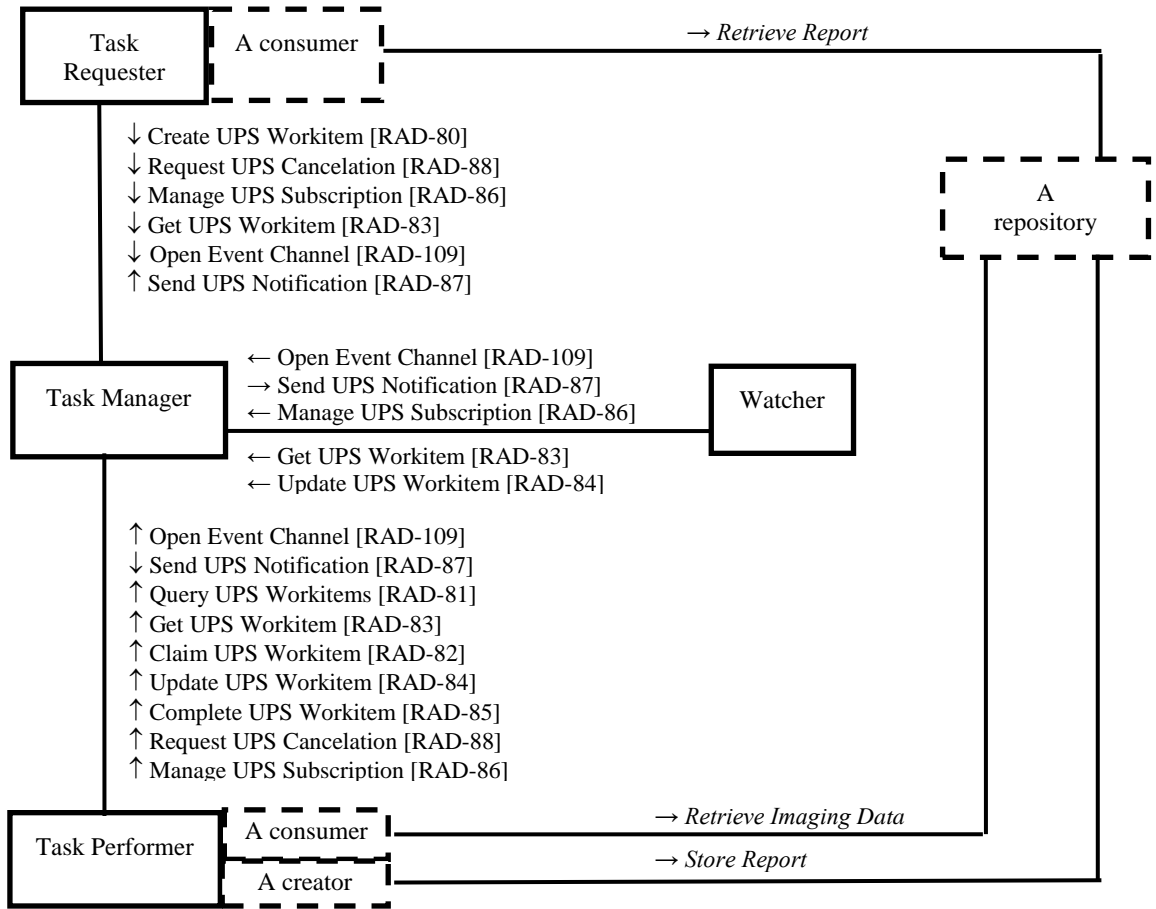
410 Remote Reading Workflow is the practice of having medical images interpreted (read) by a reading specialist who is not present at the site where the imaging study was acquired. This is particularly important for subspecialties like Nuclear Medicine or Neuro-radiology where these professionals are generally located at large institutions in major metropolitan areas. 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.

415 With the introduction of cross-enterprise document and image sharing profiles, such as XDS and 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.

40.1 RRR-WF Actors, Transactions, and Content Modules

420 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/.

425 Figure 40.1-1 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 due to their participation in other related profiles are shown in dotted lines. Actors which have a mandatory grouping are shown in conjoined boxes. Italicized transaction names are placeholders indicating an expected communication, but the specific transaction will depend on the options and/or other profiles the actor chooses to implement.



430

Figure 40.1-1: RRR-WF Actor Diagram

Table 40.1-1 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”).

435

Table 40.1-1: 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-109]	R	RAD TF-3: 3.109
	Send UPS Notification [RAD-87]	R	RAD TF-3: 3.87
	Get UPS Workitem [RAD-83]	R	RAD TF-3: 3.83
	Request UPS Cancellation [RAD-88]	O	RAD TF-3: 3.88

Actors	Transactions	Optio nality	Reference
	Manage UPS Subscription [RAD-86]	O	RAD TF-3: 3.86
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-109]	R	RAD TF-3: 3.109
	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-109]	R	RAD TF-3: 3.109
	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]	R	RAD TF-3: 3.86
Watcher	Manage UPS Subscription [RAD-86]	R	RAD TF-3: 3.86
	Open Event Channel [RAD-109]	R	RAD TF-3: 3.109
	Send UPS Notification [RAD-87]	R	RAD TF-3: 3.87
	Get UPS Workitem [RAD-83]	O	RAD TF-3: 3.83
	Update UPS Workitem [RAD-84]	O	RAD TF-3: 3.84

40.1.1 Actor Descriptions and Actor Profile Requirements

440 Most requirements are documented in Transactions (Volumes 2 & 3). This section documents any additional requirements on profile's actors.

Also note that DICOM PS3.4 CC.4 instructs implementations of UPS to document "special behaviors" in their conformance statements. Various details related to implementation of this profile qualify so implementers are reminded to add appropriate text to product conformance statements.

445

40.1.1.1 Task Requester

The Task Requester shall implement the DICOM RESTful Message Semantics of the transactions listed in Table 40.1-1 which have RESTful Message Semantics. As a baseline, a

450 Content-Type of application/json shall be supported; application/dicom+xml may additionally be supported.

The Task Requester shall be able to configure 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.

455 The Task Requester shall populate the Issuer of Patient ID (0010,0021) for Patient IDs provided in the reading task. The Task Requester is recommended to also populate the Issuer of Patient ID Qualifiers Sequence (0010,0024).

The Task Requester shall populate the Issuer of Accession Number Sequence (0008,0051) for Accession Numbers provided in the reading task.

460 The Task Requester shall populate the Requesting Station Name Code Sequence in the reading task to facilitate future notification of the Task Requester in the event that an addendum to the report is created after completion of the reading task.

40.1.1.2 Task Manager

465 The Task Manager shall implement the DICOM RESTful Message Semantics of the transactions listed in Table 40.1-1 which have RESTful Message Semantics. As a baseline, a Content-Type of application/json shall be supported; application/dicom+xml may additionally be supported.

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

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

The Task Manager shall support Filtered Global Subscriptions in the Manage UPS Subscriptions [RAD-86] transaction.

Worklist Maintenance

475 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.

40.1.1.3 Task Performer

480 The Task Performer shall implement the DICOM RESTful Message Semantics of the transactions listed in Table 40.1-1 which have RESTful Message Semantics. As a baseline, a Content-Type of application/json shall be supported; application/dicom+xml may additionally be supported.

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.

485 The Task Performer shall include in the instances that are referenced in the Output Information Sequence all patient ID/Issuer pairs from the reading task Workitem and from the Input Instances.

The Task Requester shall support the DICOM Option (See 40.2.3).

Performing System Identification

490 The Task Performer shall update the Human Performer's Organization (0040,4036) upon to starting work on a claimed workitem to identify the performing organization. If known, the Task Performer shall also update the Human Performer Code Sequence (0040,4026). The Task Performer shall also update the Progress Information Sequence (0074,1002), for example by setting the Procedure Step Progress Description (0074,1006) to "Reading". This will result in
 495 progress notification events being sent by the Task Manager to subscribers letting them know that work has begun on the claimed item. If they get the workitem they may also see who is performing the work.

Note that RAD-84 already requires the Performer to update the Performed Station Name Code Sequence to identify itself as described in RAD TF-3: 4.84.4.1.2.1.

500 **40.1.1.4 Watcher**

The Watcher shall implement the DICOM RESTful Message Semantics of the transactions listed in Table 40.1-1 which have RESTful Message Semantics. As a baseline, a Content-Type of application/json shall be supported; application/dicom+xml may additionally be supported.

505 A Watcher which is being used to decide and assign tasks to Performers would need to implement the Get UPS Workitem [RAD-83] and Update UPS Workitem [RAD-84] transactions.

40.2 RRR-WF Actor Options

Options that may be selected for each actor in this profile, if any, are listed in the Table 40.2-1. Dependencies between options when applicable are specified in notes.

510

Table 40.2-1: Radiology Remote Reading Workflow - Actors and Options

Actor	Option Name	Reference
Task Requester	XDS Option	RAD TF-1:40.2.1
	DICOMweb Option	RAD TF-1:40.2.2
	DICOM Option	RAD TF-1:40.2.3
Task Manager	No options defined	--
Task Performer	XDS Option	RAD TF-1:40.2.1
	DICOMweb Option	RAD TF-1:40.2.2
	DICOM Option	RAD TF-1:40.2.3
Watcher	No options defined	--

The options address the different mechanisms that may be used for "data flow" to access the input data used in reading and to store and access the output data that results from reading.

515 These options require that the Task Performer be symmetrically able to both retrieve and store instances using a given mechanism. The purchaser of devices for a given deployment must ensure that the Task Requester and the Task Performer have implemented the same mechanism (i.e., the same option).

Note that it is not required that deployment projects adopt symmetrical data mechanisms.

520 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, allowing the Task Performer to use the retrieval method it prefers.

525 The Output Destination Sequence (0040,4070) allows a Task Requester to request that the Task Performer store the resulting instances to a particular destination, for example a destination that is convenient to or preferred by the Task Requester. Although the Task Performer is not guaranteed to be able to support the requested mechanism or be configured for the requested destination, it will generally try to comply with the request. Failing that, a sensible approach for Task Performers would be to export reports using the same mechanism and servers from which
530 prior reports or other inputs were imported, unless otherwise configured. Typically such decisions and details are handled when the sharing community is established.

Defining how the input images and evidence documents get to the location which the Task Requester references in the Input Information Sequence of the created read request, and from which the Task Performer retrieves, is outside the scope of this profile. The Task Requester is
535 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 workflow. As a result, the following options will describe requirements on the Task Requester to pull reports but will not require pushing images. See also 40.4.1.11 Locations of Inputs and Outputs.

540 Note that in the following options it is possible the Task Requester or the Task Performer may be grouped with an appropriate storage actor and may hold instances locally and reference itself in the associated retrieval sequence for input or output information. This is a valid feature, however to claim the associated option, the actor must still be able to interact with an external storage actor as described since any given deployment project may require use of external storage actors.

545 **40.2.1 XDS Option**

This option specifies the ability to use 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.

550 A Task Performer that claims the XDS Option shall implement the Retrieve Imaging Document Set [RAD-69] transaction as the Imaging Document Consumer and the Provide and Register

Imaging Document Set – MTOM/XOP [RAD-68] transaction as the Imaging Document Source. The Task Performer may also choose to implement the WADO Retrieve [RAD-55] transaction as the Imaging Document Consumer.

555 The Task Performer shall be capable of retrieving any instances identified with an XDS Retrieval Sequence in the workitem Input Information Sequence.

560 The Task Performer shall be capable of storing 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. For reports, this may involve either submitting CDA® documents directly, or wrapping CDA® documents into DICOM instances. CDA® templates and implementation guidance for encoding Imaging Reports are documented in DICOM PS3.20.

565 The Task Requester is advised to populate the Referenced SOP Sequence inside the Input Information Sequence with each of the image instances to be read, and to reference the Image Document Source in the XDS Retrieval Sequence. This facilitates the use of RAD-69 by the Task Performer to retrieve the image instances. The alternative would be to populate the Referenced SOP Sequence with a manifest instance and reference the corresponding XDS Repository, which would require the Task Performer to use ITI-43 to get and parse the manifest prior to doing the same set of RAD-69 calls.

570 A Task Requester that claims the XDS Option shall implement the Retrieve Imaging Document Set [RAD-69] transaction as the Imaging Document Consumer and the Retrieve Document Set [ITI-43] transaction as the Document Consumer.

The Task Requester shall be capable of retrieving any reports identified with an XDS Retrieval Sequence in a workitem Output Information Sequence.

575 Note that all non-DICOM instances referenced in the Input Information Sequence and Output Information Sequence should use a value of CDA® for the Type of Instances (0040,E020). This indicates the type of UID that will be used to identify the instance. The actual format of the document will be communicated in the mimeType attribute of the metadata in the response to the XDS retrieve request as described in transaction ITI-43.

40.2.2 DICOMweb Option

580 This option specifies the ability to use 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.

585 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 in the role of Sender.

The Task Performer shall be capable of retrieving any instances identified in the workitem Input Information Sequence with a WADO-RS Retrieval Sequence.

590 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. For reports, this may involve wrapping CDA® documents into DICOM instances. CDA® templates and implementation guidance for encoding Imaging Reports are documented in DICOM PS3.20.

595 Note: The specification of RAD-107 can be found in the Trial Implementation Supplement of the Mobile access to Health Documents for Imaging Profile, and the specification of RAD-108 can be found in the Trial Implementation Supplement of the Web Image Capture Profile.

A Task Requester that claims the DICOMweb Option shall implement the WADO-RS Retrieve [RAD-107] transaction as the Imaging Document Consumer.

600 The Task Requester shall be capable of retrieving any reports identified in a workitem Output Information Sequence with a WADO-RS Retrieval Sequence.

40.2.3 DICOM Option

This option specifies the ability to use conventional DIMSE 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.

605 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.

610 The Task Performer shall be capable of storing any relevant output documents to a DICOM server and identifying them in the workitem Output Information Sequence with a DICOM Retrieval Sequence. For reports, this may involve wrapping CDA® or PDF documents into DICOM instances. CDA® templates and implementation guidance for encoding Imaging Reports are documented in DICOM PS3.20.

615 Note that Task Performers are expected to implement other retrieval transactions, such as Retrieve Presentation States [RAD-17], Retrieve Reports [RAD-27], Retrieve Key Image Notes [RAD-31], Retrieve Evidence Documents [RAD-45], and Retrieve Dose Information [RAD-65], as necessary for the types of reads performed by their users.

620 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.

The Task Requester shall also be capable of handling reports provided as DICOM-wrapped PDF and DICOM-wrapped CDA® documents.

625 **40.3 RRR-WF Required Actor Groupings**

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).

630 Section 40.5 describes some optional groupings that may be of interest for security considerations and Section 40.6 describes some optional groupings in other related profiles.

Table 40.3-1: Radiology Remote Reading Workflow - Required Actor Groupings

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

40.4 RRR-WF Overview

635 **40.4.1 Concepts**

Reading tasks are described in "workitem" objects.

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.

640 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.

40.4.1.1 Reading Tasks

645 Some key details which a Task Requester can include in the workitem for a reading task are:

Table 40.4.1-1: Reading Task Attributes

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)
Modality required (e.g., CT, MR, etc.)	Scheduled Workitem Code Sequence (0040,4018) and Scheduled Processing Parameters Sequence (0074,1210)
Sub-specialty required (e.g., NM, Neuro, etc.)	Scheduled Workitem Code Sequence (0040,4018) and Scheduled Processing Parameters Sequence (0074,1210)
Procedure being reported (the "orderable")	Requested Procedure Code Sequence (0032,1064)
Body System/Part	Scheduled Processing Parameters Sequence (0074,1210)
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)
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)
Evidence Documents	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)
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 or Collaboration Group	Scheduled Human Performers Sequence (0040,4034)

650 The Task Requester is expected to populate the above attributes adequately; to properly communicate the nature of the reading task, to facilitate appropriate assignment of the task, or to

facilitate Task Performers being able to efficiently query or subscribe for relevant tasks. Specifically, the Task Requester is expected to populate most, if not all, of the content items described in 40.4.1.2 and to aid flexible queries, replicate the value of either the (RRR004, 99IHE, "Modality to Read") content item or the (RRR005, 99IHE, "Specialty to Read") content item into the Scheduled Workitem Code Sequence (0040,4018).

A Task Performer, which might be handling tasks for a particular reader, several readers, or an entire reading practice, can use the above attributes to query for appropriate types of studies, or alternatively to subscribe to be notified when appropriate types of studies are posted to the worklist.

A Task Performer might, for example, query or subscribe for workitems that are Ultrasound studies and Cardiac specialty, or perhaps all CT studies without filtering on specialty, or all Neurology studies without filtering on modality. Also, Task Performers may do further "local filtering" by examining additional attributes of the workitem to decide which to present to the human reader and how to sort them.

40.4.1.2 Codesets

The Scheduled Workitem Code Sequence (0040,4018) contains a code communicating the nature of the reading task. The Scheduled Processing Parameters Sequence (0074,1210) contains items encoding specific details of the reading task, such as the modality and radiological specialty involved, and whether a final and/or preliminary report is requested. The Requested Procedure Code Sequence (0032,1064) contains a code describing the specific imaging procedure the reader is being asked to interpret.

While this profile does not mandate the use of particular codesets for the Workitem Code and Processing Parameter Codes, agreeing on a common codeset will be a key pre-requisite of any deployment of this profile. The codes in Tables 40.4.1.2-1, 40.4.1.2-2 and 40.4.1.2-3 are provided as a recommended starting point. Deployments may add codes (using their own coding scheme designator) to address additional modalities and specialties.

To communicate that the task is to read a particular primary modality, the Scheduled Processing Parameters Sequence (0074,1210) may contain an item with a concept code of (RRR004, 99IHE, "Modality to Read") and a value from Table 40.4.1.2-3.

Table 40.4.1.2-1: Modality-to-Read Code Values

Coding Scheme	Code Value	Code Meaning
99IHE	ReadCT	Read CT Study
99IHE	ReadMG	Read Mammography Study
99IHE	ReadMR	Read MR Study

Coding Scheme	Code Value	Code Meaning
99IHE	ReadNM	Read NM Study
99IHE	ReadPET	Read PET Study
99IHE	ReadUS	Read Ultrasound Study
99IHE	ReadXR	Read XR Study

685

To communicate that the task is to read a particular radiological specialty, the Scheduled Processing Parameters Sequence (0074,1210) may contain an item with a concept code of (RRR005, 99IHE, "Specialty to Read") and a value from Table 40.4.1.2-3.

690

Table 40.4.1.2-2: Specialty-to-Read Code Values

Coding Scheme	Code Value	Code Meaning
99IHE	Abdomen	Abdominal
99IHE	Cardiac	Cardiac
99IHE	HeadNeck	Head and Neck
99IHE	MSK	Musculoskeletal
99IHE	Neuro	Neurology
99IHE	OBGyn	Obstetrics/Gynecology
99IHE	Oncology	Oncology
99IHE	Thoracic	Thoracic
99IHE	Pediatric	Pediatric
99IHE	Vascular	Vascular

To communicate that the task is to produce a particular type of report, the Scheduled Processing Parameters Sequence (0074,1210) may contain an item with a concept code of (RRR000, 99IHE, "Report Requested") and a value from Table 40.4.1.2-3.

695

Table 40.4.1.2-3: Requested Report Type Code Values

Coding Scheme	Code Value	Code Meaning
99IHE	RRR001	Preliminary Report Only
99IHE	RRR002	Final Report Only
99IHE	RRR003	Final Report With Fast Preliminary

700 Both the Requested Procedure Code Sequence (0032,1064) and the Specialty content item in the Scheduled Processing Parameters Sequence (0074,1210) contain values that may give a general sense of the anatomy being reported. The headers of the images referenced in the Input Information Sequence (0040,4021) may contain additional details. If additional anatomical detail would be useful for claiming or assigning tasks, implementations may choose to include a specific anatomy content item in the Scheduled Processing Parameters Sequence.

705 To communicate a specific anatomic region that is the target of the study, the Scheduled Processing Parameters Sequence (0074,1210) may contain an item with a concept code of (123014, DCM, "Target Region") and a value drawn from DICOM CID 4 "Anatomic Region". As with the Workitem Code, a deployment may choose to supplement or constrain the set of codes used.

710 To communicate that a study is for screening purposes (for example, screening mammography or CT lung screening studies), the Reason for Requested Procedure Code Sequence (0040,100A) may contain an item with a concept code of (R-42453, SRT, "Screening") and Task Performers can query or subscribe appropriately.

40.4.1.3 Preliminary vs Final Reports

715 Some reading tasks are intended to result in a final report. Others may only require a preliminary report, for example a request to a Nighthawk service might ask for a preliminary read only because the local radiologist will generate a final report the next day. And some requests may require a final report but due to urgency may want a preliminary report too if it can be made available more quickly.

720 Table 40.4.1.2-3 lists values which may be used for the Report Requested content item in the Scheduled Processing Parameters Sequence (0074,1210). The Task Performer is expected to examine this parameter to understand what to return.

725 When a Final Report With Fast Preliminary is requested, the reporting task is complete when the Final Report is made available, regardless of whether a Preliminary Report was made available or not. The Task Performer can indicate that the preliminary report is available by updating the Output Information Sequence to reference it and updating the Progress to say "Preliminary Report Available" but leaving the state of the workitem as IN PROGRESS.

When a Final Report Only is requested, the Task Performer might still produce a preliminary report as part of the process for generating the final report, but the Task Requester has no interest in that preliminary report and does not expect it to be returned.

730 40.4.1.4 Urgent Reads

Some reading tasks may be urgent and 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:

- 735
- Urgency = STAT
 - Attending Physician = the ED physician
 - Report Requested = 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
- 740 time to populate them.

Note that reconciliation of the Preliminary Read with the Final Read will need to be done. However, this is 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.

745 **40.4.1.5 "Performer" of the Reading Task**

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

750 In some implementations the Task Performer may function as a type of proxy. For example, the Task Performer system might retrieve the images (and other inputs such as evidence documents) 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

755 the clinical content produced back to the values in the workitem.

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

40.4.1.6 Workitem Notifications and Subscriptions

A variety of needs call for sending notifications about workitems.

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

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

765 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.

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

- 770 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 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.
- 775 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. 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.
- 780 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 specific workitems. Task Performers are automatically subscribed to workitems that have been assigned to them by the Task Requester or some scheduling system. Task Requesters may be automatically subscribed to workitems they create.
- 785 Filtered Global 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 already assigned (to avoid wasting time on them or disrupting others). This has the advantage that a Task Performer can wait for a notification rather than repeatedly
- 790 querying.

40.4.1.7 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 filtering on more than the criteria provided in the query, this is referred to in this profile as "over-filtering".

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

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 Section 40.6.

800 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.

805

810 Over-filtering can apply to filtered notifications as well as query responses. For example, a Task
811 Manager might omit notifications to AE-Titles for tasks that are assigned to someone else, and
812 might have a configurable list for AE-Titles that would receive such notifications anyway (to
813 support dashboards or analytics data collectors).

40.4.1.8 Workflow vs Data Flow

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

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

40.4.1.9 Assigned vs Claimed

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

835 The profile permits a variety of systems (Task Requester, Task Manager, Watcher) to assign a
836 workitem (see "Assign Workitem to Task Performer" in Section 40.4.2.2.1), however only a
837 Task Performer may Claim the workitem. In the Open Worklist case, the workitem is not
838 assigned prior to being claimed.

840 The Task Performer claims the workitem to accept and take control of the associated task. When
841 it claims the workitem, the Task Performer changes the state of the workitem to IN PROGRESS;
842 however, no actual progress is recorded in the UPS Progress Information module yet. When
843 actual work on the task begins, the Task Performer updates the progress fields of the workitem to
844 make this visible to the Task Requester, Task Manager and Watchers and results in progress
845 notification events being sent to subscribed systems.

40.4.1.10 Multiple Patient ID Domains

845 The patient that is the subject of a reading task may have been issued IDs by multiple different
846 organizations. For example the patient may have one ID issued by the organization which
847 performed the image acquisition, a second ID issued by a regional image sharing community,

and perhaps a third ID issued by the site where the reading is performed. Such IDs are distinguished by the Issuer of Patient ID (0010,0021) attribute.

850 Like most patient-related DICOM instances, a UPS Workitem can have any number of IDs & Issuers in the Other Patient IDs Sequence (0010,1002) in addition to the "primary" ID & Issuer that is outside that sequence.

855 The Task Requester will likely include in the Workitem the same patient IDs & Issuers that are included in the referenced instances and metadata. Some deployments may find it useful to have a policy requiring Task Requesters to be grouped with a PIX Consumer and specifically include the Affinity Domain patient ID in the tasks they create, perhaps specifically as the primary Patient ID. Similarly, other deployments, such as small imaging centers in a large affinity domain, may find it useful to require Task Requesters to be grouped with a PDQ Consumer to allow them to find and include the Affinity Domain patient ID when the PIX Manager does not map their local IDs.

860 The Task Performer does not frequently query based on patient ID, but such queries do happen occasionally, for example when a patient is transferred. If the radiologist is asked to skip to a particular requested patient and the name is insufficient, the ID they are provided to perform their query should logically be one of the Patient IDs included by the Task Requester.

865 When a query is made based on Patient ID & Issuer, the Task Manager is required to identify tasks with a matching ID and Issuer that were communicated in either the primary Patient ID or the Other Patient IDs Sequence. The Task Manager is permitted, but not required, to augment the list of patient IDs & Issuers in workitems, for example by consulting a local PIX Manager to get additional IDs corresponding to those in the workitem.

870 The Input Information Sequence inside the workitem provides the Task Performer with direct references to the necessary input instances, allowing them to be retrieved directly without using a query. If the Task Performer decides to query further for additional data, it will find relevant patient IDs & Issuers in the Workitem, and also in the bodies of the instances referenced in the Input Information Sequence. The Task Performer is also expected to include those IDs & Issuers in the result objects it creates, possibly adding its own local ID and Issuer if appropriate, for example to support storage of the results local to the Task Performer.

875 XDS mandates that the Document Source include the patient ID issued by the Affinity Domain and the patient ID issued by the Source in the corresponding metadata attributes when submitting a document. XDS also mandates that the Document Consumer use the patient ID issued by the Affinity Domain when issuing a query.

880 When the XDS Option of the RRR-WF Profile is used, the Affinity Domain patient ID will come into play naturally as part of complying with XDS-I and the requirement to group with an Imaging Document Consumer and/or an Imaging Document Source. In other scenarios, such things are left to local policy, not mandated by this profile.

885 The situation is similar for Accession Numbers and the corresponding Issuer of Accession Number Sequence (0008,0051) with the exception that Affinity Domains do not typically coordinate a centrally issued accession # so the listed numbers will be local.

40.4.1.11 Locations of Inputs and Outputs

890 The Input Information Sequence (0040,4021) allows the Task Requester to communicate to the Task Performer a list of input instances, and the Output Information Sequence (0040,4033) allows the Task Performer to communicate to the Task Requester a list of output instances. Both sequences can facilitate retrieval of the instances using XDS-I, DICOMweb and/or Conventional DICOM mechanisms, and describing where the instances are located. Further, the Output Destination Sequence (0040,4070) allows the Task Requester to request in advance that the Task Performer store its output instances in a particular location.

895 This can provide significant flexibility. For example, a Task Requester might choose to point to images accessible through a regional XDS-I repository, or for performance reasons, it might push the images to a store local to the assigned reader and provide a DICOM Retrieval Sequence. The Task Performer might post the resulting report to its own Document Repository in the same XDS Affinity Domain, or it might store the report back to the original XDS-I Imaging Document Source as a DICOM-wrapped PDF.

900 For such variations to work robustly, however, the participating systems may have to be configured with the necessary security certificates, AE-Titles, port numbers and other details. Also, although a Task Performer will try to store output instances to the location requested by the Task Requester, it might not be configured to access that destination, in which case it will store them where it can and list that location in the Output Information Sequence.

905 Deployment projects are advised to consider their preferred mechanisms and data flows and establish policies for configuring participating systems accordingly.

910 Such policy discussions should consider tradeoffs between the costs and effort of maintaining multiple copies of instances, keeping instances in the possession of the legally responsible creator, making instances conveniently accessible to those using them for clinical, billing and administrative purposes, and then keeping all instances related to a study (images, reports, etc.) together for proper management.

Based on those policy decisions, various behaviors of the Task Requesters and Task Performers can be configured. As with other profiles, it will be important for the deployment project to manage the AE-Titles assigned to different systems to avoid duplication/collision.

915 40.4.1.12 Additional Outputs

Reading tasks are generally expected to result in a report, either preliminary or final. It is possible for reading tasks to also result in additional outputs. For example, the reading workstation may generate:

- 920 • Key Object Selection instances to identify key images for surgeons, referring physicians or other professionals
- Presentation States to highlight certain features or provide recommended view settings
- Secondary Capture Image objects with particular 3D views generated during review
- SR objects containing the results of CAD or other clinical applications

925 Deployments should consider where such objects should be stored. It may make sense to store them in the same location as the original images being read.

For some sites, whether things like CAD are shared will be a policy decision.

40.4.1.13 Single Read Request vs. Multiple Read Request

930 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:

- 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 reader's report

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

Meeting some of these constraints may be challenging in an environment where the clinical records of the patient are made conveniently available 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.

940 In this scenario, 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)

945 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.
- 950 • Secondary readers 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
- 955 • 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)

- 960 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.
- 965
- 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.
- 970
- 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
- 975
- disagreement, a discrepancy report is generated.

Mammography has specific patterns of double reading (both blinded and unblinded) where an imaging facility might simultaneously post two requests for reads on the same acquired image study. This is somewhat similar to Peer Review.

- 980 The scope of this profile is worklists. It does not directly define or mandate specific patterns like peer review and Mammo overreads. It does, however, provide mechanisms which implementations may use for such purposes. 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
- 985 second read request should specifically assign a different facility; if the Task Requester wishes the second read to be blinded, it can omit the 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.

40.4.1.14 Addendums

- 990 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), simply list the additional report in the Output Information Sequence of the original workitem.

- 995 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. Instead, the

1000 Task Performer creates a new task with a Scheduled Workitem Code of ("Addendum", 99IHE, "Add an addendum to the study report"). The Accession Number, Patient ID and other identifiers in the new workitem and the addendum document will be the same as those in the original workitem and report. The original report is listed in the Input Information Sequence of the new workitem, and the addendum document is listed in the Output Information Sequence.

Since the original Task Requester might not otherwise be aware or notified of the new work, the Task Performer is advised to subscribe the original Task Requester to the new workitem so it will be notified by the Task Manager.

40.4.1.15 Community Worklists

1005 This profile is intended to support "community worklists", meaning that Task Requesters in a given community may post tasks to the worklist that will be performed by Task Performers in the community. The community could span multiple enterprises across a large geographical region. The profile could also be used to coordinate reading worklists across several departments (e.g., radiology, cardiology and an outpatient imaging center inside a single enterprise. The scale and
1010 scope of the community is up to the deployment.

Also, although the examples here show a single worklist on a single Task Manager, a deployment may choose to deploy several Task Managers or one Task Manager with several RESTful endpoints to partition the work into separate worklists. For example, they might choose to set up one Task Manager for work generated within their local network of hospitals and
1015 another for work submitted from elsewhere in the region. Similarly, deployments may choose to use the Worklist Label (0074,1202) to assign tasks to virtual sub-worklists, e.g., for reading tasks from the ER.

40.4.2 Use Cases

40.4.2.1 Use Case #1: Open Worklist

1020 Reading tasks are submitted by a Task Requester to a community worklist to be claimed and performed by any available Task Performer.

40.4.2.1.1 Open Worklist Use Case Description

1025 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.

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 Section 40.4.1.1 and puts in on the worklist.

1030 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 global subscription" to be notified when reading tasks matching certain criteria are created.

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

1035 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:

- Afterhours reading by a community pool where an Imaging Facility does not have credentialed Radiologists to read studies after hours
- 1040 • 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

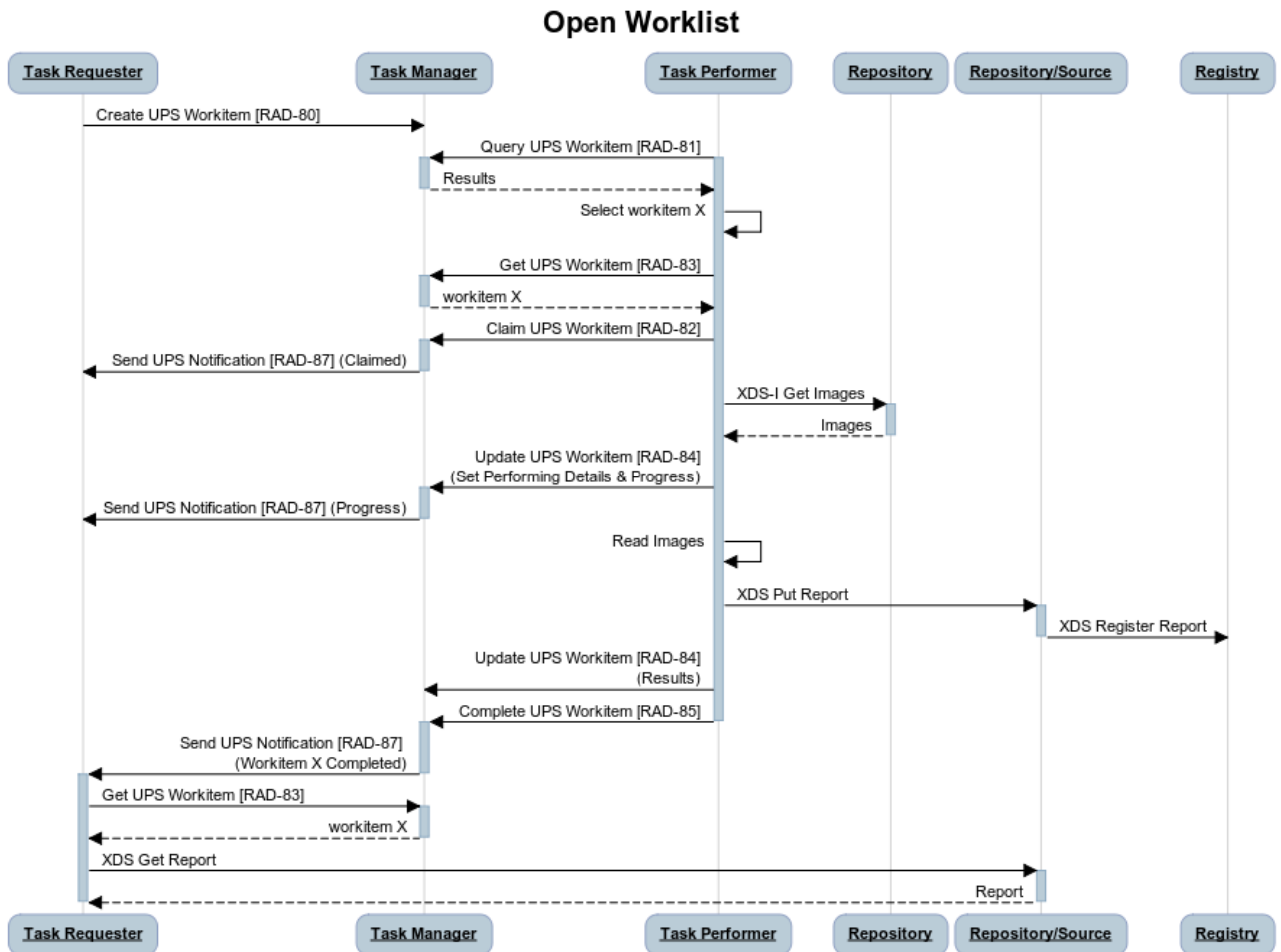
1045 Figure 40.4.2.1-1 shows data access (retrieval of the images to be read, and storage and retrieval of the resulting report) based on the XDS Option (See Section 40.2.1). The use case could be similarly performed based on the DICOMweb Option (see Section 40.2.2) or the DICOM Option (see Section 40.2.3).

The profile requires that the Task Requester 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.

1050 This use case shows the Task Requester receiving notifications as the status and contents of the workitem change as it proceeds through the process. The Task Requester might choose to 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.

40.4.2.1.2 Open Worklist Process Flow

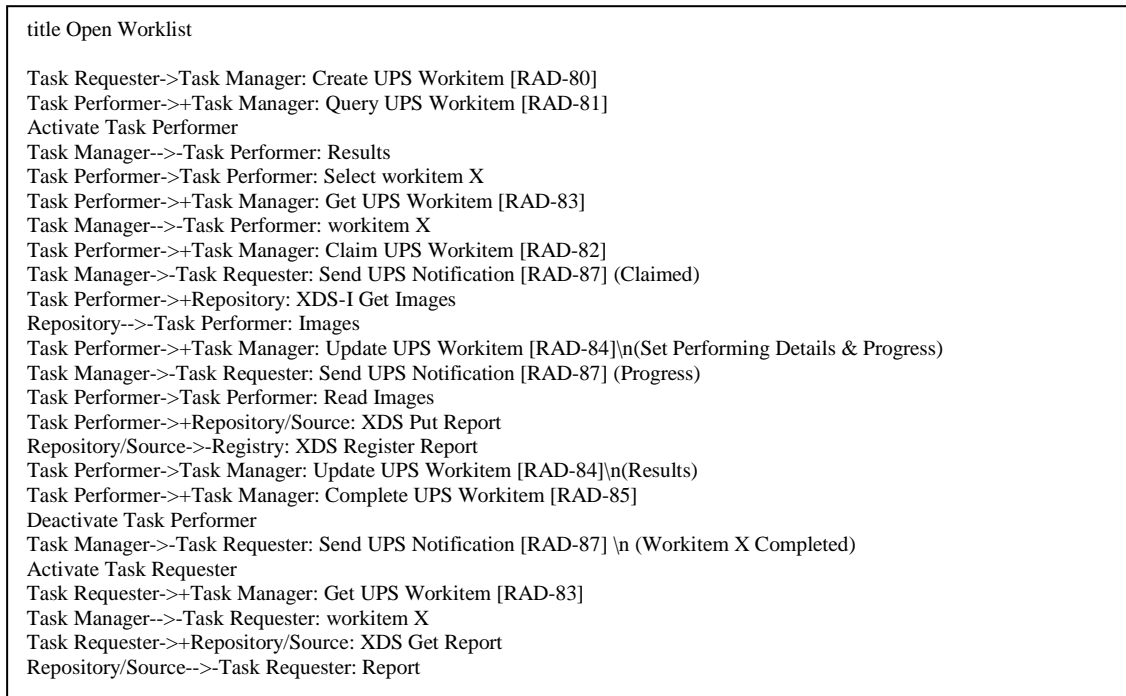
1055 The details used to create the UPS workitem include a list of the images to be read and how they can be retrieved. How the images got there is out of scope of this profile and is not shown in Figure 40.4.2.1-1. For example, the images may have been uploaded to a community repository as standard procedure upon completion of acquisition.



1060

Figure 40.4.2.1-1: Open Worklist Process Flow in RRR-WF Profile

The text in Figure 40.4.2.1-2 was used to generate the diagram in Figure 40.4.2.1-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.



1065

Figure 40.4.2.1-2: Diagram Pseudocode for Open Worklist Process Flow

40.4.2.2 Use Case #2: Assigned Read

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

40.4.2.2.1 Assigned Read Use Case Description

1070 In this use case the assigned Task Performer is determined by extra functionality on the Task
 Manager. Although not shown here, it would be equally valid for the Task Requester to set the
 assigned Task Performer when it created the task in the first place, or alternatively, a privileged
 1075 Watcher subscribes to be 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 which Task Performer should be assigned, the data on which
 that decision is made, and how that data is obtained are all outside the scope of this profile.

1080 The profile does define how the assignment is recorded, how the assigned Task Performer is
 informed of the assignment and how systems can monitor the progress (or lack thereof) of the
 assigned reading task.

Examples of situations where an assigned read might occur include:

- The Task Manager might assign reads to different Task Performers across a community to balance the reading load across the available resources
- 1085 • 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.
- 1090 • The Task Requester might assign a read to a specific contracted "Nighthawk" organization when an Imaging Facility does not have credentialed Radiologists to read studies after hours

The assigned performer does not become the performing system until it accepts the assignment by claiming the workitem. See 40.4.2.3 Re-assignment, Cancellation and Failures for further details.

1095 **Example:**

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.

- 1100 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 Document Registry and Repository, XDS-I Imaging Document Source and RRR-WF Task Manager.

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

- 1105 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.

Create Workitem for Read Request:

- 1110 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.

Assign Workitem to Task Performer:

- 1115 Rather than leave the workitem open for the first available resource, the Task Manager operated by CHA has chosen to assign reading workitems to specific performers, in this example GCH. The workitem is assigned by setting the scheduled performer organization attribute to list GCH. The Task Manager then sends a notification to the GCH Task Performer alerting it to the assignment.

- 1120 Essentially, for each Task Performer the Task Manager has a Filtered Global Subscription that matches against attributes of the Scheduled Human Performers Sequence (0040,4034)

and possibly the Scheduled Station Name Code Sequence (0040,4025), Scheduled Station Geographic Location Code Sequence (0040,4027), and/or Scheduled Station Class Code Sequence (0040,4026),

Claim Workitem:

1125 GCH's Task Performer retrieves the workitem identified in the notification from the CHA Task Manager. Internally, it confirms that credentialed Radiology staff are available to perform the read, and that it recognizes the referenced XDS-I Imaging Document Source where the images and other inputs are stored. The Task Performer then formally claims the workitem, taking control of the task.

1130 Upon successfully claiming the task, GCH's Task Performer might (not shown) proxy the read into local systems. For example, it could move copies of the images and other inputs 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 actual reading process could be managed as if the study was acquired locally. See Section 40.4.1.5 for additional discussion.

1135

If the Task Performer did not claim the task (because it was offline or too busy) the task would need to be reassigned. See Section 40.4.2.3.

Update Workitem:

1140 Using the Reading Facility's normal workflow processes, the Radiologist performs the read. The GCH Task Performer updates the workitem with the name of the Radiologist and progress note that the Radiologist has begun reviewing the study.

The Radiologist creates the report which is stored and registered into the community XDS Repository & Registry operated by CHA. The GCH Task Performer system updates the workitem with the reference to report instance in the XDS Repository.

1145 **Complete Workitem:**

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.

1150 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.

40.4.2.2.2 Assigned Read Process Flow

1155 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.

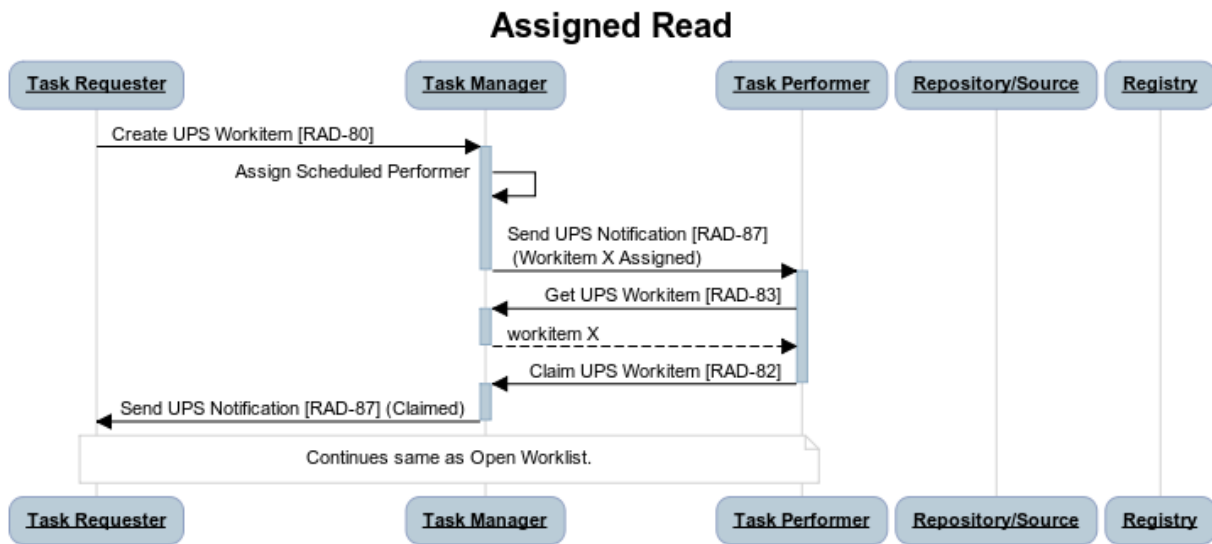
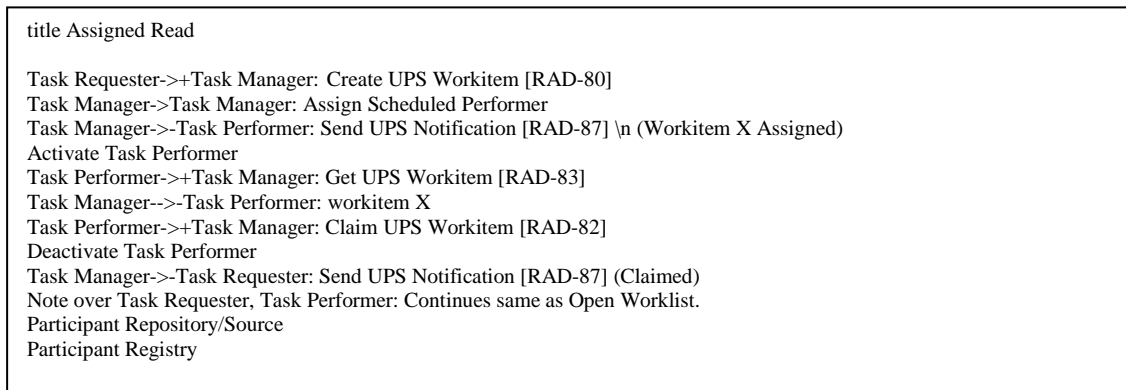


Figure 40.4.2.2-1: Assigned Read Process Flow in RRR-WF Profile

1160

The text in Figure 40.4.2.2-2 was used to generate the diagram in Figure 40.4.2.2-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.



1165

Figure 40.4.2.2-2: Diagram Pseudocode for Assigned Read Process Flow

One can imagine the process flow in Figure 40.4.2.2-1 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 Section 40.4.1.13.

1170 **40.4.2.3 Use Case #3: Report Addendum**

After the original read has been completed, a performer submits an addendum to the original report.

40.4.2.3.1 Report Addendum Use Case Description

1175 It is not uncommon for something to be noticed, perhaps as the result of a senior radiologist reviewing work completed by a junior radiologist, which requires the originally submitted report to be amended. This is done by submitting an addendum to the original report.

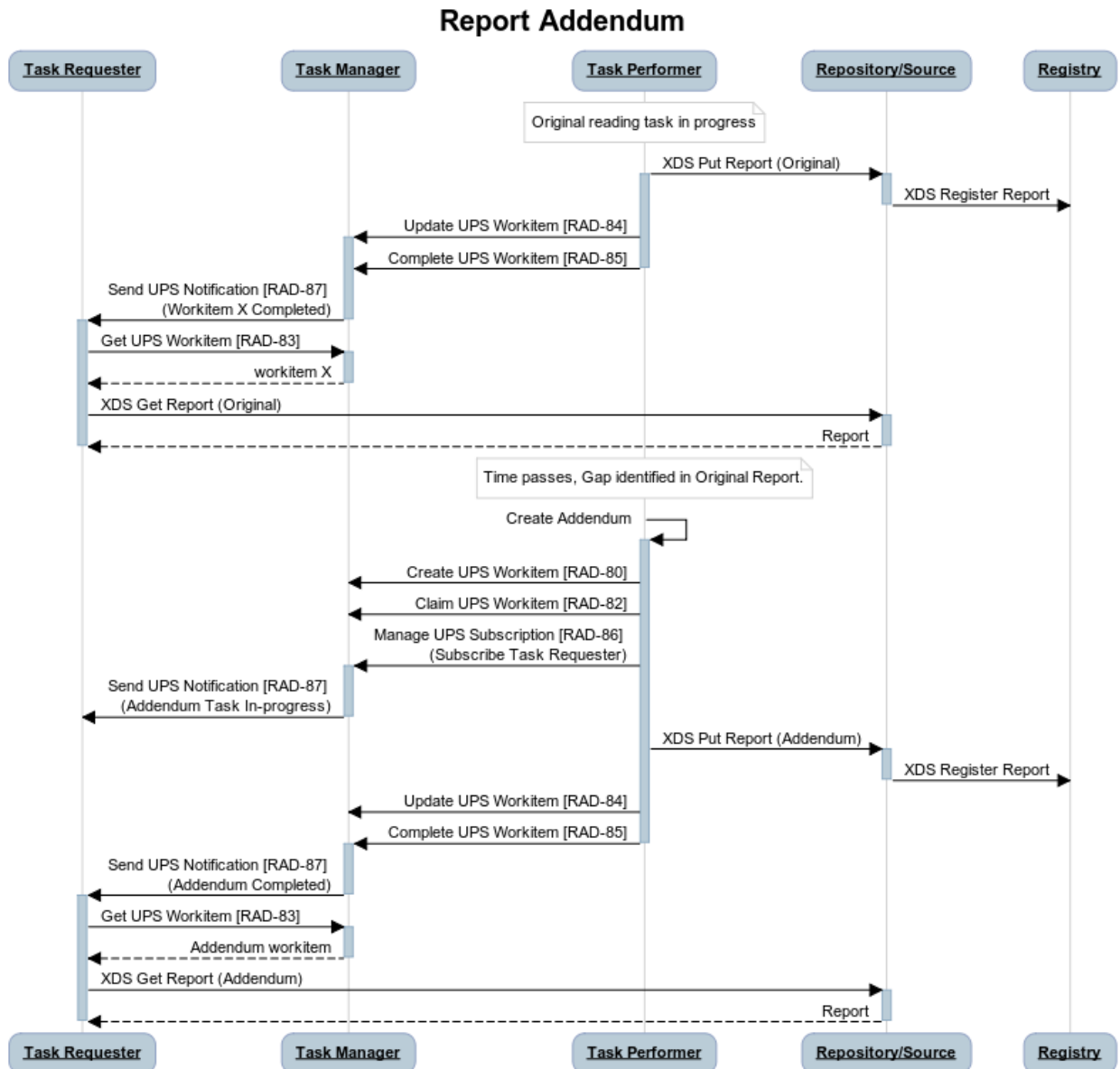
Since the task corresponding to the original report has been marked as complete and closed, a new addendum chain of messages is triggered by the Task Performer. The new task is created by the Task Performer to capture the details in the same way as for an original read task.

1180 It is expected that the addendum report will be stored at the same destination and using the same transport mechanism used for the original report. The Task Requester that requested the original read might not be monitoring the destination for updates. A notification alerts the Task Requester to the addendum.

1185 As with the original report, what further actions the Task Requester takes related to the addendum are outside the scope of this profile.

40.4.2.3.2 Report Addendum Process Flow

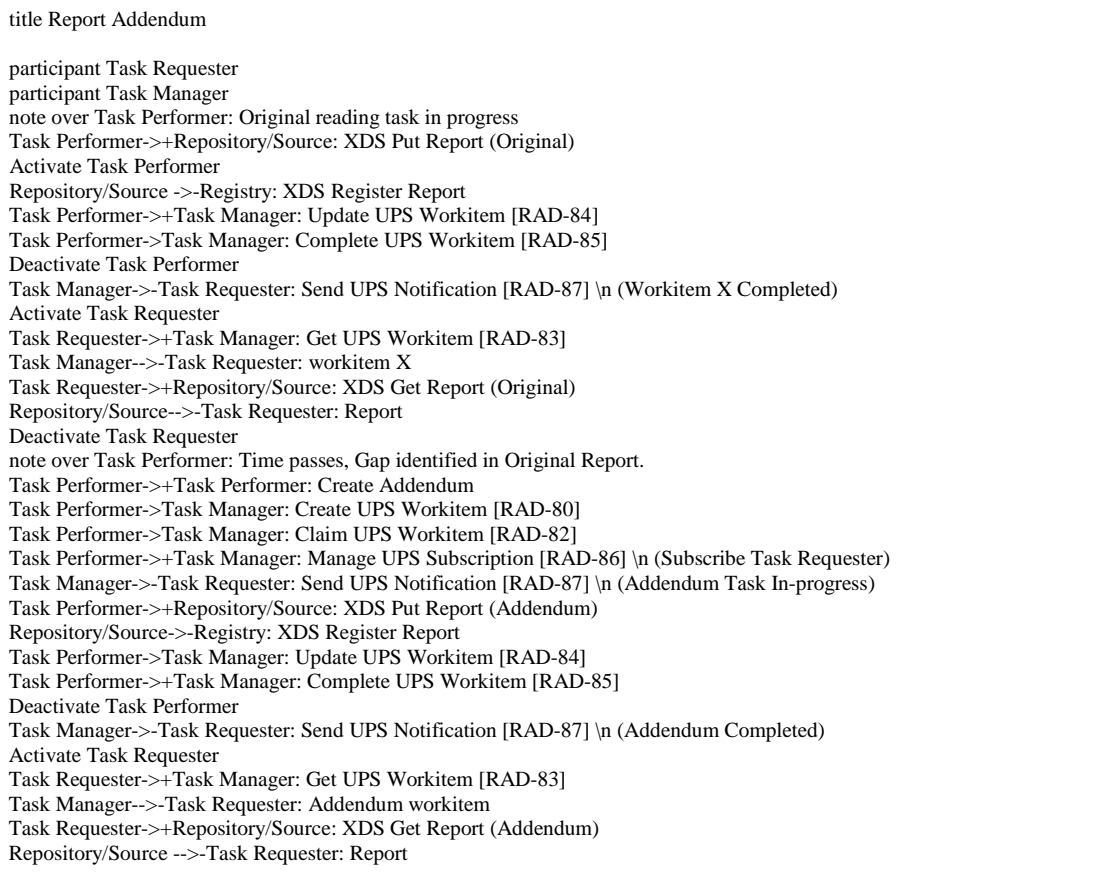
The top half of the process flow shows the final messages of the original reading workflow to establish context for the addendum which is shown in the bottom half of the process flow.



1190

Figure 40.4.2.3-1: Report Addendum Process Flow in RRR-WF Profile

The text in Figure 40.4.2.3-2 was used to generate the diagram in Figure 40.4.2.3-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.



1195

Figure 40.4.2.3-2: Diagram Pseudocode for Report Addendum Process Flow

40.4.2.4 Use Case #4: Re-assignment

1200

A task which was originally assigned to one Task Performer is reassigned to another Task Performer.

40.4.2.4.1 Re-assignment Use Case Description

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.

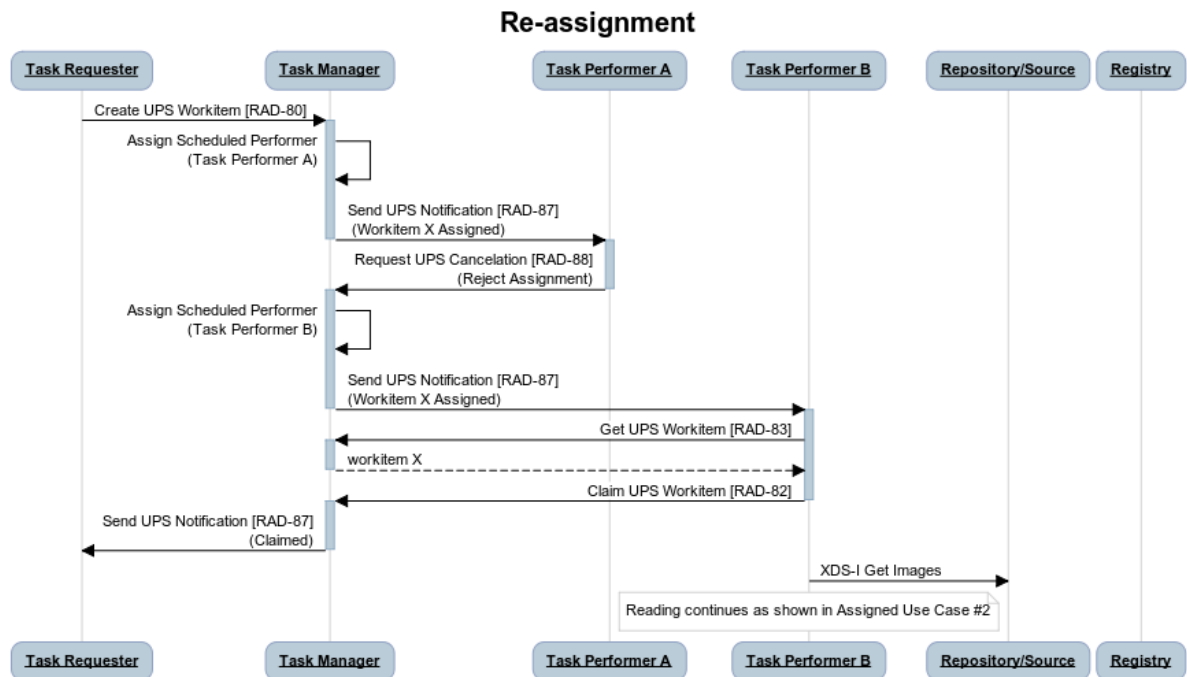
1205

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.

1210 In the case shown in the Process Flow diagram below, an assigned Task Performer 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) and helps by communicating that it has no intention of claiming the assigned task. Doing so in a timely fashion helps 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.

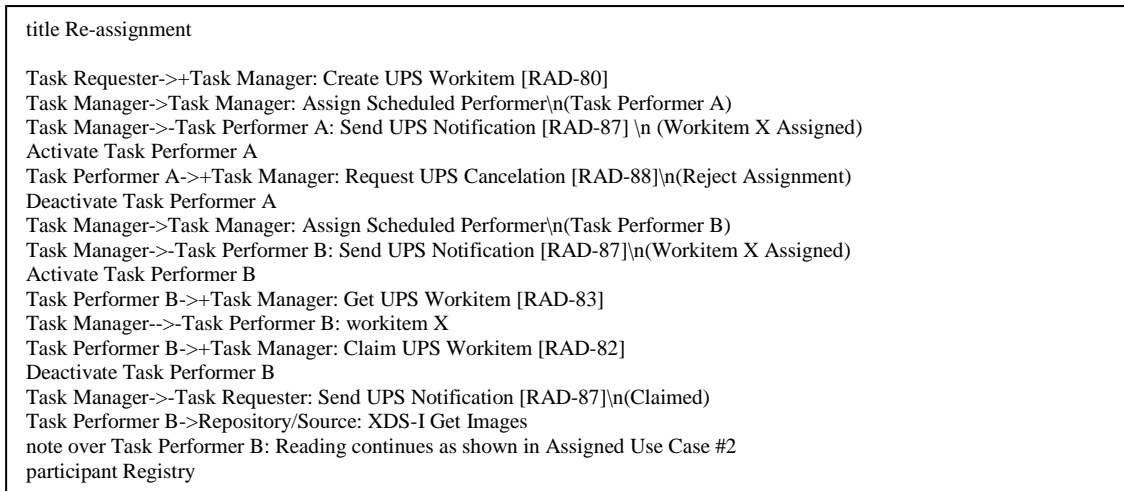
1215 **40.4.2.4.2 Re-assignment Process Flow**

Here, the Task Manager initially assigns Task Performer A which rejects the assignment. The task is re-assigned to Task Performer B which accepts by claiming the task.



1220 **Figure 40.4.2.4-1: Re-assignment Process Flow in RRR-WF Profile**

The text in Figure 40.4.2.4-2 was used to generate the diagram in Figure 40.4.2.4-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.



1225

Figure 40.4.2.4-2: Diagram Pseudocode for Re-assignment Process Flow

40.4.2.5 Use Case #5: Cancellation

A Task Requester cancels a requested task.

40.4.2.5.1 Cancellation Use Case Description

1230 A task may be canceled 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.

1235 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.

1240 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.

1245 **40.4.2.5.2 Cancellation Process Flow**

Here, the cancellation request does not come from the Task Requester until after the Task Performer has claimed the task, but the Task Performer agrees to abort the task. If the request came a little earlier, the flow is simpler since the Task Performer would not be involved at all, or at most, its initial attempt to claim the task would simply fail. If the request came a little later or if the Task Performer was not able to abort the task, then the task would complete normally and the Task Requester could choose to ignore the result.

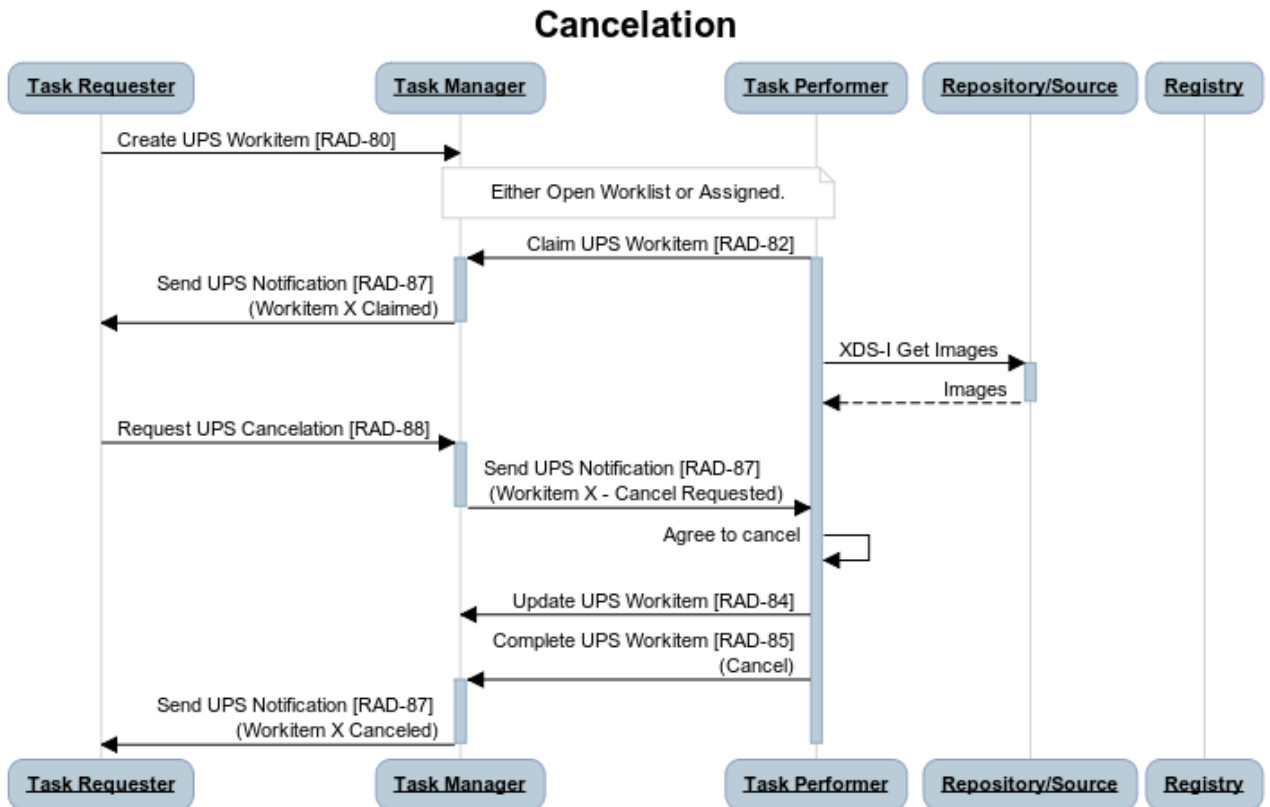


Figure 40.4.2.5-1: Cancellation Process Flow in RRR-WF Profile

1255

The text in Figure 40.4.2.5-2 was used to generate the diagram in Figure 40.4.2.5-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.

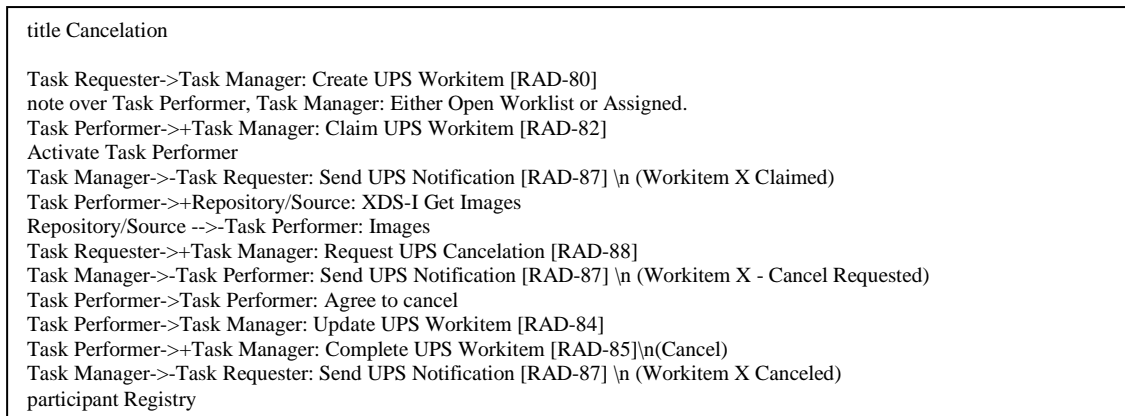


Figure 40.4.2.5-2: Diagram Pseudocode for Cancellation Process Flow

1260

40.4.2.6 Use Case #6: Failure

A Task Performer commits to performing a task by claiming it, but finds itself unable to meet the commitment and is forced to cancel the task.

40.4.2.6.1 Failure Use Case Description

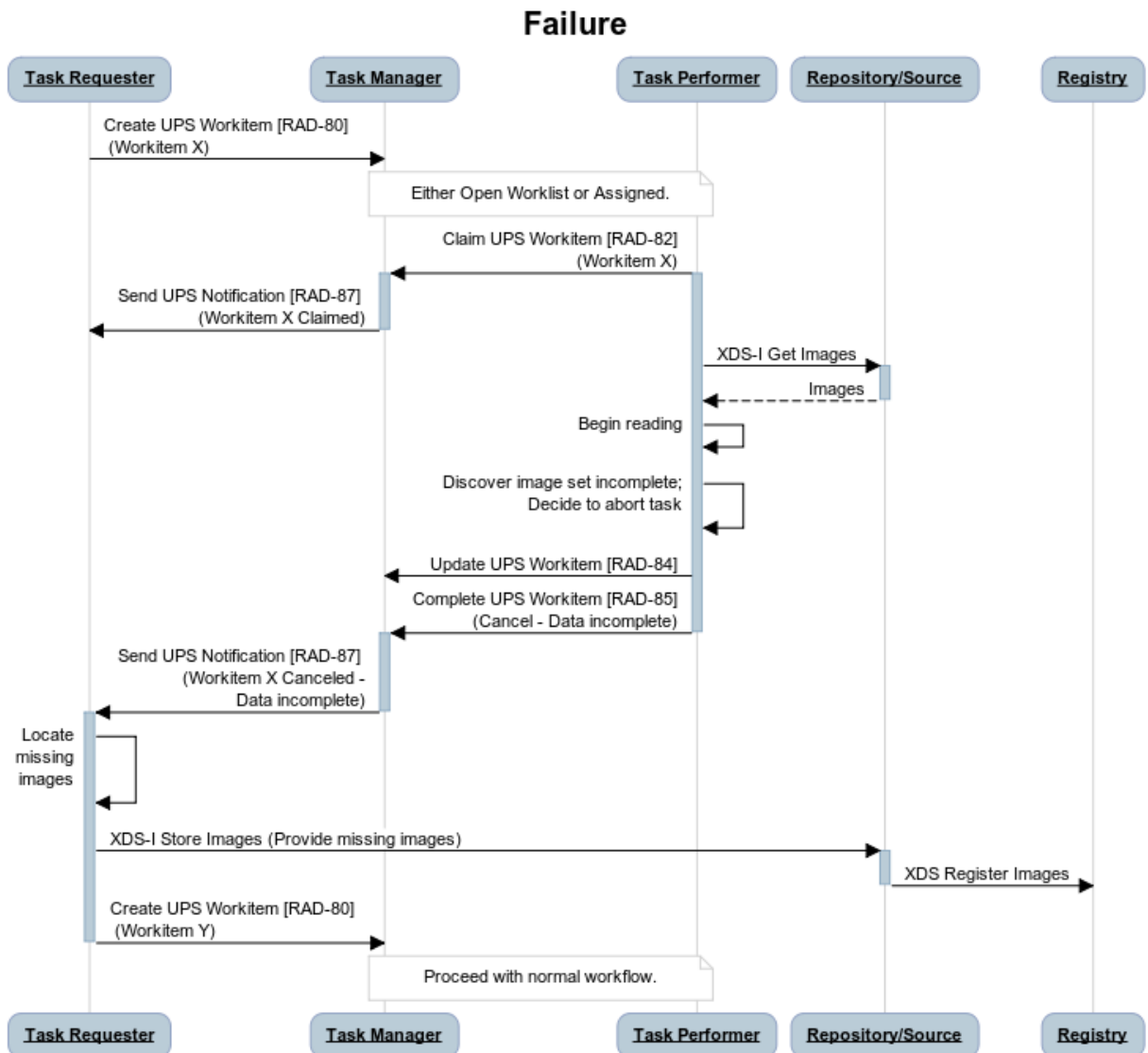
1265 The Failure Use Case is very similar to the Cancellation Use Case, except the Task Performer changes the workitem state to CANCELED based in local issues rather than an external request. Otherwise the notification message flow is similar.

The Task Requester, Task Manager or Watchers may choose to create a replacement task if they feel they can resolve or avoid any issues identified in the cancellation reason of the notification and/or the contents of the performed section of the canceled workitem.

1270

40.4.2.6.2 Failure Process Flow

1275 In this example, the Task Requester is shown creating a replacement task and assigning it to another Task Performer. Here, the cancellation request does not come from the Task Requester until after the Task Performer has claimed the task, but the Task Performer agrees to abort the task. If the request came a little earlier, the flow is simpler since the Task Performer would not be involved at all, or at most, its initial attempt to claim the task would simply fail. If the request came a little later, or if the Task Performer was not able to abort the task, then the task would complete normally and the Task Requester could choose to ignore the result.



1280

Figure 40.4.2.6-1: Failure Process Flow in RRR-WF Profile

The text in Figure 40.4.2.6-2 was used to generate the diagram in Figure 40.4.2.6-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.

```

title Failure

Task Requester->Task Manager: Create UPS Workitem [RAD-80]\n (Workitem X)
note over Task Performer, Task Manager: Either Open Worklist or Assigned.
Task Performer->+Task Manager: Claim UPS Workitem [RAD-82]\n (Workitem X)
Activate Task Performer
Task Manager->-Task Requester: Send UPS Notification [RAD-87] \n (Workitem X Claimed)
Task Performer->+Repository/Source: XDS-I Get Images
Repository/Source -->-Task Performer: Images
Task Performer->Task Performer: Begin reading
Task Performer->Task Performer: Discover image set incomplete;\n Decide to abort task
Task Performer->Task Manager: Update UPS Workitem [RAD-84]
Task Performer->+Task Manager: Complete UPS Workitem [RAD-85]\n(Cancel - Data incomplete)
Deactivate Task Performer
Task Manager->-Task Requester: Send UPS Notification [RAD-87] \n (Workitem X Canceled -\nData incomplete)
Activate Task Requester
Task Requester->Task Requester: Locate\n missing\n images
Task Requester->+Repository/Source: XDS-I Store Images (Provide missing images)
Repository/Source -->-Registry: XDS Register Images
Task Requester->-Task Manager: Create UPS Workitem [RAD-80]\n (Workitem Y)
note over Task Performer, Task Manager: Proceed with normal workflow.

```

1285

Figure 40.4.2.6-2: Diagram Pseudocode for Failure Process Flow

40.5 RRR-WF Security Considerations

1290 Tasks submitted by the Task Requester to the Task Manager are open to query and retrieval by Task Performers and Watchers which can also attempt to access the documents listed in the Input Information Sequence. Communities are advised to manage which systems are permitted to connect to the Task Manager, for example using HTTPS and the ATNA Secure Node or Secure Application features which RRR-WF actors are required to support, and also to monitor the information they access, for example using ATNA audit logging.

1295 Updates to claimed tasks are limited to systems providing the Transaction UID given to the Task Performer that claimed the task. However, if the Transaction UID is stolen by another malicious system, then potentially it can submit fake results and/or modify the task status to prevent the actual Task Performer from completing the task. A sanity check is for the Task Requester / Task Manager to check if the Transaction UID is used consistently by the same system.

1300 When storing and accessing the input information and output information as well, it is highly recommended to use HTTPS or DICOM over TLS according to ATNA. This is particularly important for cross-enterprise access as ATNA provides both encryption as well as authentication.

1305 The Task Requester or Task Performer should consider how long the input or output should remain accessible after the task is complete. If the output is time limited, then the Task Requester should consider importing the results to its local system instead of relying on a reliable access to the output for an extended period of time.

1310 Malicious cancel requests could conceivably be used to disrupt service. Task Managers and Task Performers should take note that compliance with cancel requests is at their discretion, not mandatory. Cancel requests can contain details such as the reason for cancelation and contact information to reach the person requesting cancelation which can help assess the veracity of the request.

40.6 RRR-WF Cross Profile Considerations

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

The most relevant XDS-I.b actor groupings are discussed in 40.2.1 XDS Option.

1315 XDS.b – Cross-Enterprise Document Sharing

The most relevant XDS.b actor groupings are discussed in 40.2.1 XDS Option.

MHD-I – Mobile Health Documents for Imaging

The relevant usage of RAD-107, which is the main feature of the MHD-I Profile, is discussed in Section 40.2.2 DICOMweb Option.

1320 WIC – Web Image Capture

The relevant usage of RAD-108, which is the main feature of the WIC Profile, is discussed in Section 40.2.2 DICOMweb Option.

XCA-I – Cross-Community Access for Imaging

1325 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. Note that since XCA-I does not provide a transaction for storing (just retrieving), the Performer can might store any results (reports, objects, etc.) to its local community and the Task Requester would also use XCA-I to access these results which would be listed in the Task Output Sequence as being available in the Task Performer's community. Alternatively, if the Task Requester only
1330 wanted the report but not any other output objects, the Task Performer might use XCDR to push the report to the Task Requester.

XCDR – Cross-Community Document Reliable Interchange

If the Task Performer is in a different community, the Requesting organization might use XCDR to push data to a server in that other community and then reference them in the Input list.

1335 PDI – Portable Data for Imaging

A Portable Media Importer in PDI might be grouped with a Task Requester to submit a read request for the imported images after it has finished migrating them off the media (CD, DVD, etc.) and performing any necessary attribute reconciliation. In that scenario, the Task Performer does not interact with the media but rather with the already imported images.

1340 The Input Information Sequence and the Output Information Sequence in the UPS Workitem do include a Media Retrieval Sequence for specifying that input or output instances are available on

portable media, but this profile does not further describe that mechanism since network transfers will generally be available and are preferable.

IUA – Internet User Authorization

- 1345 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.

PIX – Patient Identifier Cross-Referencing

- 1350 A PIX Consumer in PIX might be grouped with a Task Requester to obtain alternate patient IDs to include in requested reading workitems.

PAWF – Post Acquisition Workflow

A Watcher or a Workitem Creator in PAWF might be grouped with a Task Creator to capture outputs of post-acquisition processing that might be relevant to the reading radiologist and list them as inputs in the reading task.

- 1355 **MRRT – Management of Radiology Report Templates**

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

- 1360 A 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.

- 1365 **HPD – Healthcare Provider Directory**

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 Section 40.4.1.7 Over-Filtering.

- 1370

Volume 3 – Transactions

Most of these Volume 3 changes involve adding RESTful Semantics to each UPS transaction. The unchanged text was previously reviewed/approved as part of the PAWF Profile.

1375 Modify Create UPS Workitem [RAD-80]

4.80 Create UPS Workitem [RAD-80]

4.80.1 Scope

This transaction is used to create a new workitem.

1380 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.

1385 ~~In a typical “pull workflow” t~~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.

1390 In an unscheduled or append case, this transaction allows a Workitem Performer (adopting the role of a Requestor) 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

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

1395

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

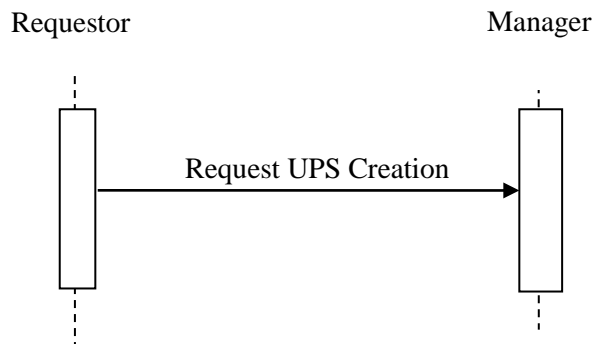
Role:	<p>Manager:</p> <p>Creates and manages a Unified Procedure Step instance for the requested workitem.</p>
Actor(s):	<p>The following actors may play the role of Manager:</p> <p>Workitem Manager: when receiving a new workitem for its worklist. <u>Task Manager</u></p>

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

- 1400 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**

4.80.4 Interaction Diagram



1405

4.80.4.1 Request UPS Creation Message

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.

1410

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. 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.

1415 4.80.4.1.2 Message Semantics

This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.

DICOM RESTful Message Semantics

1420 **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.

1425 **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

1430 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.

1435 Note: DICOM CID 9231 provides a handful of very generic codes.

The Scheduled Processing Parameter Sequence (0074,1210) is intended to support some control by the Requestor over the exact processing performed. Some profiles may define specific parameters and values. Beyond that, the onus is on the Workitem Performer or Task Performer to provide documentation of the parameters and values they support so that Requestors can be configured to populate it appropriately.

1440

The Issuer of Patient ID (0010,0021) attribute shall be populated for each patient ID provided.

1445 **Requestors may specify the intended performing person by populating the Human Performer Code Sequence (0040,4026) inside the Scheduled Human Performers Sequence (0040,4034). The Code Value (0008,0100) shall contain the identifier of the designated**

person (for example their National Provider ID). The Code Meaning (0008,0104) may contain a human-readable name of the designated person, but is only used for display, not matching.

1450 **Requestors may specify the intended performing organization by populating the Human Performer's Organization (0040,4036) inside the Scheduled Human Performers Sequence (0040,4034). To match reliably against this string, the exact values should be coordinated between the organizations using them.**

1455 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.

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.

1460 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.

See Appendix W (**currently in the PAWF Trial Implementation Supplement**) for details on the correspondence between attribute values in unscheduled UPS instances and associated DICOM objects.

1465 **4.80.4.1.2.2 Examples for the Use of Attributes**

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.

1470 **4.80.4.1.2.3 Work Items for Remote Radiology Reporting Tasks**

The contents of this section are required for Requestors claiming the Remote Radiology Reporting Workflow Profile.

1475 **The Requestor shall support including a content item in the Scheduled Processing Parameter Sequence (0074,1210) with a Value Type (0040,A040) of CODE, a Concept Name Code Sequence (0040,A043) of (RRR000 99IHE, "Report Requested") and the value of Concept Code Sequence (0040,A168) shall be drawn from Table 40.4.1.2-3. This is used by the Requestor to indicate whether the Task Performer is requested to return a preliminary report, a final report or both.**

4.80.4.1.3 Expected Actions

1480 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.

4.80.5 Security Considerations

1485 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.

Modify Query UPS Workitems [RAD-81]

1490 4.81 Query UPS Workitems [RAD-81]

4.81.1 Scope

This transaction is used to find workitems of interest.

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.

1495 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, or a request to read and report on an imaging study.

1500 The querying system might also be a Watcher trying to select workitems of interest to which it will then subscribe for notifications.

This transaction focuses on attributes relevant to filtering/selection. Matching key values are used to perform filtering on the ~~m~~Manager; Return key values can be used to perform additional filtering and sorting on the ~~r~~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.

1505

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:

Role:	Requestor: Query the Manager for Procedure Steps.
--------------	--

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

1510

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

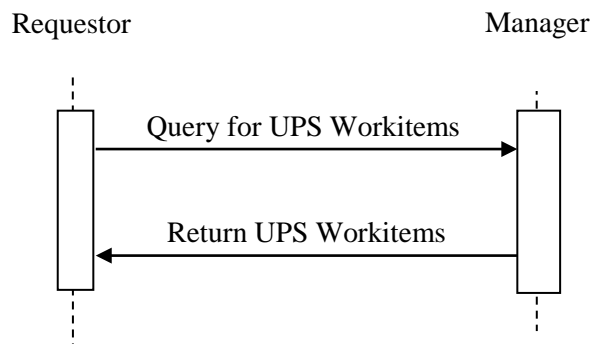
DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

1515 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

4.81.4 Interaction Diagram



1520 **4.81.4.1 Query for UPS Workitems Message**

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

1525 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

1530 **This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.**

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.

DICOM DIMSE Message Semantics

1535 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.

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

The profile in which this transaction is used will specify which of the following query types the Requestor must support.

1545 **For any of the following query types that t**The Requestor **supports, it** shall be capable of performing ~~each of the following~~ query **types as described below.**

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.

1550 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)

1555 Note: **In general**, UPS instances are permitted to be created with the Issuer of Patient ID value left blank, **however specific profiles that use this transaction may require that a value be provided**. A blank value can be presumed to match the local institution.

1560 **The Manager shall identify Workitems with a matching Patient ID and Issuer either inside the Other Patient IDs Sequence (0010,1002) or outside that sequence (i.e., in the "primary" ID) when a query is made using both Patient ID (0010,0020) and Issuer of Patient ID (0010,0021).**

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

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.

1565 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 4.81.4.1.2.1-2: 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)

1570 **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.

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.

1575 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.

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>	<i>(0040,4025)</i>
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
Scheduled Procedure Step Start DateTime	(0040,4005)
Procedure Step State	(0074,1000)

1580 **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.

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.

1585

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>	<i>(0040,4026)</i>
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
Scheduled Procedure Step Start DateTime	(0040,4005)
Procedure Step State	(0074,1000)

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

1590 **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 4.81.4.1.2.1-5: UPS Keys for Task-oriented Workitem Queries

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

<u>Requested Procedure Code Sequence</u>	<u>(0032,1064)</u>
<u>>Code Value</u>	<u>(0008,0100)</u>
<u>>Coding Scheme Designator</u>	<u>(0008,0102)</u>
<u>Procedure Step State</u>	<u>(0074,1000)</u>

1595 **6. Staff-oriented Query: Query for workitems associated with a specific person or organization.**

The Requestor shall support all of the matching key attributes listed in Table 4.81.4.1.2.1-6 in a query. Support for the keys individually or in combinations is at the discretion of the Requestor.

1600

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>>Code Value</u>	<u>(0008,0100)</u>
<u>>Coding Scheme Designator</u>	<u>(0008,0102)</u>
<u>Human Performer's Organization</u>	<u>(0040,4036)</u>

Additional Filtering

1605 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 helpful in identifying workitems of interest.

1610 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), **Scheduled Processing Parameters Sequence (0074,1210), Reason for the Requested Procedure (0040,1002), Reason for Requested Procedure Code Sequence (0040,100A).**

1615 **Worklist Label (0074,1202) may be of particular interest to deployments interested in setting up sub-worklists for various purposes. Each label value effectively defines a sub-worklist. It is, of course, necessary to communicate to the Requestors the labels being used and the purpose of each so Requestors can include them appropriately in queries.**

4.81.4.1.2.2 Examples for the Use of Matching Key Attributes

- 1620
- 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.
- 1625 • Scheduled Station Name Code Sequence supports a query for tasks scheduled for this workstation.
- **Human Performer's Organization (inside the Scheduled Human Performers Sequence) supports a query for tasks scheduled for a specific organization, such as a radiology reading group.**
- 1630 • **Human Performer Code Sequence (inside the Scheduled Human Performers Sequence) supports a query for tasks scheduled for a specific person.**
- Scheduled Procedure Step Start DateTime, Scheduled Workitem Code and Scheduled Station Class Code **could be combined** together support a query for surface rendering tasks scheduled for today on 3D reconstruction workstations.
- 1635 • **Requesting Service and Expiration DateTime could be combined to support a query for tasks from orthopedics that will expire in the next 8 hours.**

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

- 1640 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.

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.

- 1645 **4.81.4.2.2 Message Semantics**

This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.

DICOM RESTful Message Semantics

- 1650 **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

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.

1655 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.

1660 **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

1665 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

4.81.5.1 Security Audit Considerations

1670 Managers that support the ATNA Profile shall audit this transaction.
This transaction corresponds to a Query Information ATNA Trigger Event.

<i>Modify Claim UPS Workitem [RAD-82]</i>

4.82 Claim UPS Workitem [RAD-82]

4.82.1 Scope

1675 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.

1680 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:

1685

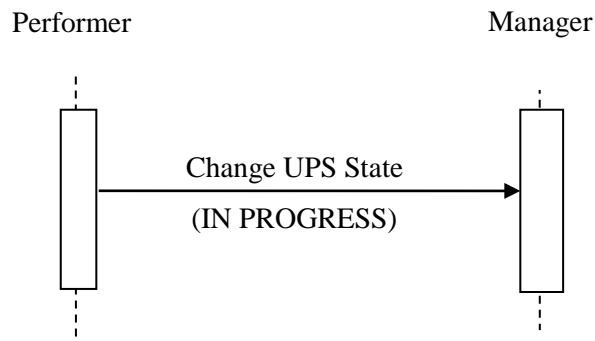
Role:	Performer: Takes ownership of a workitem for the purpose of updating it.
Actor(s):	The following actors may play the role of Performer: Workitem Performer <u>Task Performer</u>
Role:	Manager: Confirms/grants ownership of a workitem to the Performer.
Actor(s):	The following actors may play the role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

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

- 1690 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

4.82.4 Interaction Diagram



1695 **4.82.4.1 Change UPS State Message**

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

1700 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

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

1705 The Performer shall not claim a workitem if the contents of the **assignment related attributes Scheduled Station Name Code Sequence (0040,4025)** indicate that the workitem was not intended for the Performer. **This includes:**

- **Scheduled Station Name Code Sequence (0040,4025)**
- **Human Performer's Organization (0040,4036)**
- **Human Performer Code Sequence (0040,4026)**

1710 See 4.80.4.1.2.1 for details on populating the **Scheduled Station Name Code Ssequence**.

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.

1715 **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.

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.

1720 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

1725 **This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.**

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.

DICOM DIMSE Message Semantics

1730 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.

1735 **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.

1740 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.

1745 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

1750 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 **PerformerRequester**. This includes the DICOM requirement to send out notifications of the UPS creation based on subscription settings if ~~the profile requires~~ the Manager ~~to~~ supports the Send UPS Notification **[RAD-87]** transaction.

4.82.5 Security Considerations

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.

1760

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

4.83 Get UPS Workitem Contents [RAD-83]

4.83.1 Scope

1765 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

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

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

1770

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

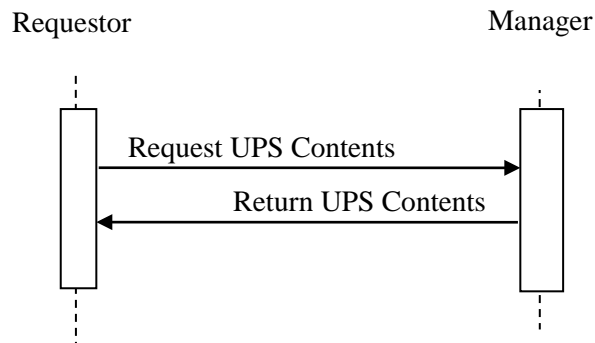
DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

1775 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



1780 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.

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.

1785 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:

- 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.

1790

4.83.4.1.2 Message Semantics

This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.

1795

DICOM RESTful Message Semantics

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

1800

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.

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.

1805 **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.**

4.83.4.1.2.1 UPS Attribute Requirements

1810 See RAD TF-3: Appendix V (**currently in the PAWF Trial Implementation Supplement**) for details on the required correspondence between attribute values in UPS instances and associated DICOM objects.

1815 ~~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

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

1820 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.

4.83.4.2.2 Message Semantics

1825 **This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.**

DICOM RESTful Message Semantics

1830 **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

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.

1835

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.

1840 **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.

4.83.5 Security Considerations

1845 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.

<i>Modify Update UPS Workitem Contents [RAD-84]</i>

1850 **4.84 Update UPS Workitem [RAD-84]**

4.84.1 Scope

This transaction is used by a ~~workitem p~~Performer to request that the ~~workitem m~~Manager modify the contents of a workitem it manages.

1855 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.

4.84.2 Use Case Roles

1860 The roles in this transaction are defined in the following table and may be played by the actors shown here:

Role:	Performer: Provides updated attribute values for a workitem it is performing.
--------------	--

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

1865 **4.84.3 Referenced Standards**

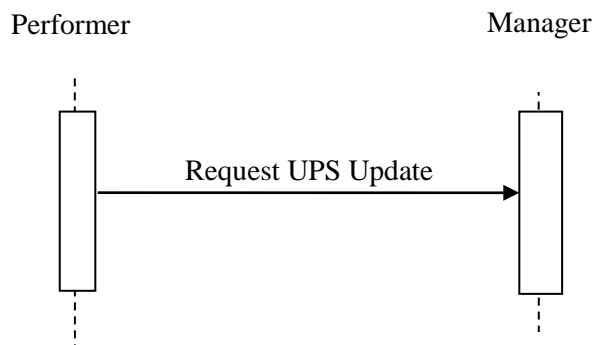
DICOM ~~2011~~ PS 3.4: Unified Procedure Step Service and SOP Classes

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

1870 **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.

1875 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.

1880 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).

1885 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

This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.

1890 **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.

DICOM DIMSE Message Semantics

1895 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.

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.

1900 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
1905 Locking UID some other way.

4.84.4.1.2.1 UPS Attribute Requirements

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

1910 The Actual Human Performers Sequence (0040,4035) shall be populated if a human has performed the workitem.

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
1915 reflect the AE-Title on which Send UPS Notification transactions could be received (e.g., notifying that a cancelation request has been submitted).

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.

1920 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

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

1925 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

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

1930 4.84.5.1 Security Audit Considerations

This transaction is not associated with an ATNA Trigger Event.

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

4.85 Complete UPS Workitem [RAD-85]

1935 4.85.1 Scope

This transaction is used by a ~~work p~~Performer to tell the ~~m~~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
1940 permitted.

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

4.85.2 Use Case Roles

1945 The roles in this transaction are defined in the following table and may be played by the actors shown here:

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

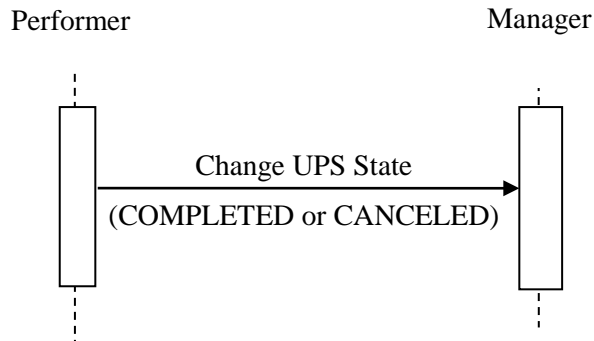
1950 4.85.3 Referenced Standards

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



1955

4.85.4.1 Change UPS State Message

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)).

1960

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

1965

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.

1970

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

1975

This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.

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.

DICOM DIMSE Message Semantics

1980 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.

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.

1985 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

1990 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 **PerformerRequestor**. This includes the DICOM requirement to send out notifications of the UPS completion based on subscription settings.

1995 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

4.85.5.1 Security Audit Considerations

This transaction is not associated with an ATNA Trigger Event.

2000

<i>Modify Manage UPS Subscription [RAD-86]</i>
--

4.86 Manage UPS Subscription [RAD-86]

4.86.1 Scope

2005 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.

2010 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.

2015 **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

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

2020

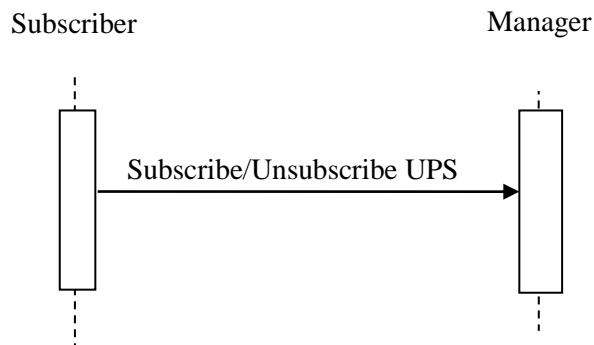
Role:	Subscriber: Requests to change its subscription status to one or more UPS workitems.
Actor(s):	The following actors may play the role of Subscriber: Watcher <u>Task Requester</u> <u>Task Performer</u>
Role:	Manager: Modify subscription record as requested.
Actor(s):	The following actors may play the role of Manager: <u>Task Manager</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.

4.86.3 Referenced Standards

2025 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



2030 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.

2035 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).

2040 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

2045 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

2050 **This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.**

DICOM RESTful Message Semantics

2055 **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.**

2060

DICOM DIMSE Message Semantics

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.

2065 **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 semantics of Deletion Locks and Global Subscriptions are described in DICOM PS3.4 CC.2.3.

2070 The Manager shall support the use of Deletion Locks and Global Subscriptions. Usage of Deletion Locks and Global Subscriptions by the ~~Performer~~**Subscriber** will depend on the nature of the application.

2075 **For Filtered Global Subscriptions, the Manager shall identify Workitems with a matching Patient ID and Issuer either inside the Other Patient IDs Sequence (0010,1002) or outside that sequence (i.e., in the "primary" ID) when the filter specifies both Patient ID (0010,0020) and Issuer of Patient ID (0010,0021).**

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.

2080 **4.86.5 Security Considerations**

Local policy should consider what users and systems have permission to subscribe to workitem notifications and configure appropriately. **More advanced implementations might have logic to identify Subscribers that are requesting unnecessarily broad subscriptions, or whose task targeting is suspicious.**

2085 **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.

<i>Modify Send UPS Notification [RAD-87]</i>
--

2090 **4.87 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

2095 The roles in this transaction are defined in the following table and may be played by the actors shown here:

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

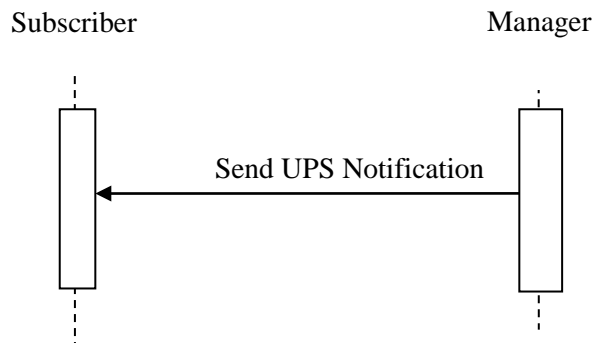
2100 **4.87.3 Referenced Standards**

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

4.87.4 Interaction Diagram



2105

4.87.4.1 Send UPS Notification Message

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.

2110 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.

2115 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.

Similarly, ~~Workitem~~ **Subscriber that is also a Task Performer** shall be prepared to receive notifications for workitems not individually subscribed to when a new workitem is assigned to the **Task Performer**, or when there is a cancellation request for a workitem the **Task Performer** has claimed.

4.87.4.1.1 Trigger Events

Several events may trigger a Send UPS Notification Message

- The state or ~~progress attributes~~ **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.
- 2125 • A Subscriber is newly subscribed to a workitem instance (See RAD TF-3: 4.86). The Manager sends an initial notification, which provides the current state of the workitem to the Subscriber. **The Subscriber may have subscribed specifically to the workitem instance, it may have a Global Subscription which generated a subscription to the workitem instance, or it may have a Filtered Global Subscription which generated a**

- 2130 **subscription to the workitem instance because the contents of the workitem either matched the filter initially or the contents were modified resulting in a match to the filter.**
- A cancellation request is received for a workitem being performed (See RAD TF-3: 4.88). The Manager notifies subscribers *and the performer of the workitem* of the cancellation request. This notification of the performer does not depend on the performer having previously subscribed to the workitem.
 - A workitem has been assigned to a specific **pTask Performer** (~~by a workitem creator or the Manager setting~~ the value of the Scheduled Station Name Code Sequence **matches the Task Performer**). The Manager notifies the assigned **pTask Performer**. This notification of the **pTask Performer** does not depend on the **pTask Performer** having previously subscribed to the workitem. The notified **pTask Performer** may, but is not mandated to, claim the workitem.

4.87.4.1.2 Message Semantics

2145 **This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.**

DICOM RESTful Message Semantics

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.

2150 **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-109.**

DICOM DIMSE Message Semantics

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.

2155 **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

- 2160 The Subscriber is not required to take any specific action upon receipt of a notification. Specifically, in the case of notification of a cancellation 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 cancellation.
- 2165 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

This transaction is not associated with an ATNA Trigger Event.

2170 *Modify Request UPS Cancellation [RAD-88]*

4.88 Request UPS Workitem Cancellation [RAD-88]

4.88.1 Scope

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

2175 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.

2180 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.

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

2185 The roles in this transaction are defined in the following table and may be played by the actors shown here:

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

Role:	<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>
Actor(s):	<p>The following actors may play the role of Manager:</p> <p><u>Task Manager</u> Workitem Manager</p>

2190 Transaction text specifies behavior for each role. The behavior of specific actors are only specified when it goes beyond that of the general role.

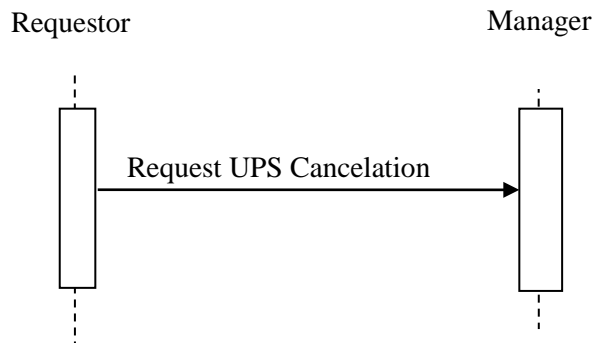
4.88.3 Referenced Standards

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

2195 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.

2200 For workitems still in the SCHEDULED state, the Manager will handle the cancellation 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, **for example if the Manager determines that the cancel request is not from an authorized source**).

2205 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.

2210 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.

2215 **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 this to the Manager.**

4.88.4.1.2 Message Semantics

2220 **This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.**

DICOM RESTful Message Semantics

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.

2225 **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.

2230 **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.**

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 (RRR9, 99IHE, "Workitem assignment rejected by assigned resource").

2235 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 cancelation in the form of a Send UPS Notification message (See RAD TF-3: 4.87) if the Requestor is subscribed to the workitem.

2240 **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.

4.88.5 Security Considerations

2245 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.

2250 *Add transaction 3.109*

3.109 Open Event Channel [RAD-109]

3.109.1 Scope

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

2255 **3.109.2 Actor Roles**

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

Table 3.109.2-1: Actor Roles

Role:	Subscriber: Initiates the channel on which it will receive events.
Actor(s):	The following actors may play the role of Subscriber: Watcher Task Performer Task Creator

Role:	<p>Manager:</p> <p>Keeps the channel open and uses it to send events to the Subscriber.</p>
Actor(s):	<p>The following actor may play the role of Manager:</p> <p>Task Manager</p>

2260

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.

3.109.3 Referenced Standards

DICOM PS 3.18: DICOM UPS-RS Worklist Service

2265

IETF RFC 6455: The WebSocket Protocol

3.109.4 Interaction Diagram



3.109.4.1 Open Event Channel

2270

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.

3.109.4.1.1 Trigger Events

2275

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.

2280 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. If the Subscriber suspects it may have missed messages, Query UPS Workitems [RAD-81] or Get UPS Workitem [RAD-83] can be used to find the current status.

3.109.4.1.2 Message Semantics

2285 **This transaction defines both DICOM RESTful Message Semantics and DICOM DIMSE Message Semantics. Profiles using this transaction will specify which semantics actors are required to support.**

DICOM RESTful Message Semantics

2290 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.

2295 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].

3.109.4.1.3 Expected Actions

2300 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 send subsequent events and notifications (such as RAD-87) to the Subscriber.

3.109.5 Security Considerations

2305 The transaction itself does not inherently verify that the provided AE-Title does, in fact, belong to the application entity (AE) opening the channel to receive events. Implementers are advised to use this transaction in conjunction with ATNA Secure Node/Secure Application or other security features if there is a risk of misuse.

3.109.5.1 Security Audit Considerations

2310 Managers and Subscribers that support the ATNA Profile shall audit this transaction.

This transaction corresponds to an Application Activity ATNA Trigger Event.

2315

A separate IHE-RAD-CP will modify Actor Requirement Sections in the TI Draft of Post-Acquisition Workflow Profile Supplement to clarify that PAWF only requires implementation of the DIMSE Message Semantics