

Digital Imaging and Communications in Medicine (DICOM)

Supplement 246: DICOMweb Modality Workflow Services

Prepared by:

DICOM Standards Committee, Working Group 27

1812 N. Moore St, Suite 2200
Arlington, VA 22209, USA

Status: May 2025, Public Comment

Developed pursuant to DICOM Work Item 2023-10-C

Table of Contents

Document History.....	6
Open Issues.....	6
Closed Issues.....	7
Scope and Field of Application.....	8
Y Modality Scheduled Procedure Step Service and Resources.....	9
Y.1 Overview	9
Y.1.1 Resource Descriptions.....	9
Y.1.2 Common Query Parameters.....	9
Y.1.3 Common Media Types.....	9
Y.2 Conformance.....	10
Y.3 Transactions Overview.....	10
Y.4 Search Transaction	10
Y.4.1 Request	11
Y.4.1.1 Target Resources	11
Y.4.1.2 Query Parameters.....	11
Y.4.1.3 Request Header Fields	11
Y.4.1.4 Request Payload.....	11
Y.4.2 Behavior.....	11
Y.4.3 Response.....	11
Y.4.3.1 Status Codes	12
Y.4.3.2 Response Header Fields	12
Y.4.3.3 Response Payload.....	12
X Modality Performed Procedure Step Service and Resources.....	13
X.1 Overview	13
X.1.1 Resource Descriptions.....	13
X.1.2 Common Query Parameters.....	13
X.1.3 Common Media Types.....	14
X.2 Conformance.....	14
X.3 Transactions Overview.....	14
X.4 Create Transaction.....	15
X.4.1 Request	15
X.4.1.1 Target Resource	16
X.4.1.2 Query Parameters.....	16
X.4.1.3 Request Header Fields	16
X.4.1.4 Request Payload.....	16
X.4.2 Behavior.....	16
X.4.3 Response.....	16
X.4.3.1 Status Codes	16
X.4.3.2 Response Header Fields	17
X.4.3.3 Response Payload.....	17
X.5 Update Transaction	17
X.5.1 Request	17
X.5.1.1 Target Resources	17
X.5.1.2 Query Parameters.....	17
X.5.1.3 Request Header Fields	17
X.5.1.4 Request Payload.....	18
X.5.2 Behavior.....	18

X.5.3	Response.....	18
X.5.3.1	Status Codes	18
X.5.3.2	Response Header Fields	19
X.5.3.3	Response Payload.....	19
X.6	Retrieve Transaction	19
X.6.1	Request	19
X.6.1.1	Target Resources	19
X.6.1.2	Query Parameters.....	19
X.6.1.3	Request Header Fields	20
X.6.1.4	Request Payload.....	20
X.6.2	Behavior.....	20
X.6.3	Response.....	20
X.6.3.1	Status Codes	20
X.6.3.2	Response Header Fields	21
X.6.3.3	Response Payload.....	21
4	Symbols and Abbreviated Terms	22
8.1.1.1	Method	23
B	Examples (Informative)	23
B.X1	Searching for Modality Scheduled Procedure Steps using JSON Media Type.....	23
B.X2	Creating a Modality Performed Procedure Step using JSON Content Type.....	24
B.X3	Updating a Modality Performed Procedure Step with Produced Image Data using JSON Content Type	25
B.X4	Completing a Modality Performed Procedure Step using JSON Content Type	26
B.X5	Retrieving a Modality Performed Procedure Step using JSON Media and Content Type	26
B.X5.1	Return All Attributes.....	26
B.X5.2	Returning Specific Attributes Only	27
B.X6	Bi-directional Proxies for Searching the Modality Scheduled Procedure Steps.....	28
B.X7	Bi-directional Proxies for Managing a Modality Performed Procedure Step	30
B.X7.1	Create	30
B.X7.2	Update	32
B.X7.3	Retrieve	34
H	Capabilities Description.....	37
N.1	Overview	38
N.1.3	DICOM Web Services.....	38
N.1.3.Y	Modality Scheduled Procedure Step Service.....	38
N.1.3.X	Modality Performed Procedure Step Service.....	38
N.5	Service and Interoperability Description.....	39
N.5.3	Supported DICOM Web Services.....	39
N.5.3.Y	Modality Scheduled Procedure Step Web Service	39
N.5.3.Y.1	Search Transaction – Modality Scheduled Procedure Step Service	39
N.5.3.Y.1.1	User Agent.....	39
N.5.3.Y.1.2	Origin Server	40
N.5.3.X	Modality Performed Procedure Step Web Service	40
N.5.3.X.1	Create Transaction – Modality Performed Procedure Step Service	40
N.5.3.X.1.1	User Agent.....	40
N.5.3.X.1.2	Origin Server	41

N.5.3.X.2	Update Transaction – Modality Performed Procedure Step Service	42
N.5.3.X.2.1	User Agent.....	42
N.5.3.X.2.2	Origin Server	42
N.5.3.X.3	Retrieve Transaction – Modality Performed Procedure Step Service	43
N.5.3.X.3.1	User Agent.....	43
N.5.3.X.3.2	Origin Server	44
N.7	Network and Media Communication Details	45
N.7.3	Status Codes	45
N.7.3.3	DICOM Web Services	45
N.7.3.3.Y	Modality Scheduled Procedure Step Service.....	45
N.7.3.3.Y.1	Search Transaction as Origin Server	45
N.7.3.3.Y.2	Search Transaction as User Agent.....	45
N.7.3.3.X	Modality Performed Procedure Step Service	46
N.7.3.3.X.1	Create Transaction as Origin Server	46
N.7.3.3.X.2	Create Transaction as User Agent	46
N.7.3.3.X.3	Update Transaction as Origin Server	47
N.7.3.3.X.4	Update Transaction as User Agent	47
N.7.3.3.X.5	Retrieve Transaction as Origin Server	48
N.7.3.3.X.6	Retrieve Transaction as User Agent.....	48

1

Document History

2024.08	Version 00	JM, DK	Initial version with proposed document structure and content.
2024.11	Version 01	JM, DK	Extended with observations; alternative approach included.
2025.01	Version 02	JM, DK	Alternative approach promoted, extended with conformance.
2025.01	Version 03	JM	Split into two services; reworked comments from WG06.
2025.01	Version 04	DK	Added several examples.
2025.03	Version 05	JM, DK	Added diagrams for bi-directional proxies. More examples. Reworked comments from WG06.
2025.04	Version 06	JM	Reworked comments from WG06. Incorporated consequences of proposed solutions to open issues.

2

Open Issues

3	<p>Context: MPPS notifications.</p> <p>Issue: In HTTP there is no way for an origin server to open a connection to a user agent. Therefore, MPPS notifications as present in DIMSE cannot be mimicked in DICOMweb. There are several ways to deal with this in DICOMweb:</p> <ol style="list-style-type: none"> 1. Do not allow for DICOMweb MPPS notifications at all; 2. Have user agents always open a WebSocket pipeline as defined in Section 8.10, without knowing whether they will be notified or not (see issue 2); 3. Use a subscription mechanism like is done in UPS(-RS), including global subscriptions (applicable for all performed procedures, not only specific ones). 4. Use HTTP/2 Server Push mechanism (suggested in a WG27 meeting). 5. Do not allow for DICOMweb MPPS notifications at all but instead elaborate on the pattern used in IHE's Scheduled Workflow integration profile, where an intermediate party (broker-like) forwards MPPS updates to interested parties; ensure that such behavior is mentioned in the conformance statement. <p>Proposal: Go for the fifth option, where an MPPS origin server can be a MPPS user agent when forwarding MPPS updates when received.</p> <p>Decision: [WGxx, YYYY-MM-DD] None yet.</p>
4	<p>Context: HTTP method for updating an MPPS.</p> <p>Issue: Updating an MPPS, i.e. making a partial change to it, requires a DICOMweb transaction with an HTTP method. The HTTP Patch method is a request for making partial changes to an existing resource and therefore seems most appropriate. However, the approach in DICOMweb for updating a resource is set by UPS-RS, and this utilizes the POST method for making an update to a Workitem (PS3.18, Section 11.6.1) and introduces a new resource for changing a Workitem's state which uses PUT for that (PS3.18, 11.7.1). Using PATCH for MPPS updates would therefore be against the approach used in UPS-RS but would be in line with HTTP semantics.</p> <p>Proposal: Go for using the PATCH method for MPPS updates and create a separate CP for changing UPS-RS' approach to keep DICOMweb architecturally consistent. Even though the latter would require breaking changes, no UPS-RS implementations are known, so no harm is done. Furthermore, using PATCH will align DICOMweb's transactions with HTTP semantics.</p> <p>Decision: [WGxx, YYYY-MM-DD] None yet.</p>

5	<p>Context: Partial updates to MPPS sequences.</p> <p>Issue: DIMSE does not allow for partial updates of sequences within an MPPS (PS3.4, F7.2.2.2). With modalities that create Series that can contain over 100K instances and that may update the MPPS regularly (multiple N-SETs), this may be wasting bandwidth considerably, as each time the entire Referenced Image Sequence within the Performed Series Sequence is to be sent, including all that was already sent before. Another approach to this could be diverting from DIMSE's MPPS N-SET semantics and allowing for updates of this and similar sequences in the MPPS. As the MPPS N-SET was created in a time where Series would never have so many instances, it was not a big problem to send over the same information repeatedly. However, this has changed.</p> <p>Proposal: Although the concern is valid, it is not clear whether there are many occurrences of modalities that update the MPPS <i>repeatedly</i>, even though there could be merit in doing so, for instance for showing progress. It is therefore proposed to not include this in this supplement and write a CP for this behavior when needed, including DIMSE.</p> <p>Decision: [WGxx, YYYY-MM-DD] None yet.</p>
6	<p>Context: The name of the service returning modality scheduled procedure steps.</p> <p>Issue: In DIMSE this service is formally called the Basic Worklist Management Service (see PS3.4, Annex K) and is colloquially called the Modality Worklist Service. However, it might be clearer when its name shows that it is the counterpart of the Modality Performed Procedure Step Service.</p> <p>Proposal: Baptize this DICOMweb service the Modality Scheduled Procedure Step Service.</p> <p>Decision: [WGxx, YYYY-MM-DD] None yet.</p>

3

Closed Issues

1	<p>Context: The description of the work item proposal talked about adding the Modality Worklist and the Modality Performed Procedure Step services to DICOMweb, in principle based on the existing DICOMweb Worklist service. This was expected to boil down to creating an informative annex and any normative changes needed if gaps are discovered.</p> <p>Issue: It proved very hard, if not impossible, to map MWL/MPPS to UPS, as, among other things, the two serve different purposes.</p> <p>Proposal: Create new Modality Workflow Services and Resources based on the MWL/MPPS DIMSE model instead of basing them on UPS-RS.</p> <p>Decision: [WG06: 2025-01-14] Agreed with proposal.</p>
2	<p>Context: The notified parties of the MPPS notification service as specified in PS3.4.F.9.</p> <p>Issue: This service does not specify how the MPPS Notification SCP knows what SCUs to notify on MPPS changes.</p> <p>Proposal: Do not change the current way this behavior is specified; just add one or more notes to make clear that this aspect is something beyond the standard, and that a conceivable way to achieve this would be configuring the SCP with the SCUs to be notified.</p> <p>Decision: [WG06: 2025-03-28] Make this proposal into a separate CP.</p>

4

5

6

Scope and Field of Application

7 This supplement defines the means to perform modality workflow management in DICOMweb. Modality
8 workflow services enable a user agent to use and create workflow-related resources on an origin server.
9 They are an extension to the existing DICOMweb services, providing RESTful interfaces to the Modality
10 Worklist (MWL) and Modality Performed Procedure Step (MPPS) services that are already available in
11 DIMSE. The modality workflow services have been designed with the intention of facilitating proxies
12 from/to DIMSE.

13

Changes to NEMA Standards Publications PS 3.18

Add new section Y Modality Scheduled Procedure Step Service and Resources, immediately before section X below

Y Modality Scheduled Procedure Step Service and Resources

Y.1 Overview

The Modality Scheduled Procedure Step Service enables a user agent to search for Scheduled Procedure Steps, and entities related to these steps, intended to be performed on an imaging modality. It corresponds to the DIMSE Modality Worklist (MWL) service as defined in Annex K of PS3.4 and has the same semantics.

Y.1.1 Resource Descriptions

The Modality Scheduled Procedure Step Service provides access to a collection of Modality Scheduled Procedure Steps, defined as the resource given in Table Y.1.1-1.

Table Y.1.1-1. Resources, URI Templates and Descriptions

Resource	URI Template	Description
Modality Scheduled Procedure Steps	/modality-scheduled-procedure-steps	The collection of Modality Scheduled Procedure Steps managed by the origin server.

Y.1.2 Common Query Parameters

The origin server shall support Query Parameters as required in Table Y.1.2-1.

The user agent shall supply in the request Query Parameters as required in Table Y.1.2-1.

Table Y.1.2-1. Common Query Parameters

Name	Value	Usage		Section
		User Agent	Origin Server	
Accept	media-type	O	M	Section 8.3.3.1
Accept-Charset	charset	O	M	Section 8.3.3.2

Y.1.3 Common Media Types

The origin server shall support the media types specified as Default or Required in Table Y.1.3-1.

Table Y.1.3-1. Default, Required, and Optional Media Types

Media Type	Usage	Section
application/dicom+json	Default	Section 8.7.3.2
application/dicom+xml	Required	Section 8.7.3.2
multipart/related; type="application/dicom+json"	Required	Section 8.7.3.2
multipart/related; type="application/dicom+xml"	Required	Section 8.7.3.2

37 **Y.2 Conformance**

38 An origin server conforming to the Modality Scheduled Procedure Step Service shall support the Retrieve
39 Capabilities Transaction (see Section 8.9.1).

40 An origin server conforming to the Modality Scheduled Procedure Step Service shall support the
41 Transactions listed as Required in Table Y.2-1 and may support Transactions listed as Optional.

42 **Table Y.2-1. Required and Optional Transactions**

Transaction	Support	Section
Retrieve Capabilities	Required	Section 8.9
Search	Required	Section Y.4

43

44 Implementations shall specify in their Conformance Statement (see PS3.2) and the Retrieve Capabilities
45 Transaction the supported Transactions and the implementations' role: origin server, user agent, or both.

46 In addition, for each supported Transaction they shall specify:

- 47 • The supported Query Parameters, including optional Attributes, if any.
- 48 • The supported DICOM Media Types.
- 49 • The supported character sets (if other than UTF-8).

50 **Y.3 Transactions Overview**

51 The Modality Scheduled Procedure Step Service consists of the Transactions listed in Table Y.3-1.

52 **Table Y.3-1. Modality Scheduled Procedure Step Service Transactions**

Transaction Name	Method	Payload		Description
		Request	Success Response	
Search	GET	none	dataset according to PS3.4, Table K.6-1	Searches for Modality Scheduled Procedure Steps

53

54 Table Y.3-2 lists the Modality Scheduled Procedure Step Service Transactions and their corresponding
55 DIMSE Operations used in MWL.

56 **Table Y.3-2. Mapping of Modality Scheduled Procedure Step Service Transactions and DIMSE
57 Operations**

Transaction	Operation	Reference	DIMSE Service
Search	Query Worklist	PS3.4, K.4	C-FIND

58

59 **Note** As in DIMSE, the Transactions do *not* provide a complete CRUDL interface for the respective resource.
60 For instance, it is not possible to create Modality Scheduled Procedure Steps using DICOM, neither
61 with DIMSE, nor with DICOMweb. What DICOM *does* provide is access to scheduled procedure steps
62 at the level required for modalities.

63

64 **Y.4 Search Transaction**

65 This Transaction searches the Modality Scheduled Procedure Steps for scheduled procedure steps that
66 match the specified Query Parameters and returns a list of matching scheduled procedure steps. Each

67 scheduled procedure step in the returned list includes return Attributes specified in the request. The
68 Transaction corresponds to the DIMSE MWL C-FIND Operation (see PS3.4, Section K.4.1).

69 **Y.4.1 Request**

70 The request shall have the following syntax:

71 GET SP /modality-scheduled-procedure-steps?{&match*}{&includefield}{&fuzzymatching}{&offset}{&limit} SP version CRLF
72 Accept: 1#media-type CRLF
73 *(header-field CRLF)
74 CRLF

75 **Y.4.1.1 Target Resources**

76 The Target Resource for this Transaction is the Modality Scheduled Procedure Steps.

77 **Y.4.1.2 Query Parameters**

78 The origin server shall support Query Parameters as required in Table 8.3.4-1.

79 The user agent shall supply in the request Query Parameters as required in Table 8.3.4-1.

80 **Y.4.1.3 Request Header Fields**

81 The origin server shall support header fields as required in Table X.4.1-1.

82 The user agent shall supply in the request header fields as defined in Table X.4.1-1.

83 **Table X.4.1-1. Request Header Fields**

Name	Values	Usage		Description
		User Agent	Origin Server	
Accept	media-type	M	M	The Acceptable Media Types of the response payload.

84

85 See also Section 8.4.

86 **Y.4.1.4 Request Payload**

87 The request shall have no payload.

88 **Y.4.2 Behavior**

89 The origin server shall perform a search according to the requirements specified in Section 8.3.4.

90 For each matching modality scheduled procedure step, the origin server shall include in the results:

- 91 • All Attributes in Table K.6-1 “Attributes for the Modality Worklist Information Model” in PS3.4 with a
92 Return Key Type of 1 or 2.
- 93 • All Attributes in Table K.6-1 “Attributes for the Modality Worklist Information Model” in PS3.4 with a
94 Return Key Type of 1C or 2C for which the conditional requirements are met.
- 95 • All other Attributes passed as match parameters that are supported by the origin server as either
96 matching or return Attributes.
- 97 • All other Attributes passed as includefield parameter values that are supported by the origin server as
98 return Attributes.

99 **Y.4.3 Response**

100 The response shall have the following syntax:

101 version SP status-code SP reason-phrase CRLF
 102 CRLF
 103 [payload]

104 **Y.4.3.1 Status Codes**

105 Table Y.4.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5
 106 for additional status codes.

107 **Table Y.4.3-1. Status Code Meaning**

Status	Code	Meaning
Success	200 (OK)	The origin server returns the matching results.
	204 (No Content)	The origin server has no matching results.
Failure	400 (Bad Request)	The origin server cannot handle the search request because of errors in the request headers or parameters.
	413 (Payload Too Large)	The origin server cannot return the results, as their combined size exceeds the maximum payload size supported. The user agent may repeat the request with paging or with a narrower query to reduce the size.
	503 (Service Unavailable)	The origin server cannot handle the query; this may be a temporary or permanent state.

108

109 **Y.4.3.2 Response Header Fields**

110 The origin server shall support header fields as required in Table Y.4.3-2.

111 **Table Y.4.3-2. Response Header Fields**

Name	Values	Origin Server Usage	Description
Content-Type	media-type	C	See section 8.4.2.
Content-Encoding	encoding	C	See section 8.4.2.
Content-Length	Uint	C	See section 8.4.3.

112

113 All success responses shall also contain the Content Representation (see Section 8.4.2) and Payload
 114 header fields (see Section 8.4.3) with appropriate values.

115 **Y.4.3.3 Response Payload**

116 A success response shall contain a dataset according to PS3.4, Table K.6-1 supplied in an Acceptable
 117 Media Type. See Section 8.7.5.

118 A failure response payload may contain a Status Report describing any failures, warnings, or other useful
 119 information.

Add new section X Modality Performed Procedure Step Service and Resources, immediately after section Y above

X Modality Performed Procedure Step Service and Resources

X.1 Overview

The Modality Performed Procedure Step Service enables a user agent to report progress on Performed Procedure Steps as executed by imaging modalities. This service corresponds to the DIMSE Modality Performed Procedure Step (MPPS) service as defined in Annex F of PS3.4 and has the same semantics. However, Notifications, as defined in PS3.4, Annex F.9, are not supported by this service. Instead, to be able to achieve notification-like behavior, it is recommended to mimic the approach taken in IHE's Scheduled Workflow integration profile [IHE RAD TF-1], where the Actor Modality Performed Procedure Step Manager forwards the creation and updating of Modality Performed Procedure Steps to other Actors that are interested in progress.

X.1.1 Resource Descriptions

There is one resource defined by this service:

MPPS A dataset containing the Attributes specified in Table F.7.2-1 "Modality Performed Procedure Step SOP Class N-CREATE, N-SET and Final State Attributes" in PS3.4.

In the Modality Performed Procedure Step Service, an MPPS is identified by an MPPS UID, which corresponds to the SOP Instance UID used in the PS3.4 MPPS Service, see e.g. Section F.7.2.1.2.

The following URI Template variables are used in the definitions of the resources throughout Chapter X.

{mppsUID} The UID of the MPPS.

The Modality Performed Procedure Step Service manages a number of MPPSs; its resources are given in Table X.1.1-1.

Table X.1.1-1. Modality Workflow Service Resource Descriptions

Resource	URI Template	Description
Modality Performed Procedure Step	/modality-performed-procedure-steps/{mppsUID}	A single Modality Performed Procedure Step.

X.1.2 Common Query Parameters

The origin server shall support Query Parameters as required in Table X.1.2-1.

The user agent shall supply in the request Query Parameters as required in Table X.1.2-1.

Table X.1.2-1. Common Query parameters

Name	Value	Usage		Section
		User Agent	Origin Server	
Accept	media-type	O	M	Section 8.3.3.1
Accept-Charset	charset	O	M	Section 8.3.3.2

150

151 **X.1.3 Common Media Types**

152 The origin server shall support the media types specified as Default or Required in Table X.1.3-1.

153

Table X.1.3-1. Default, Required, and Optional Media Types

Media Type	Usage	Section
application/dicom+json	Default	Section 8.7.3.2
application/dicom+xml	Required	Section 8.7.3.2
multipart/related; type="application/dicom+json"	Required	Section 8.7.3.2
multipart/related; type="application/dicom+xml"	Required	Section 8.7.3.2

154

155 **X.2 Conformance**

156 An origin server conforming to the Modality Performed Procedure Step Service shall support the Retrieve
157 Capabilities Transaction (see Section 8.9.1). Furthermore, it shall support the transactions listed as
158 Required in Table X.2-1 and may support Transactions listed as Optional. The support of the Subscribe
159 and Unsubscribe transactions is mutually dependent.

160

Table X.2-1. Required and Optional Transactions

Transaction	Support	Section
Retrieve Capabilities	Required	Section 8.9
Create	Required	Section X.4
Update	Required	Section X.5
Retrieve	Optional	Section X.6

161

162 Implementations shall specify in their Conformance Statement (see PS3.2) and the Retrieve Capabilities
163 Transaction the supported Transactions and the implementations' role: origin server, user agent, or both.

164 In addition, for each supported Transaction they shall specify:

- 165 • The supported Query Parameters, including optional Attributes, if any.
- 166 • The supported DICOM Media Types.
- 167 • The supported character sets (if other than UTF-8).

168 **X.3 Transactions Overview**

169 The Modality Workflow Service consists of the Transactions listed in Table X.3-1.

170

Table X.3-1. Modality Performed Procedure Step Services Transactions

Transaction Name	Method	Payload		Description
		Request	Success Response	
Create	PUT	dataset according to PS3.4, Table F.7.2-1 (N-CREATE)	none	Creates a new Modality Performed Procedure Step

Transaction Name	Method	Payload		Description
		Request	Success Response	
Update	PATCH	dataset according to PS3.4, Table F.7.2-1 (N-SET)	none	Updates the target Modality Performed Procedure Step
Retrieve	GET	none	dataset according to PS3.4, Table F.8.2-1	Retrieves the target Modality Performed Procedure Step

171

172 In Table X.3-2, the Target Resources permitted for each transaction are marked with M if support is
 173 mandatory for the origin server and O if it is optional. A blank cell indicates that the resource is not
 174 allowed in the transaction.

175

Table X.3-2. Resources by Transaction

Resource	Create	Update	Retrieve
MPPS	M	M	O
Subscription			

176

177 Table X.3-3 lists the Modality Performed Procedure Step Service Transactions that have a corresponding
 178 DIMSE Operation in DIMSE MPPS.

Table X.3-3. Mapping of Modality Performed Procedure Step Service Transactions and DIMSE Operations

179

Transaction	Operation	Reference	DIMSE Service
Create	Create MPPS Instance	PS3.4, F.7.2.1	N-CREATE
Update	Set MPPS Information	PS3.4, F.7.2.2	N-SET
Retrieve	Get MPPS Information	PS3.4, F.8.2.1	N-GET

181

182 Note As in DIMSE, the Transactions do *not* provide a complete CRUDL interface for the respective
 183 resources. For instance, it is not possible to list all Modality Performed Procedure Steps using DICOM,
 184 neither with DIMSE, nor with DICOMweb. What DICOM *does* provide is access to performed procedure
 185 steps at the level required for modalities.

186

187

188 **X.4 Create Transaction**

189 This Transaction creates a Modality Performed Procedure Step with the given Attributes. It corresponds
 190 to the DIMSE MPPS N-CREATE Operation (see PS3.4, Section F.7.2.1).

191 **X.4.1 Request**

192 The request shall have the following syntax:

193 PUT SP /modality-performed-procedure-steps/{mppsUID} SP version CRLF

194 Accept: 1#media-type CRLF

195 *(header-field CRLF)

196 CRLF

197 payload

198 **X.4.1.1 Target Resource**

199 The Target Resource of this transaction is an individual Modality Performed Procedure Step identified by
200 its MPPS UID.

201 **X.4.1.2 Query Parameters**

202 The request has no Query Parameters.

203 **X.4.1.3 Request Header Fields**

204 The origin server shall support Request Header Fields as required in Table X.4.1-1.

205 The user agent shall supply Request Header Fields as required in Table X.4.1-1.

206 **Table X.4.1-1. Request Header Fields**

Name	Values	Usage		Description
		User Agent	Origin Server	
Accept	media-type	M	M	The Acceptable Media Types of the response payload.

207

208 See Section 8.4.

209 **X.4.1.4 Request Payload**

210 The request payload shall be present and shall contain one representation consistent with the Content-
211 Type header field. The representation shall conform to Media Types described in Section 8.7.3 DICOM
212 Media Type Sets. The payload shall conform to Section 8.6 Payloads.

213 The request payload shall contain the Modality Performed Procedure Step attributes with which the user
214 agent requests the origin server to create a Modality Performed Procedure Step resource, according to
215 PS3.4, Table F.7.2-1, requirement type N-CREATE (SCU).

216 **X.4.2 Behavior**

217 The origin server shall create a Modality Performed Procedure Step identified by the provided MPPS UID
218 and filled with the provided attributes in the payload.

219 **X.4.3 Response**

220 The response shall have the following syntax:

221 version SP status-code SP reason-phrase CRLF
222 CRLF
223 [payload]

224

225 **X.4.3.1 Status Codes**

226 Table X.4.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5
227 for additional status codes.

228

Table X.4.3-1. Status Code Meaning

Status	Code	Meaning
Success	200 (OK)	The origin server has created the requested Modality Performed Procedure Step with the provided attributes.
Failure	400 (Bad Request)	The origin server cannot handle the create request because of errors in the request headers or parameters.

	409 (Conflict)	The origin server cannot create the target Modality Performed Procedure Step because the provided Modality Performed Procedure Step UID is already in use.
	503 (Service Unavailable)	The origin server cannot handle the creation of the Modality Performed Procedure Step; this may be a temporal or permanent state.

229

230 **X.4.3.2 Response Header Fields**

231 The origin server shall support header fields as required in Table X.4.3-2.

232

Table X.4.3-2. Response Header Fields

Name	Values	Origin Server Usage	Description
Content-Type	media-type	C	See section 8.4.2.
Content-Encoding	encoding	C	See section 8.4.2.
Content-Length	uint	C	See section 8.4.3.

233

234 All success responses shall also contain the Content Representation (see Section 8.4.2) and Payload
235 header fields (see Section 8.4.3) with appropriate values.

236 **X.4.3.3 Response Payload**

237 A success response shall have no payload.

238 A failure response payload may contain a Status Report describing any failures, warnings, or other useful
239 information.

240 **X.5 Update Transaction**

241 This Transaction sets Attributes of an existing Modality Performed Procedure Step. It corresponds to the
242 DIMSE MPPS N-SET Operation (see PS3.4, Section F.7.2.2).

243 **X.5.1 Request**

244 The request shall have the following syntax:

245 PATCH SP /modality-performed-procedure-steps/{mppsUID} SP version CRLF
246 Accept: 1#media-type CRLF
247 *(header-field CRLF)
248 CRLF
249 payload

250 **X.5.1.1 Target Resources**

251 The Target Resource of this transaction is an individual Modality Performed Procedure Step identified by
252 its MPPS UID.

253 **X.5.1.2 Query Parameters**

254 The request has no Query Parameters.

255 **X.5.1.3 Request Header Fields**

256 The origin server shall support Request Header Fields as required in Table X.5.1-1.

257 The user agent shall supply Request Header Fields as required in Table X.5.1-1.

258

Table X.5.1-1. Request Header Fields

Name	Values	Usage		Description
		User Agent	Origin Server	
Accept	media-type	M	M	The Acceptable Media Types of the response payload.

259

260 See also Section 8.4.

261 **X.5.1.4 Request Payload**

262 The request payload shall be present and shall contain one representation consistent with the Content-
263 Type header field. The representation shall conform to Media Types described in Section 8.7.3 DICOM
264 Media Type Sets. The payload shall conform to Section 8.6 Payloads.

265 The request payload shall contain the Modality Performed Procedure Step attributes with which the user
266 agent requests the origin server to update a Modality Performed Procedure Step resource, according to
267 PS3.4, Table F.7.2-1, requirement type N-SET (SCU).

268 **X.5.2 Behavior**

269 The origin server shall update the Modality Performed Procedure Step identified by the provided MPPS
270 UID with the provided attributes in the payload.

271 **X.5.3 Response**

272 The response shall have the following syntax:

273 version SP status-code SP reason-phrase CRLF

274 CRLF

275 [payload]

276

277 **X.5.3.1 Status Codes**

278 Table X.5.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5
279 for additional status codes.

280

Table X.5.3-1. Status Code Meaning

Status	Code	Meaning
Success	200 (OK)	The origin server has updated the Modality Performed Procedure Step with the provided attributes.
Failure	400 (Bad Request)	The origin server cannot handle the update request because of errors in the request headers or parameters.
	404 (Not Found)	The origin server has no knowledge about the target Modality Performed Procedure Step.
	409 (Conflict)	The origin server cannot update the target Modality Performed Procedure Step, for instance because the changes provided are incompatible with the data of the target Modality Performed Procedure Step.
	410 (Gone)	The origin server knows that the target Modality Performed Procedure Step did exist but has been deleted.
	503 (Service Unavailable)	The origin server cannot handle the creation of the Modality Performed Procedure Step; this may be a temporal or permanent state.

281

282 Note When it is requested that attributes are to be updated while these have not been made available at
283 creation time, a 409 (Conflict) can be returned; this is the case when PS3.4, Table F.7.2-1 specifies that
284 these attributes should have been made available at creation time.

285

286 **X.5.3.2 Response Header Fields**

287 The origin server shall support header fields as required in Table X.5.3-2.

288

Table X.5.3-2. Response Header Fields

Name	Values	Origin Server Usage	Description
Content-Type	media-type	C	See section 8.4.2.
Content-Encoding	encoding	C	See section 8.4.2.
Content-Length	uint	C	See section 8.4.3.

289

290 All success responses shall also contain the Content Representation (see Section 8.4.2) and Payload
291 header fields (see Section 8.4.3) with appropriate values.

292 **X.5.3.3 Response Payload**

293 A success response should have no payload.

294 A failure response payload may contain a Status Report describing any failures, warnings, or other useful
295 information.

296 **X.6 Retrieve Transaction**

297 This Transaction retrieves an existing Modality Performed Procedure Step. It corresponds to the MPPS
298 DIMSE N-GET Operation (see PS3.4, Section F.8.2.1).

299 **X.6.1 Request**

300 The request shall have the following syntax:

301 GET SP /modality-performed-procedure-steps/{mppsUID}{?includefield*} SP version CRLF
302 Accept: 1#media-type CRLF
303 *(header-field CRLF)
304 CRLF
305

306 **X.6.1.1 Target Resources**

307 The Target Resource of this transaction is an individual Modality Performed Procedure Step identified by
308 its MPPS UID.

309 **X.6.1.2 Query Parameters**

310 The origin server shall support the includefield Query Parameter. This specifies the Attributes that shall
311 be included in the response. The value is either a comma-separated list of attributes, or the single
312 keyword "all", which means that all available attributes of the object should be included in the response.

313 includefield = *("includefield" "=" (1#attribute / "all"))

314 There may be one or more includefield parameters; however, if a parameter with the value of "all" is
315 present, then other includefield parameters shall not be present.

316 The includefield parameter corresponds to DIMSE's PS3.4, Table F.8.2-1 "Modality Performed Procedure
317 Step Retrieve SOP Class N-GET Attributes".

318 The user agent may supply includefield Query Parameters as described above.

319 **X.6.1.3 Request Header Fields**

320 The origin server shall support Request Header Fields as required in Table X.6.1-1.

321 The user agent shall supply Request Header Fields as required in Table X.6.1-1.

322 **Table X.6.1-1. Request Header Fields**

Name	Values	Usage		Description
		User Agent	Origin Server	
Accept	media-type	M	M	The Acceptable Media Types of the response payload.

323

324 See Section 8.4.

325 **X.6.1.4 Request Payload**

326 The request shall have no payload.

327 **X.6.2 Behavior**

328 If the Modality Performed Procedure Step exists on the origin server, the attributes of this as specified in
329 the includefield shall be returned in an Acceptable Media Type (see Section 8.7.4). When the includefield
330 is absent, all attributes shall be returned.

331 **X.6.3 Response**

332 The response shall have the following syntax:

333 version SP status-code SP reason-phrase CRLF

334 CRLF

335 [payload]

336

337 **X.6.3.1 Status Codes**

338 Table X.6.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5
339 for additional status codes.

340

Table X.6.3-1. Status Code Meaning

Status	Code	Meaning
Success	200 (OK)	The origin server returned the target Modality Performed Procedure Step.
Failure	400 (Bad Request)	The origin server cannot handle the retrieve request because of errors in the request headers or parameters.
	404 (Not Found)	The origin server has no knowledge about the target Modality Performed Procedure Step.
	410 (Gone)	The origin server knows that the target Modality Performed Procedure Step did exist but has been deleted.

	503 (Service Unavailable)	The origin server cannot handle the retrieval of the target Modality Performed Procedure Step; this may be a temporal or permanent state.
--	---------------------------	---

341

342 **X.6.3.2 Response Header Fields**

343 The origin server shall support header fields as required in Table X.6.3-2.

344

Table X.6.3-2. Response Header Fields

Name	Values	Origin Server Usage	Description
Content-Type	media-type	C	See section 8.4.2.
Content-Encoding	encoding	C	See section 8.4.2.
Content-Length	uint	C	See section 8.4.3.

345

346 All success responses shall also contain the Content Representation (see Section 8.4.2) and Payload
347 header fields (see Section 8.4.3) with appropriate values.

348 **X.6.3.3 Response Payload**

349 A success response has a payload containing the requested Modality Performed Procedure Step in the
350 Selected Media Type.

351 A failure response payload may contain a Status Report describing any failures, warnings, or other useful
352 information.

353 **Update Section 2 Normative References: add [IHE RAD TF-1]**

354 ...
355 **2.3 Other References**
356 ...
357 [FHIR Access Denied] HL7. . FHIR Security - Access Denied Response Handling.
358 <http://hl7.org/fhir/security.html#AccessDenied>.
359 **[IHE RAD TF-1] Integrating the Healthcare Enterprise (IHE). Radiology Technical Framework**
360 **Volume 1. http://www.ihe.net/uploadedFiles/Documents/Radiology/IHE_RAD_TF_Vol1.pdf.**
361 **[IHE RAD TF-Vol-2] Integrating the Healthcare Enterprise (IHE). Radiology Technical Framework Volume**
362 **2. http://www.ihe.net/uploadedFiles/Documents/Radiology/IHE_RAD_TF_Vol2.pdf.**
363 ...

364 **Update Section 4 Symbols and Abbreviated Terms: add CRUDL, MPPS, MWL, and UPS**

365 **4 Symbols and Abbreviated Terms**

366 ...

367 **ABNF** Augmented Backus-Naur Form. See [RFC5234] and [RFC7405].

368 **CRUDL** **Create, Read, Update, Delete, List; basic operations/actions on objects.**

369 **DICOM** Digital Imaging and Communications in Medicine

370 ...

371 **JSON** JavaScript Object Notation

372 **MPPS** **Modality Performed Procedure Step service. See PS3.4, Annex F.**

373 **MWL** **Modality Worklist service; colloquial name for the Basic Worklist service. See PS3.4,**
374 **Annex K.**

375 **QIDO-RS** Query based on ID for DICOM Objects by RESTful Services

376 ...

377 **UID** Unique (DICOM) Identifier

378 **UPS** **Unified Procedure Step service. See PS3.4, Annex CC.**

379 **UPS-RS** Unified Procedure Step by RESTful Services

380 ...

381

382 **Update Section 8.1.1 Request Message Syntax by adding PATCH**

383 ...
384 method = "CONNECT" / "DELETE" / "GET" / "HEAD" / "OPTIONS" / "PATCH" / "POST" / "PUT"

385 ...
386 **8.1.1.1 Method**

387 The request method is one of the HTTP methods, such as CONNECT, DELETE, GET, HEAD, OPTIONS,
388 **PATCH**, POST, **and** PUT. See [RFC7230] Section 4.

389
390 **Update Section B Examples: add new examples for the Modality Workflow Service**

391 **B Examples (Informative)**

392 ...
393 **B.X1 Searching for Modality Scheduled Procedure Steps using JSON Media Type**

394 This example illustrates a request to retrieve the scheduled procedure steps for a scheduled station:
395 CTSCANNER, start date: 20250101 and modality: CT, where the results are to be returned in JSON.
396 Also, the number of returned results is limited to 20 and the results are requested to contain all available
397 tags. The offset of the returned results is set to 0.

398 GET /radiology/modality-scheduled-procedure-
399 steps/?00400100.00400010=CTSCANNER&00400100.00400002=20250101&00400100.00080060=CT
400 &limit=20&offset=0&includefield=all HTTP/1.1
401 Host: www.hospital-stmarco
402 Accept: application/dicom+json
403

404 An example of a successful response to the above request is given below:

405 HTTP/1.1 200 OK
406 Content-Length: 1191
407 Content-Type: application/dicom+json; charset=utf-8
408 ...
409 [{
410 , ...
411 , "00100010": { "vr": "PN", "Value": [{ "Alphabetic": "Doe^Sally" }] }
412 , "0020000D": { "vr": "UI", "Value": ["1.2.250.1.59.40211.30000008090412501082300000004"] }
413 , "00401001": { "vr": "SH", "Value": ["P-ID-22"] }
414 , ...
415 , "00400100": { "vr": "SQ", "Value":
416 [{ "00400002": { "vr": "DA", "Value": ["20250101"] }
417 , "00400007": { "vr": "LO", "Value": ["Specials^04a_HeadCTA"] }
418 , "00400009": { "vr": "SH", "Value": ["PS-ID-23"] }
419 , "00400010": { "vr": "SH", "Value": ["CTSCANNER"] }
420 , ...
421 }
422 , { "00400002": { "vr": "DA", "Value": ["20250101"] }
423 , "00400007": { "vr": "LO", "Value": ["Specials^04a_SpineCTA"] }
424

```

424     , "00400009": { "vr": "SH", "Value": ["PS-ID-24"] }
425     , "00400010": { "vr": "SH", "Value": ["CTSCANNER"] }
426     , ...
427     }
428     , ...
429   ]}
430   , ...
431   }
432   , ...
433   ]
434

```

435 The response returns two scheduled procedure steps for Sally Doe, one for the head and the other one
436 for the spine. The attributes are according to PS3.4, Table_K.6-1 “Attributes for the Modality Worklist
437 Information Model”:

- 438 • Patient's Name (0010,0010);
- 439 • Study Instance UID (0020,000D);
- 440 • Requested Procedure ID (0040,1001);
- 441 • Scheduled Procedure Step Sequence (0040,0100);
 - 442 ○ Scheduled Procedure Step Description (0040,0007);
 - 443 ○ Scheduled Station Name (0040,0010);
 - 444 ○ Scheduled Procedure Step Start Date (0040,0002);
 - 445 ○ Scheduled Procedure Step ID (0040,0009).

446 **B.X2 Creating a Modality Performed Procedure Step using JSON Content Type**

447 This example illustrates a request to create a modality performed procedure step using JSON. The
448 intention is to mark it in the state: “IN PROGRESS”. This is a continuation of the previous example as
449 given in B.X1, where the Patient’s Name (0010,0010), Study Instance UID (0020,000D), Scheduled
450 Procedure Step Description (0040,0007), and Requested Procedure ID (0040,1001) have been taken
451 over from the received modality scheduled procedure step, and the Performed Procedure Step Status
452 (0040,0252), Performed Procedure Step ID (0040,0253), Accession Number (0008,0050), and
453 Scheduled Procedure Step ID (0040,0009) have been added as “IN PROGRESS”,
454 1.2.250.1.59.40211.12345678.987654, 1, and “PS-ID-23” respectively, some of which in the Scheduled
455 Step Attributes Sequence (0040,0270).

```

456 PUT /radiology/modality-performed-procedure-steps/ 1.2.250.1.59.40211.12345678.987654 HTTP/1.1
457 Host: www.hospital-stmarco
458 Content-Type: application/dicom+json
459 ...
460 {
461   ...
462   , "00100010": { "vr": "PN", "Value": [{"Alphabetic": "Doe^Sally"}] }
463   , "00400242": { "vr": "SH", "Value": ["CTSCANNER"] }
464   , "00400252": { "vr": "CS", "Value": ["IN PROGRESS"] }
465   , "00400253": { "vr": "SH", "Value": ["1.2.250.1.59.40211.12345678.987654"] }
466   , ...
467   , "00400270": { "vr": "SQ", "Value":
468     [ { "00080050": { "vr": "SH", "Value": ["1"] }
469       , "0020000D": { "vr": "UI", "Value": ["1.2.250.1.59.40211..30000008090412501082300000004"] }
470       , "00400007": { "vr": "LO", "Value": ["Specials^04a_HeadCTA"] }
471       , "00400009": { "vr": "SH", "Value": ["PS-ID-23"] }
472       , "00401001": { "vr": "SH", "Value": ["P-ID-22"] }
473     ]
474   }
475   , ...
476   ]}

```

477 , ...
478 }
479 ...
480

481 A successful response to the request will be:

482 HTTP/1.1 200 OK
483

484 **B.X3 Updating a Modality Performed Procedure Step with Produced Image Data using**
485 **JSON Content Type**

486 This example illustrates an HTTP request for updating a modality performed procedure step using JSON.
487 The intention is to record the newly created instances as part of the Referenced Image Sequence
488 (0008,1140) during the ongoing acquisition of images on the modality.

489 This example is a continuation of the previous example as given in B.X2, working on the same MPPS
490 with UID 1.2.250.1.59.40211.12345678.987654. It adds a Performed Series Sequence (0040,0340),
491 which contains:

- 492 • a Series Description (0008,103E) with value "Head 1.50 Hr64 ax";
- 493 • Gregory House as the performing physician (Performing Physician's Name (0008,1050));
- 494 • a Referenced Image Sequence (0008,1140) with two items that have the same Referenced SOP
495 Class UID (0008,1150), namely "1.2.840.10008.5.1.4.1.1.2", which is CT Image, and have distinct
496 Referenced SOP Instance UIDs (0008,1155);
- 497 • a Protocol Name (0018,1030) with value "Special^99a_HeadCTA";
- 498 • a Series Instance UID (0020,000E):
499 "1.2.250.1.59.40211.197132.30000020040718322840300000007".

500

```
501 PATCH /radiology/modality-performed-procedure-steps/1.2.250.1.59.40211.12345678.987654 HTTP/1.1
502 Host: www.hospital-stmarco
503 Content-Type: application/dicom+json
504 ...
505 { ...
506 , "00400340": { "vr": "SQ", "Value":
507   [ { "0008103E": { "vr": "LO", "Value": ["Head 1.50 Hr64 ax"] }
508     , "00081050": { "vr": "PN", "Value": [{"Alphabetic": "House^Gregory" }] }
509     , "00081140": { "vr": "SQ", "Value":
510       [ { "00081150": { "vr": "UI", "Value": ["1.2.840.10008.5.1.4.1.1.2"] }
511         , "00081155": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.3000002004071832284030000520"] }
512         , ...
513       ]
514     , { "00081150": { "vr": "UI", "Value": ["1.2.840.10008.5.1.4.1.1.2"] }
515     , "00081155": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.3000002004071832284030000521"] }
516     , ...
517   ]
518   , ...
519 ]}
520 , ...
521 , "00181030": { "vr": "LO", "Value": ["Special^99a_HeadCTA"] }
522 , "0020000E": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.30000020040718322840300000007"] }
523 , ...
524 }
525 , ...
526 ]}
527 , ...
528 }
```


529 ...
530

531 A successful response to the request will be:

532 HTTP/1.1 200 OK
533

534 Note Updating sequences within the Modality Performed Procedure Step, like the Performed Series
535 Sequence (0040,0340) and the Referenced Image Sequence (0008,0140), is only possible by providing
536 these in their entirety, as is required in DIMSE. Updating sequences by only providing changes to them
537 is not possible. See PS3.4, section F.7.2.2.2.

538

539 **B.X4 Completing a Modality Performed Procedure Step using JSON Content Type**

540 This example illustrates an example of an HTTP request for completing a modality performed procedure
541 step. It is a continuation of the previous example as given in B.X3, working on the same MPPS with UID
542 1.2.250.1.59.40211.12345678.987654. Here, the mandatory Performed Procedure Step End Date
543 (0040,0250) and Performed Procedure Step End Time (0040,0251) are added, and the Performed
544 Procedure Step Status (0040,0252) is set to "COMPLETED".

```
545 PATCH /radiology/modality-performed-procedure-steps/1.2.250.1.59.40211.12345678.987654 HTTP/1.1
546 Host: www.hospital-stmarco
547 Content-Type: application/dicom+json
548 ...
549 { ...
550   , "00400250": { "vr": "DA", "Value": ["20200101"] }
551   , "00400251": { "vr": "TM", "Value": ["1300"] }
552   , "00400252": { "vr": "CS", "Value": ["COMPLETED"] }
553   , ...
554 }
555 ...
556
```

557 A successful response to the request will be:

558 HTTP/1.1 200 OK
559

560 **B.X5 Retrieving a Modality Performed Procedure Step using JSON Media and Content Type**

562 Here we have two examples, the first returning all available attributes, and the second returning a
563 specified selection of attributes.

564 **B.X5.1 Return All Attributes**

565 This example illustrates a request to retrieve an existing modality performed procedure step in JSON
566 returning all attributes. It is a culmination of the previous examples as given in B.X2-B.X4 in which all
567 attributes that have been added are returned here.

```
568 GET /radiology/modality-performed-procedure-steps/ 1.2.250.1.59.40211.12345678.987654?includefield=all HTTP/1.1
569 Host: www.hospital-stmarco
570 Accept: application/dicom+json
```

571 A successful response to the request will be:

572 HTTP/1.1 200 OK
573 Content-Length: 2191

```
574 Content-Type: application/dicom+json; charset=utf-8
575 ...
576 [{
577 ...
578   , "00100010": { "vr": "PN", "Value": [{"Alphabetic": "Doe^Sally" }] }
579   , "00400242": { "vr": "SH", "Value": ["CTSCANNER" ] }
580   , "00400252": { "vr": "CS", "Value": ["COMPLETED" ] }
581   , "00400253": { "vr": "SH", "Value": ["1.2.250.1.59.40211.12345678.987654" ] }
582   , ...
583   , "00400270": { "vr": "SQ", "Value":
584     [ { "00080050": { "vr": "SH", "Value": ["1" ] }
585       , "0020000D": { "vr": "UI", "Value": ["1.2.250.1.59.40211..30000008090412501082300000004" ] }
586       , "00400007": { "vr": "LO", "Value": ["Specials^04a_HeadCTA" ] }
587       , "00400009": { "vr": "SH", "Value": ["PS-ID-23" ] }
588       , "00401001": { "vr": "SH", "Value": ["P-ID-22" ] }
589     ]
590   }
591   , ...
592 ]}
593 , ...
594 , "00400340": { "vr": "SQ", "Value":
595   [ { "0008103E": { "vr": "LO", "Value": ["Head 1.50 Hr64 ax" ] }
596     , "00081050": { "vr": "PN", "Value": [{"Alphabetic": "House^Gregory" }] }
597     , "00081140": { "vr": "SQ", "Value":
598       [ { "00081150": { "vr": "UI", "Value": ["1.2.840.10008.5.1.4.1.1.2" ] }
599         , "00081155": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.3000002004071832284030000520" ] }
600       ]
601     }
602     , { "00081150": { "vr": "UI", "Value": ["1.2.840.10008.5.1.4.1.1.2" ] }
603       , "00081155": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.3000002004071832284030000521" ] }
604     ]
605   }
606   , ...
607 ]}
608 , ...
609 , "00181030": { "vr": "LO", "Value": ["Special^99a_HeadCTA" ] }
610 , "0020000E": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.3000002004071832284030000007" ] }
611 , ...
612 }
613 , ...
614 ]}
615 , ...
616 ]}]
617
```

618 The attributes are according to PS3.4, Section F.8.

619 **B.X5.2 Returning Specific Attributes Only**

620 This example illustrates a request to retrieve an existing modality performed procedure step in JSON
621 returning specific attributes only, in this case the Patient's Name (0010,0010), the Performed Procedure
622 Step Status (0040,0252), and the Performed Station Name (0040,0242).

```
623 GET /radiology/modality-performed-procedure-steps/
624 1.2.250.1.59.40211.12345678.987654?includefield=00100010,00400252,00400242 HTTP/1.1
625 Host: www.hospital-stmarco
626 Accept: application/dicom+json
```

627 A successful response to the request will be:

```
628 HTTP/1.1 200 OK
629 Content-Length: 289
```

```
630 Content-Type: application/dicom+json; charset=utf-8
631
632 [ { "00100010": { "vr": "PN", "Value": [ { "Alphabetic": "Doe^Sally" } ] }
633   , "00400242": { "vr": "SH", "Value": [ "CTSCANNER" ] }
634   , "00400252": { "vr": "CS", "Value": [ "COMPLETED" ] }
635 } ]
636
```

637 **Note** The order of the attributes in the result is different than that of the request, as the JSON result needs to
638 provide the attributes in ascending order (see Section F.2.2). Such ordering is not required for the query
639 parameters.

640

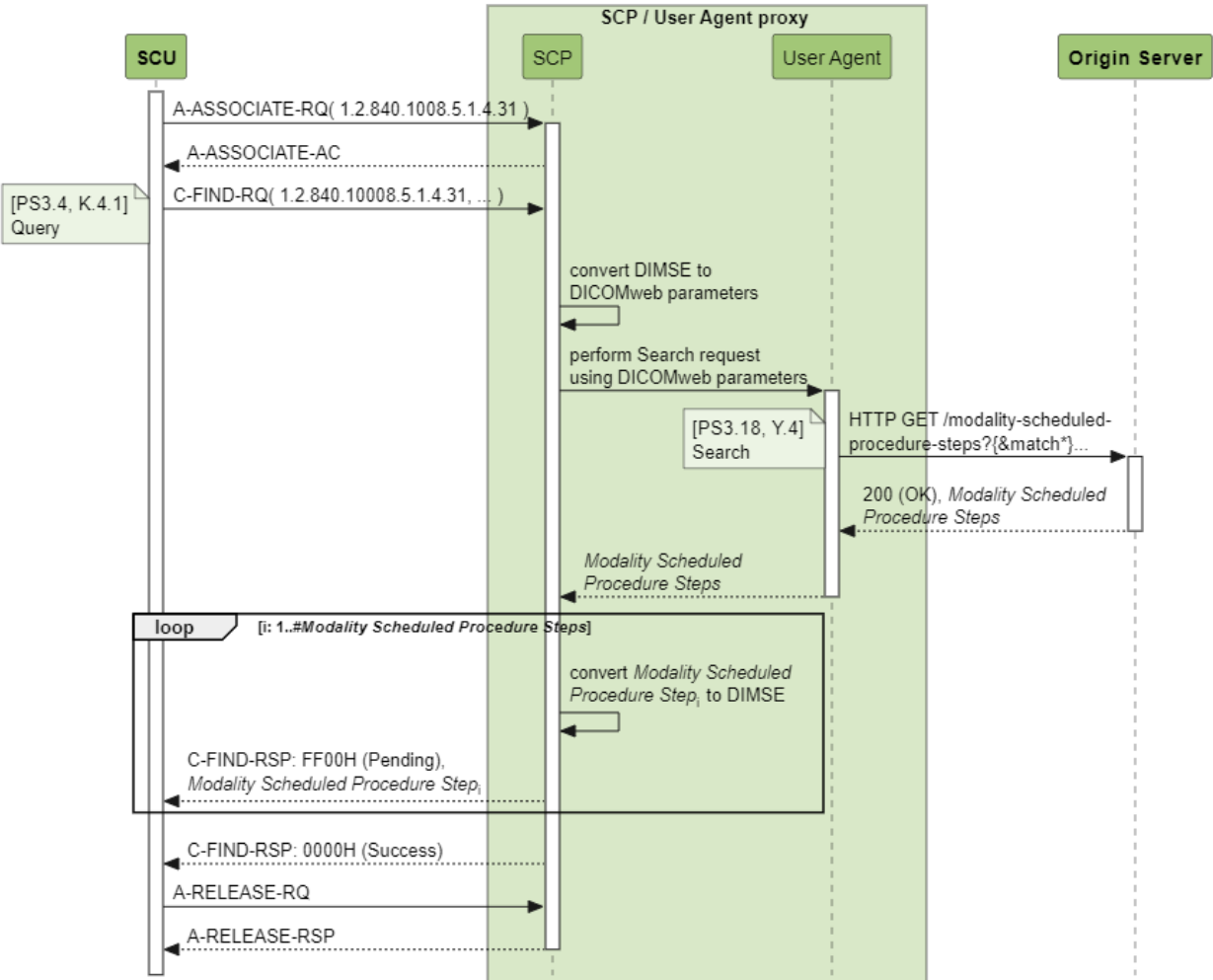
641 **B.X6 Bi-directional Proxies for Searching the Modality Scheduled Procedure Steps**

642 The DICOMweb Modality Scheduled Procedure Step Service may be deployed in a hybrid environment,
643 i.e. an environment in which both DICOMweb and DIMSE are used. In such a hybrid environment, a
644 proxy can broker transactions from one service to the other, allowing a DICOMweb origin server or a
645 DIMSE SCP to support workflow primitives for a mixed set of DICOMweb user agents and DIMSE SCUs.

646 DICOM does not require an implementation of proxies; however, since they would be very useful in a
647 hybrid environment, the examples in this section show how this could be done.

648 Figure B.X6-1 shows how a proxy could facilitate a request for searching modality scheduled procedure
649 steps from a DIMSE SCU to a DICOMweb origin server.

650

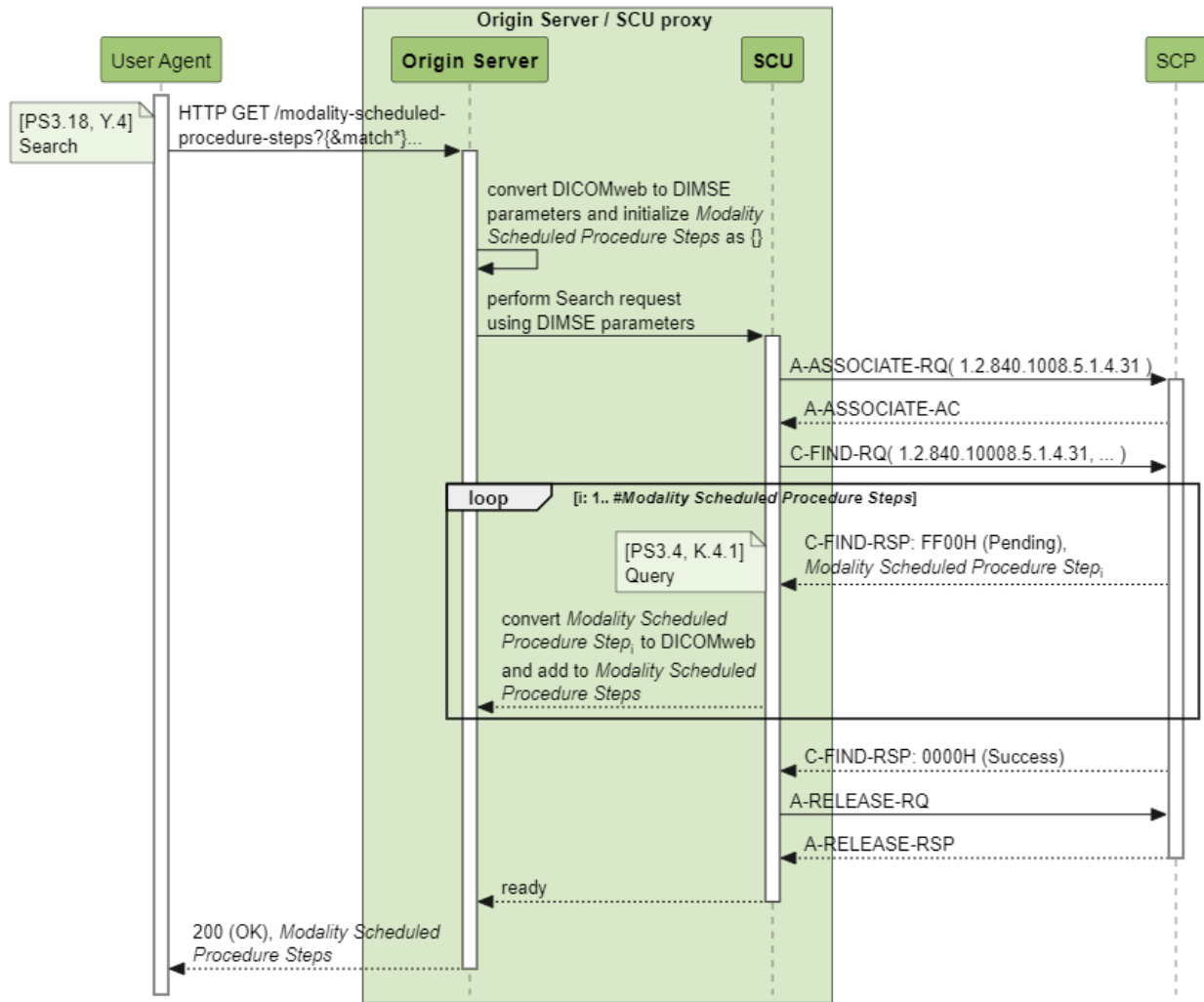


651

652 **Figure B.X6-1. Modality Scheduled Procedure Step DIMSE Proxy for DICOMweb Origin Server**

653 Figure B.X6-2 shows how a proxy could facilitate a request for searching modality scheduled procedure
654 steps from a DICOMweb user agent to a DIMSE SCP.

655



656

657

Figure B.X6-2. Modality Scheduled Procedure Step DICOMweb Proxy for DIMSE SCP

658

B.X7 Bi-directional Proxies for Managing a Modality Performed Procedure Step

659

660

661

662

The DICOMweb Modality Performed Procedure Step Service may be deployed in a hybrid environment, i.e. an environment in which both DICOMweb and DIMSE are used. In such a hybrid environment, a proxy can broker transactions from one service to the other, allowing a DICOMweb origin server or a DIMSE SCP to support workflow primitives for a mixed set of DICOMweb user agents and DIMSE SCUs.

663

664

DICOM does not require an implementation of proxies; however, since they would be very useful in a hybrid environment, the examples in this section show how this could be done.

665

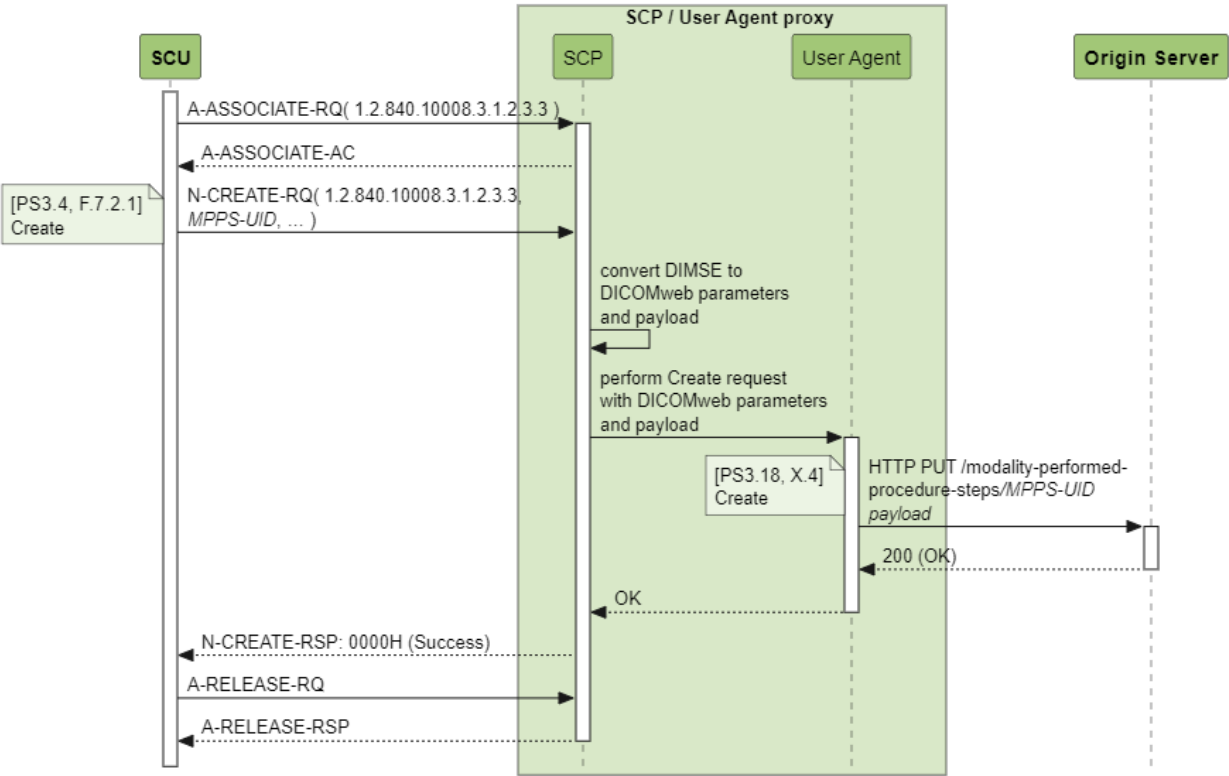
B.X7.1 Create

666

667

Figure B.X7.1-1 shows how a proxy could facilitate a request for creating a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.

668



669

670

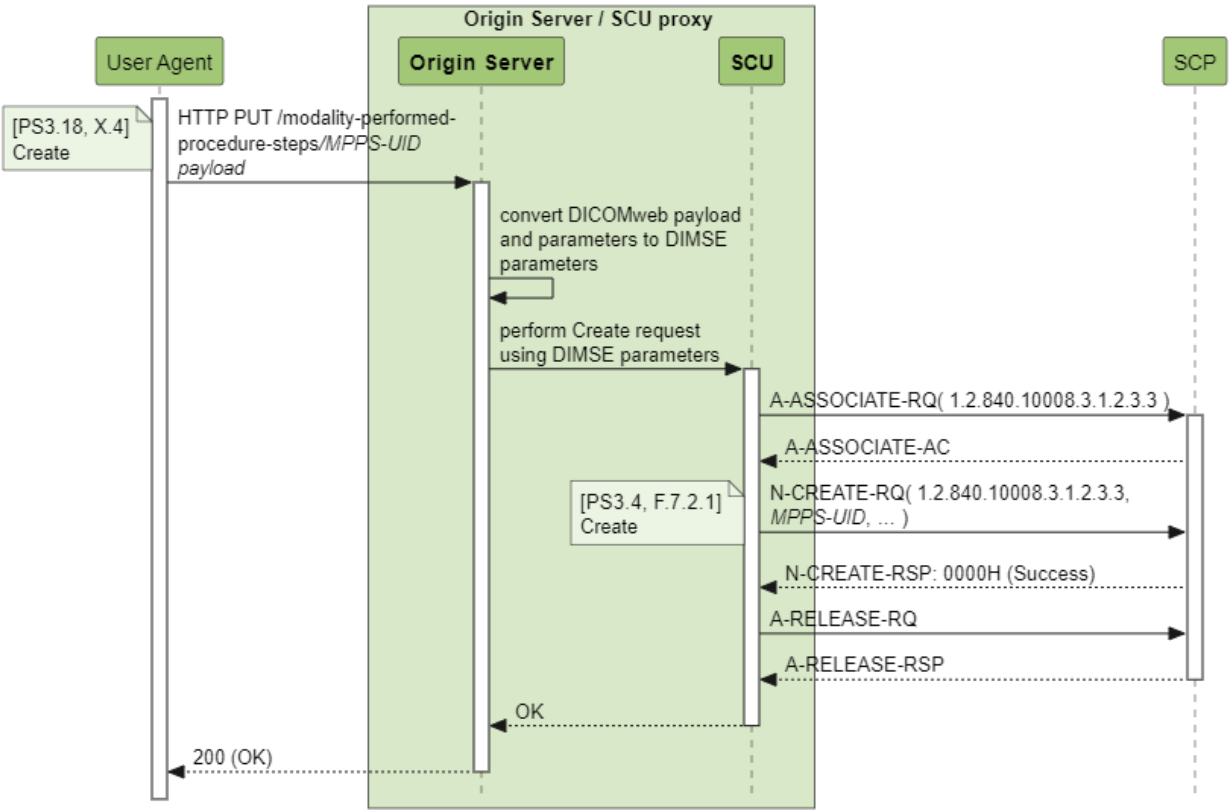
Figure B.X7.1-1. MPPS Create DIMSE Proxy for DICOMweb Origin Server

671

Figure B.X7.1-2 shows how a proxy could facilitate a request for creating a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.

672

673



674

675

Figure B.X7.1-2. MPPS Create DICOMweb Proxy for DIMSE SCP

676

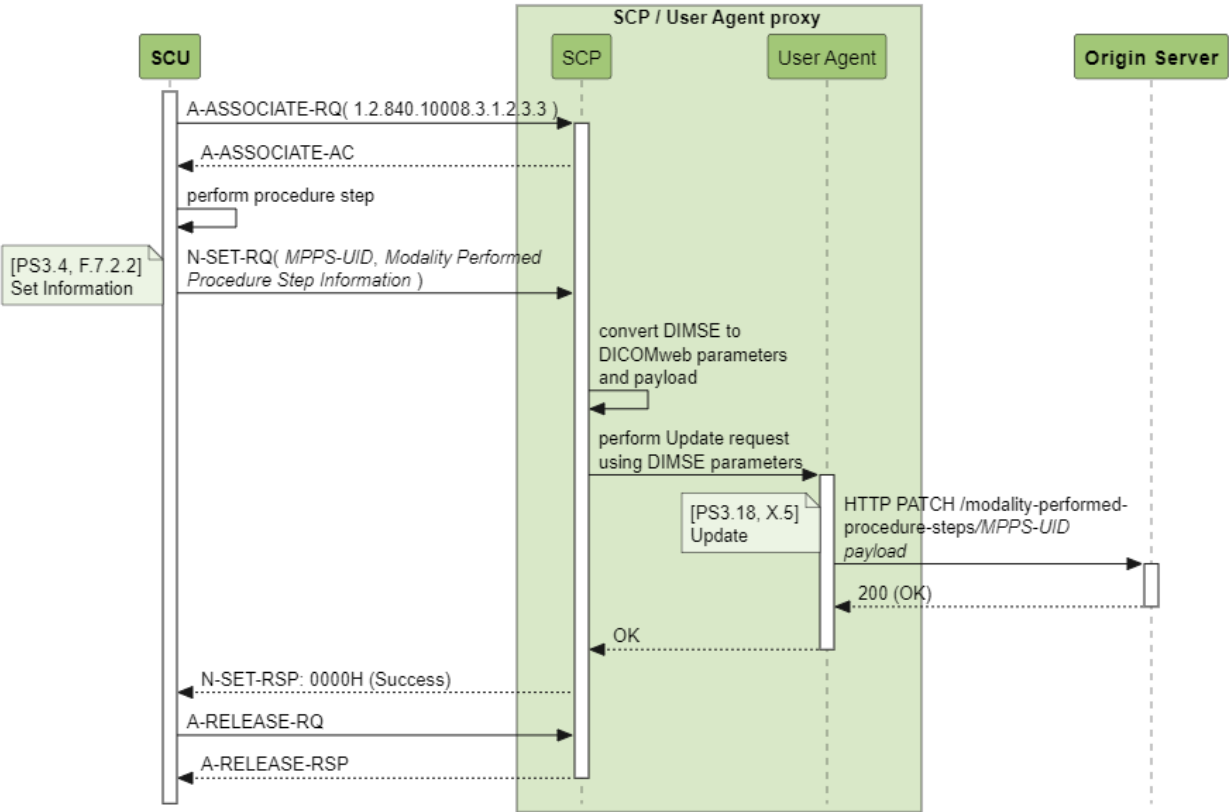
B.X7.2 Update

677

Figure B.X7.2-1 shows how a proxy could facilitate a request for updating a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.

678

679



680

681

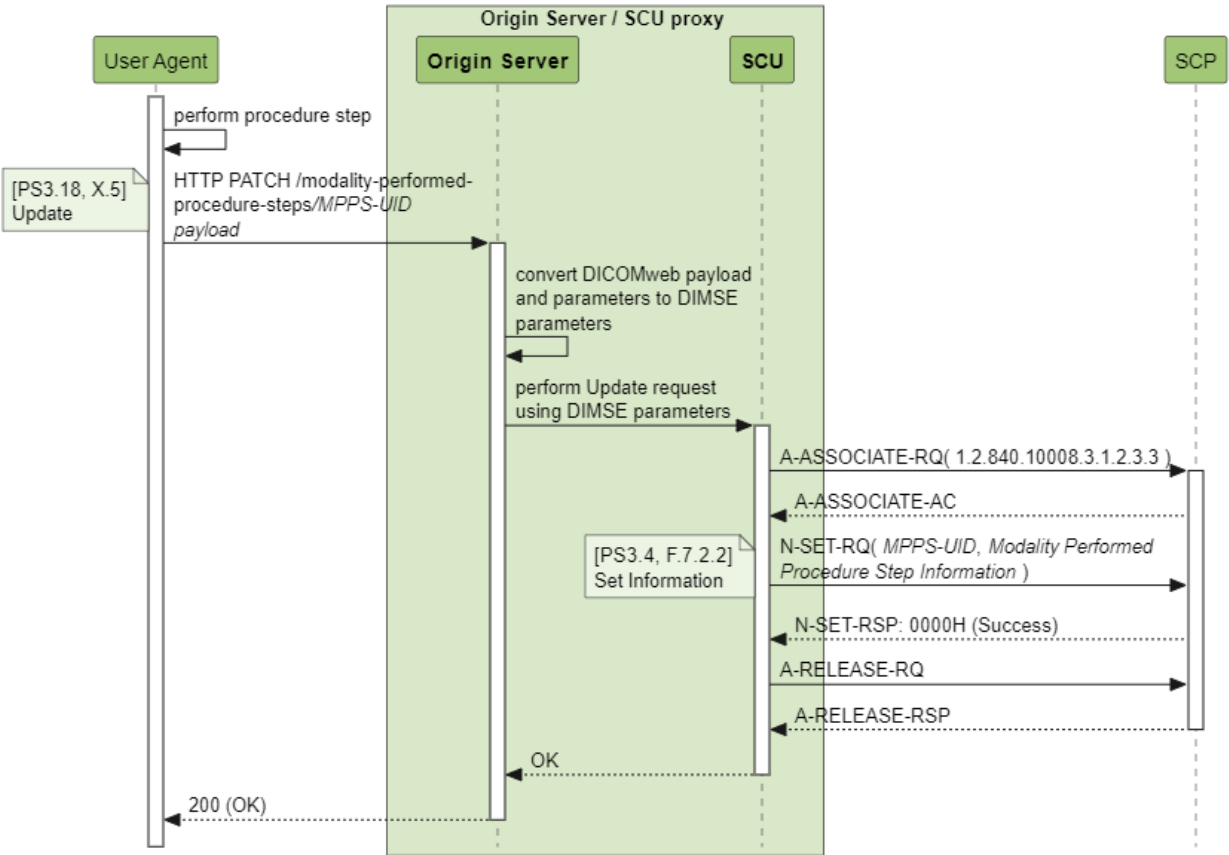
Figure B.X7.2-1. MPPS Update DIMSE Proxy for DICOMweb Origin Server

682

Figure B.X7.2-2 shows how a proxy could facilitate a request for updating a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.

683

684



685

686

Figure B.X7.2-2. MPPS Update DICOMweb Proxy for DIMSE SCP

687

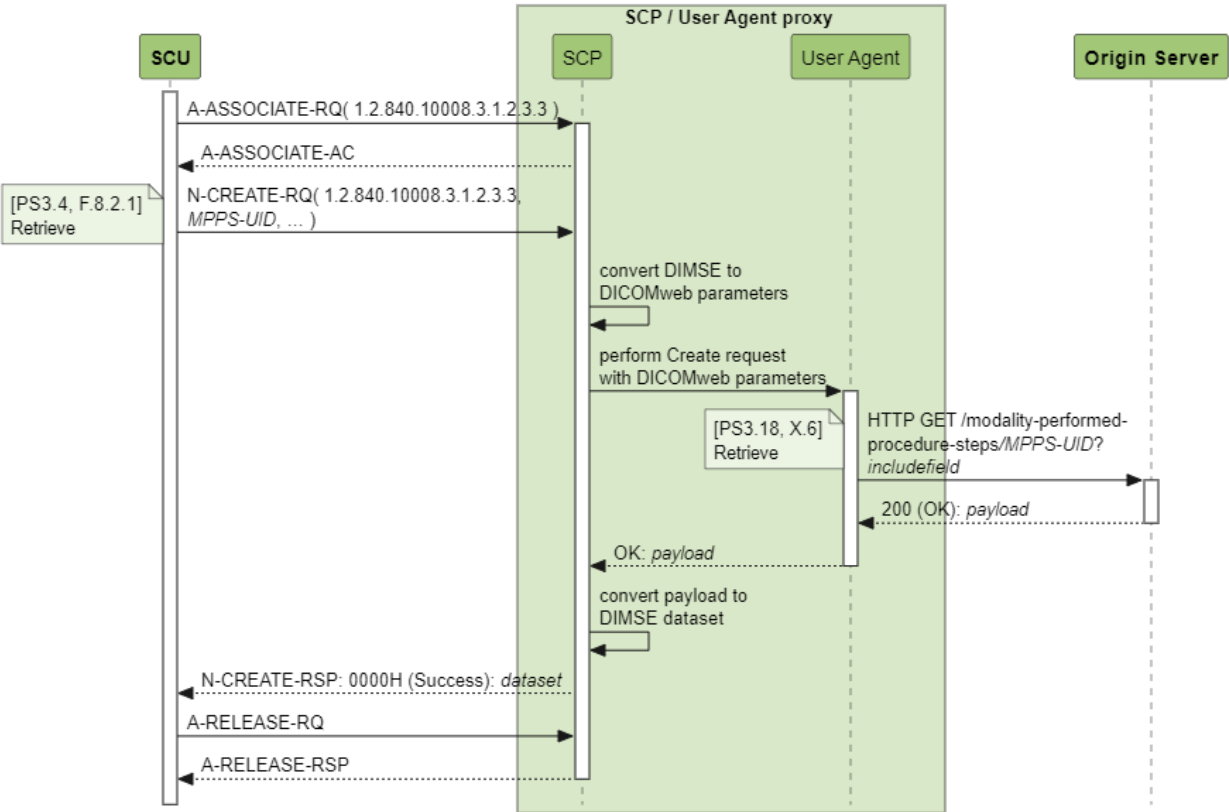
B.X7.3 Retrieve

688

Figure B.X7.3-1 shows how a proxy could facilitate a request for retrieving a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.

689

690



691

692

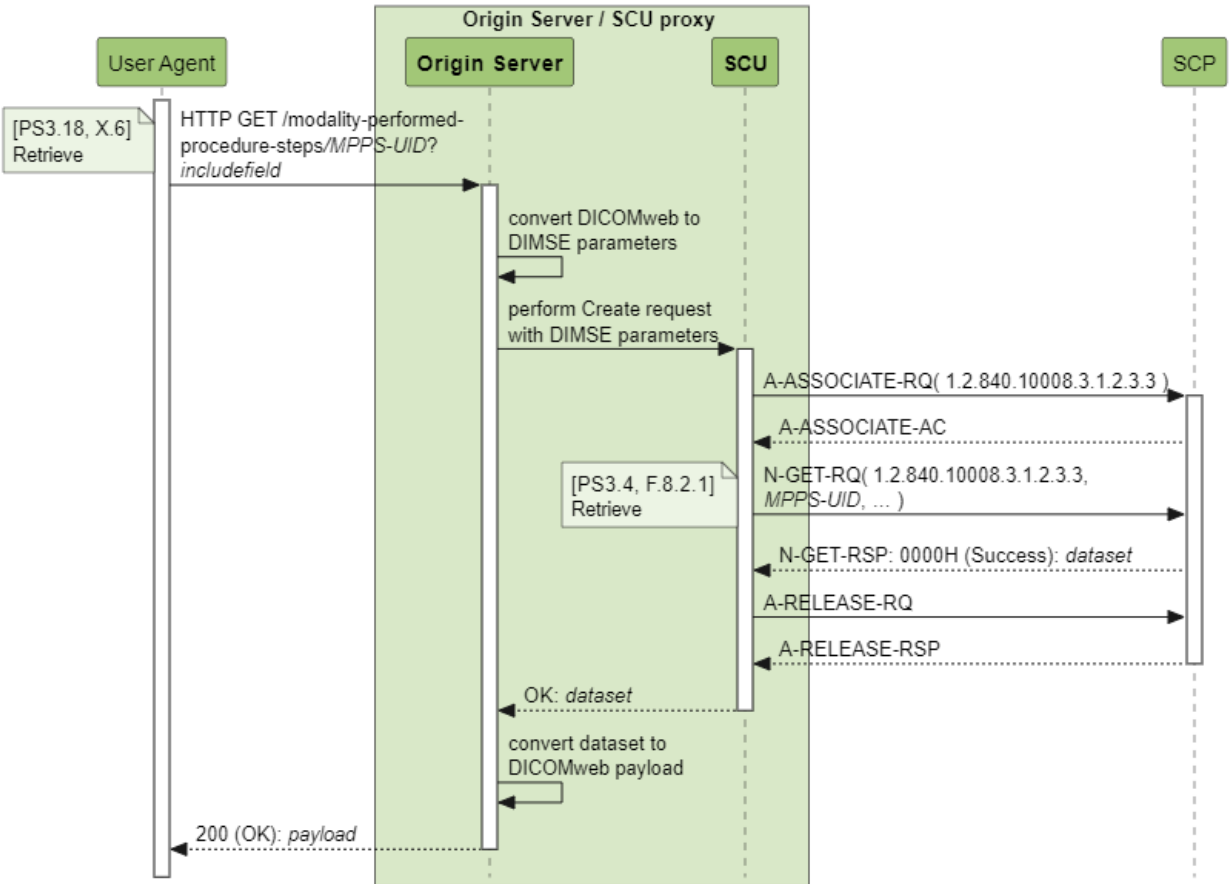
Figure B.X7.2-1. MPPS Retrieve DIMSE Proxy for DICOMweb Origin Server

693

Figure B.X7.4-2 shows how a proxy could facilitate a request for retrieving a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.

694

695



696

697

Figure B.X7.2-2. MPPS Retrieve DICOMweb Proxy for DIMSE SCP

698

699
700

Update Table H-1 Resources and Methods: add new resources and methods for Modality Workflow Services

701

H Capabilities Description

Service	Resource	Transactions	Reference
...			
Storage Commitment Requests (see Section 13.1.1)			
	commitment-requests	Request	Section 13.4
		Result Check	Section 13.5
Modality Scheduled Procedure Step Service (see section Y.1.1)			
	<u>modality-scheduled-procedure-steps</u>	<u>Search</u>	<u>Section Y.4</u>
Modality Performed Procedure Step Service (see Section X.1.1)			
	<u>modality-performed-procedure-steps</u>	<u>Create</u>	<u>Section X.4</u>
		<u>Update</u>	<u>Section X.5</u>
		<u>Retrieve</u>	<u>Section X.6</u>

702

Changes to NEMA Standards Publications PS 3.2

Add new sections to N.1.3 for the Modality Scheduled and Performed Procedure Step Services

N.1 Overview

...

N.1.3 DICOM Web Services

...

N.1.3.Y Modality Scheduled Procedure Step Service

Table N.1.3.Y-1 lists details on the support of the Modality Scheduled Procedure Step Service.

[Complete Table N.1.3.Y-1 to indicate support for the Modality Scheduled Procedure Step Web Service]

Table N.1.3.Y-1 Modality Scheduled Procedure Step Service

Service	Transaction	Resource	User Agent	Origin Server
Modality Scheduled Procedure Step Service	<i>Search</i>	modality-scheduled-procedure-steps		

N.1.3.X Modality Performed Procedure Step Service

Table N.1.3.X-1 lists details on the support of the Modality Performed Procedure Step Service.

[Complete Table N.1.3.X-1 to indicate support for the Modality Performed Procedure Step Web Service]

Table N.1.3.X-1 Modality Performed Procedure Step Service

Service	Transaction	Resource	User Agent	Origin Server
Modality Performed Procedure Step Service	<i>Create</i>	modality-performed-procedure-steps		
	<i>Update</i>			
	<i>Retrieve</i>			

[When supporting both the Origin Server and User Agent roles, indicate whether creation and update of MPPSs on the Origin Server side is mirrored on the User Agent side by selecting one of the two texts below. When only supporting one of the roles, remove the texts below.]

This system does not mirror the creation and updating of MPPSs on the Origin Server side to the User Agent side.

This system mirrors the creation and updating of MPPSs on the Origin Server side to the User Agent side.

725 **Add a new subsections on the Modality Scheduled and Performed Procedure Step Services to**
726 **section N.5.3 Supported DICOM Web Services**

727 **N.5 Service and Interoperability Description**

728 ...

729 **N.5.3 Supported DICOM Web Services**

730 ...

731 **N.5.3.Y Modality Scheduled Procedure Step Web Service**

732 This section provides details regarding the Modality Scheduled Procedure Step Web Service. For an
733 overview of supported Transactions and resources see Table N.1.3.Y-1 Modality Scheduled Procedure
734 Step Service.

735 **N.5.3.Y.1 Search Transaction – Modality Scheduled Procedure Step Service**

736 *[If your system does not support the Modality Scheduled Procedure Step Web Service Search*
737 *Transaction, you can indicate that this section is not applicable and remove the subsections below.]*

738 **N.5.3.Y.1.1 User Agent**

739 The Search Transaction user agent can request resources listed in Table N.5.3.Y.1.1-1.

740 *[List the supported resources for your Modality Scheduled Procedure Step Search Transaction user agent. Remove*
741 *the non-supported resources rows. Fill in information on your implementation in the Comments column when*
742 *necessary.]*

743 **Table N.5.3.Y.1.1-1: Resources for Search Transaction – User Agent**

Resource	Comments
	See Resources path in table Y.1.1-1 in PS3.18
<i>modality-scheduled-procedure-steps</i>	

744

745 The Search Transaction user agent supports Header Fields listed in Table N.5.3.Y.1.1-2.

746 *[List the supported Header Fields and their supported Values. Fill in information on your implementation in the*
747 *“Comments” column when necessary.]*

748 **Table N.5.3.Y.1.1-2: Header Fields for Search Transaction – User Agent**

Header Field	Supported Values	Comments
Content-Type	<i>application/dicom+json (Default)</i> <i>application/dicom+xml</i> <i>multipart/related;</i> <i>type="application/dicom+json"</i> <i>multipart/related;</i> <i>type="application/dicom+xml"</i>	
Content-Length		<i>[If Content-Encoding is not present]</i>
Content-Encoding		<i>[If Content-Length is not present]</i>

749

750 **N.5.3.Y.1.2 Origin Server**

751 The Search Transaction origin server receives GET requests to search for modality scheduled procedure
752 steps.

753 The user agent specifies the Target Resource as part of the URI and the acceptable Content-Type in the
754 HTTP header (i.e. XML or JSON).

755 The URI is composed by a Base URI: see Base URI for the origin server in Section N.6.3.Y.

756 The Request Transaction origin server supports resources listed in Table N.5.3.Y.1.2-1.

757 *[Fill in information on your implementation in the Comments column when necessary.]*

758 **Table N.5.3.Y.1.2-1: Resources for Search Transaction – Origin Server**

Resource	Comments
	See Resources path in Table Y.1.1-1 in PS3.18
<i>modality-scheduled-procedure-steps</i>	

759

760 The Search Transaction origin server supports Header Fields listed in Table N.5.3.Y.1.2-2.

761 *[List the supported Header Fields and their supported Values. Fill in information on your implementation in the*
762 *“Comments” column when necessary.]*

763 **Table N.5.3.Y.1.2-2: Header Fields for Search Transaction – Origin Server**

Header Field	Supported Values	Comments
Content-Type	<i>application/dicom+json</i> <i>application/dicom+xml</i> <i>multipart/related;</i> <i>type="application/dicom+json"</i> <i>multipart/related;</i> <i>type="application/dicom+xml"</i>	
Content-Length		<i>[If Content-Encoding is not present]</i>
Content-Encoding		<i>[If Content-Length is not present]</i>

764

765 **N.5.3.X Modality Performed Procedure Step Web Service**

766 This section provides details regarding the Modality Performed Procedure Step Web Service. For an
767 overview of supported Transactions and resources see Table N.1.3.X-1 Modality Performed Procedure
768 Step Service.

769 **N.5.3.X.1 Create Transaction – Modality Performed Procedure Step Service**

770 *[If your system does not support the Modality Performed Procedure Step Web Service Create*
771 *Transaction, you can indicate that this section is not applicable and remove the subsections below.]*

772 **N.5.3.X.1.1 User Agent**

773 The Create Transaction user agent can request to create resources listed in Table N.5.3.X.1.1-1.

774 *[List the supported resources for your Modality Performed Procedure Step Create Transaction user agent. Remove*
775 *the non-supported resources rows. Fill in information on your implementation in the Comments column when*
776 *necessary.]*

777 **Table N.5.3.X.1.1-1: Resources for Create Transaction – User Agent**

Resource	Comments
	See Resources path in table X.1.1-1 in PS3.18
<i>modality-performed-procedure-steps</i>	

778

779 The Create Transaction user agent supports Header Fields listed in Table N.5.3.X.1.1-2.

780 [List the supported Header Fields and their supported Values. Fill in information on your implementation in the
781 "Comments" column when necessary.]

782 **Table N.5.3.X.1.1-2: Header Fields for Create Transaction – User Agent**

Header Field	Supported Values	Comments
Content-Type	<i>application/dicom+json (Default)</i> <i>application/dicom+xml</i> <i>multipart/related;</i> <i>type="application/dicom+json"</i> <i>multipart/related;</i> <i>type="application/dicom+xml"</i>	
Content-Length		[If Content-Encoding is not present]
Content-Encoding		[If Content-Length is not present]

783

784 **N.5.3.X.1.2 Origin Server**

785 The Create Transaction origin server receives PUT requests to create a modality performed procedure
786 step.

787 The user agent specifies the Target Resource as part of the URI and the acceptable Content-Type in the
788 HTTP header (i.e. XML or JSON).

789 The URI is composed by a Base URI: see Base URI for the origin server in Section N.6.3.X.

790 The Create Transaction origin server supports resources listed in Table N.5.3.X.1.2-1.

791 [Fill in information on your implementation in the Comments column when necessary.]

792 **Table N.5.3.X.1.2-1: Resources for Create Transaction – Origin Server**

Resource	Comments
	See Resources path in Table X.1.1-1 in PS3.18
<i>modality-performed-procedure-steps</i>	

793

794 The Create Transaction origin server supports Header Fields listed in Table N.5.3.X.1.2-2.

795 [List the supported Header Fields and their supported Values. Fill in information on your implementation in the
796 "Comments" column when necessary.]

797 **Table N.5.3.X.1.2-2: Header Fields for Create Transaction – Origin Server**

Header Field	Supported Values	Comments
Content-Type	<i>application/dicom+json</i> <i>application/dicom+xml</i>	

	<i>multipart/related; type="application/dicom+json"</i>	
	<i>multipart/related; type="application/dicom+xml"</i>	
Content-Length		<i>[If Content-Encoding is not present]</i>
Content-Encoding		<i>[If Content-Length is not present]</i>

798

799 **N.5.3.X.2 Update Transaction – Modality Performed Procedure Step Service**

800 *[If your system does not support the Modality Performed Procedure Step Web Service Update*
801 *Transaction, you can indicate that this section is not applicable and remove the subsections below.]*

802 **N.5.3.X.2.1 User Agent**

803 The Update Transaction user agent can request to update resources listed in Table N.5.3.X.2.1-1.

804 *[List the supported resources for your Modality Performed Procedure Step Update Transaction user agent. Remove*
805 *the non-supported resources rows. Fill in information on your implementation in the Comments column when*
806 *necessary.]*

807 **Table N.5.3.X.2.1-1: Resources for Update Transaction – User Agent**

Resource	Comments
	See Resources path in table X.1.1-1 in PS3.18
<i>modality-performed-procedure-steps</i>	

808

809 The Update Transaction user agent supports Header Fields listed in Table N.5.3.X.2.1-2.

810 *[List the supported Header Fields and their supported Values. Fill in information on your implementation in the*
811 *“Comments” column when necessary.]*

812 **Table N.5.3.X.2.1-2: Header Fields for Update Transaction – User Agent**

Header Field	Supported Values	Comments
Content-Type	<i>application/dicom+json (Default)</i> <i>application/dicom+xml</i> <i>multipart/related; type="application/dicom+json"</i> <i>multipart/related; type="application/dicom+xml"</i>	
Content-Length		<i>[If Content-Encoding is not present]</i>
Content-Encoding		<i>[If Content-Length is not present]</i>

813

814 **N.5.3.X.2.2 Origin Server**

815 The Update Transaction origin server receives PATCH requests to update a modality performed
816 procedure step.

817 The user agent specifies the Target Resource as part of the URI and the acceptable Content-Type in the
818 HTTP header (i.e. XML or JSON).

819 The URI is composed by a Base URI: see Base URI for the origin server in Section N.6.3.X.

820 The Update Transaction origin server supports resources listed in Table N.5.3.X.2.2-1.

821 *[Fill in information on your implementation in the Comments column when necessary.]*

822 **Table N.5.3.X.2.2-1: Resources for Update Transaction – Origin Server**

Resource	Comments
	See Resources path in Table X.1.1-1 in PS3.18
<i>modality-performed-procedure-steps</i>	

823

824 The Update Transaction origin server supports Header Fields listed in Table N.5.3.X.2.2-2.

825 *[List the supported Header Fields and their supported Values. Fill in information on your implementation in the*
826 *“Comments” column when necessary.]*

827 **Table N.5.3.X.2.2-2: Header Fields for Update Transaction – Origin Server**

Header Field	Supported Values	Comments
Content-Type	<i>application/dicom+json</i> <i>application/dicom+xml</i> <i>multipart/related;</i> <i>type="application/dicom+json"</i> <i>multipart/related;</i> <i>type="application/dicom+xml"</i>	
Content-Length		<i>[If Content-Encoding is not present]</i>
Content-Encoding		<i>[If Content-Length is not present]</i>

828

829 **N.5.3.X.3 Retrieve Transaction – Modality Performed Procedure Step Service**

830 *[If your system does not support the Modality Performed Procedure Step Web Service Retrieve*
831 *Transaction, you can indicate that this section is not applicable and remove the subsections below.]*

832 **N.5.3.X.3.1 User Agent**

833 The Retrieve Transaction user agent can request to retrieve resources listed in Table N.5.3.X.3.1-1.

834 *[List the supported resources for your Modality Performed Procedure Step Retrieve Transaction user agent. Remove*
835 *the non-supported resources rows. Fill in information on your implementation in the Comments column when*
836 *necessary.]*

837 **Table N.5.3.X.3.1-1: Resources for Retrieve Transaction – User Agent**

Resource	Comments
	See Resources path in table X.1.1-1 in PS3.18
<i>modality-performed-procedure-steps</i>	

838

839 The Retrieve Transaction user agent supports Header Fields listed in Table N.5.3.X.3.1-2.

840 *[List the supported Header Fields and their supported Values. Fill in information on your implementation in the*
841 *“Comments” column when necessary.]*

842 **Table N.5.3.X.3.1-2: Header Fields for Retrieve Transaction – User Agent**

Header Field	Supported Values	Comments
Content-Type	<i>application/dicom+json (Default)</i> <i>application/dicom+xml</i> <i>multipart/related;</i> <i>type="application/dicom+json"</i> <i>multipart/related;</i> <i>type="application/dicom+xml"</i>	
Content-Length		<i>[If Content-Encoding is not present]</i>
Content-Encoding		<i>[If Content-Length is not present]</i>

843

844 **N.5.3.X.3.2 Origin Server**

845 The Retrieve Transaction origin server receives GET requests to retrieve a modality performed procedure
846 step.

847 The user agent specifies the Target Resource as part of the URI and the acceptable Content-Type in the
848 HTTP header (i.e. XML or JSON).

849 The URI is composed by a Base URI: see Base URI for the origin server in Section N.6.3.X.

850 The Retrieve Transaction origin server supports resources listed in Table N.5.3.X.3.2-1.

851 *[Fill in information on your implementation in the Comments column when necessary.]*

852 **Table N.5.3.X.3.2-1: Resources for Retrieve Transaction – Origin Server**

Resource	Comments
	See Resources path in Table X.1.1-1 in PS3.18
<i>modality-performed-procedure-steps</i>	

853

854 The Retrieve Transaction origin server supports Header Fields listed in Table N.5.3.X.3.2-2.

855 *[List the supported Header Fields and their supported Values. Fill in information on your implementation in the*
856 *"Comments" column when necessary.]*

857 **Table N.5.3.X.3.2-2: Header Fields for Retrieve Transaction – Origin Server**

Header Field	Supported Values	Comments
Content-Type	<i>application/dicom+json</i> <i>application/dicom+xml</i> <i>multipart/related;</i> <i>type="application/dicom+json"</i> <i>multipart/related;</i> <i>type="application/dicom+xml"</i>	
Content-Length		<i>[If Content-Encoding is not present]</i>
Content-Encoding		<i>[If Content-Length is not present]</i>

858

859

860 **Add a new subsection on the Modality Workflow Services to section N.7.3.3 DICOM Web Services.**

861 **N.7 Network and Media Communication Details**

862 ...

863 **N.7.3 Status Codes**

864 ...

865 **N.7.3.3 DICOM Web Services**

866 ...

867 **N.7.3.3.Y Modality Scheduled Procedure Step Service**

868 **N.7.3.3.Y.1 Search Transaction as Origin Server**

869 Table N.7.3.3.Y.1-1 lists the Status Codes that an origin server supports for the Search Transaction of the
870 Modality Workflow Service and the condition in which any of the listed Status Codes is sent.

871 *[Describe below the condition in which the application sends the specific Status Codes in the Search Transaction*
872 *response as origin server.]*

873 **Table N.7.3.3.Y.1-1: Status Codes of Origin Server for Search Transaction**

Status	Code	Condition
Success	200 (OK)	The origin server returns the matching results.
	204 (No Content)	The origin server has no matching results.
Failure	400 (Bad Request)	The origin server cannot handle the search request because of errors in the request headers or parameters.
	413 (Payload Too Large)	The origin server cannot return the results, as their combined size exceeds the maximum payload size supported. The user agent may repeat the request with paging or with a narrower query to reduce the size.
	503 (Service Unavailable)	The origin server cannot handle the query; this may be a temporary or permanent state.

874

875 **N.7.3.3.Y.2 Search Transaction as User Agent**

876 Table N.7.3.3.Y.2-1 lists the Status Codes that a user agent supports for the Search Transaction of the
877 Modality Workflow Service and defines the application behavior, when encountering any of the listed
878 Status Codes.

879 *[Describe below the behavior of the application when it receives various Status Codes in the Search Transaction*
880 *response]*

881 **Table N.7.3.3.Y.2-1: Status Codes of User Agent for Search Transaction**

Status	Code	Behavior
Success	200 (OK)	Select an appropriate Modality Scheduled Procedure Step and start performing it
	204 (No Content)	Change selection criteria and try again, or try again later

Status	Code	Behavior
Failure	400 (Bad Request)	Reformat the request to proper HTTP
	413 (Payload Too Large)	Try again with smaller limit parameter
	503 (Service Unavailable)	Try again later
*	Any other code	Do further analysis

882

883 **N.7.3.3.X Modality Performed Procedure Step Service**

884 **N.7.3.3.X.1 Create Transaction as Origin Server**

885 Table N.7.3.3.X.1-1 lists the Status Codes that an origin server supports for the Create Transaction of the
886 Modality Workflow Service and the condition in which any of the listed Status Codes is sent.

887 [Describe below the condition in which the application sends the specific Status Codes in the Create Transaction
888 response as origin server.]

889

Table N.7.3.3.X.1-1: Status Codes of Origin Server for Create Transaction

Status	Code	Condition
Success	200 (OK)	The origin server has created the requested Modality Performed Procedure Step with the provided attributes
Failure	400 (Bad Request)	The origin server cannot handle the create request because of errors in the request headers or parameters
	409 (Conflict)	The origin server cannot create the target Modality Performed Procedure Step because the provided Modality Performed Procedure Step UID is already in use
	503 (Service Unavailable)	The origin server cannot handle the creation of the Modality Performed Procedure Step; this may be a temporal or permanent state

890

891 **N.7.3.3.X.2 Create Transaction as User Agent**

892 Table N.7.3.3.X.2-1 lists the Status Codes that a user agent supports for the Create Transaction of the
893 Modality Workflow Service and defines the application behavior, when encountering any of the listed
894 Status Codes.

895 [Describe below the behavior of the application when it receives various Status Codes in the Create Transaction
896 response]

897

Table N.7.3.3.X.2-1: Status Codes of User Agent for Create Transaction

Status	Code	Behavior
Success	200 (OK)	Continue
Failure	400 (Bad Request)	Reformat the request to proper HTTP
	409 (Conflict)	Create another MPPS UID and try again
	503 (Service Unavailable)	Try again later
*	Any other code	Do further analysis

898

899 **N.7.3.3.X.3 Update Transaction as Origin Server**

900 Table N.7.3.3.X.3-1 lists the Status Codes that an origin server supports for the Update Transaction of the
901 Modality Workflow Service and the condition in which any of the listed Status Codes is sent.

902 *[Describe below the condition in which the application sends the specific Status Codes in the Update Transaction
903 response as origin server.]*

904 **Table N.7.3.3.X.3-1: Status Codes of Origin Server for Update Transaction**

Status	Code	Condition
Success	200 (OK)	The origin server has updated the Modality Performed Procedure Step with the provided attributes
Failure	400 (Bad Request)	The origin server cannot handle the update request because of errors in the request headers or parameters
	404 (Not Found)	The origin server has no knowledge about the target Modality Performed Procedure Step
	409 (Conflict)	The origin server cannot update the target Modality Performed Procedure Step, for instance because the changes provided are incompatible with the data of the target Modality Performed Procedure Step
	410 (Gone)	The origin server knows that the target Modality Performed Procedure Step did exist but has been deleted
	503 (Service Unavailable)	The origin server cannot handle the creation of the Modality Performed Procedure Step; this may be a temporal or permanent state

905

906 **N.7.3.3.X.4 Update Transaction as User Agent**

907 Table N.7.3.3.X.4-1 lists the Status Codes that a user agent supports for the Update Transaction of the
908 Modality Workflow Service and defines the application behavior, when encountering any of the listed
909 Status Codes.

910 *[Describe below the behavior of the application when it receives various Status Codes in the Update Transaction
911 response]*

912 **Table N.7.3.3.X.4-1: Status Codes of User Agent for Update Transaction**

Status	Code	Behavior
Success	200 (OK)	Continue
Failure	400 (Bad Request)	Reformat the request to proper HTTP
	404 (Not Found)	See whether an error was made in the UID
	409 (Conflict)	Retrieve the MPPS and analyze what created this issue
	410 (Gone)	Create a new MPPS and retry with this new UID
	503 (Service Unavailable)	Try again later
*	Any other code	Do further analysis

913

914 **N.7.3.3.X.5 Retrieve Transaction as Origin Server**

915 Table N.7.3.3.X.5-1 lists the Status Codes that an origin server supports for the Retrieve Transaction of
916 the Modality Workflow Service and the condition in which any of the listed Status Codes is sent.

917 *[Describe below the condition in which the application sends the specific Status Codes in the Retrieve Transaction*
918 *response as origin server.]*

919 **Table N.7.3.3.X.5-1: Status Codes of Origin Server for Retrieve Transaction**

Status	Code	Condition
Success	200 (OK)	The origin server returned the target Modality Performed Procedure Step
Failure	400 (Bad Request)	The origin server cannot handle the retrieve request because of errors in the request headers or parameters
	404 (Not Found)	The origin server has no knowledge about the target Modality Performed Procedure Step
	410 (Gone)	The origin server knows that the target Modality Performed Procedure Step did exist but has been deleted
	503 (Service Unavailable)	The origin server cannot handle the retrieval of the target Modality Performed Procedure Step; this may be a temporal or permanent state

920

921 **N.7.3.3.X.6 Retrieve Transaction as User Agent**

922 Table N.7.3.3.X.6-1 lists the Status Codes that a user agent supports for the Retrieve Transaction of the
923 Modality Workflow Service and defines the application behavior, when encountering any of the listed
924 Status Codes.

925 *[Describe below the behavior of the application when it receives various Status Codes in the Retrieve Transaction*
926 *response]*

927 **Table N.7.3.3.X.6-1: Status Codes of User Agent for Retrieve Transaction**

Status	Code	Behavior
Success	200 (OK)	Continue
Failure	400 (Bad Request)	Reformat the request to proper HTTP
	404 (Not Found)	See whether an error was made in the UID
	410 (Gone)	Perform error recovery
	503 (Service Unavailable)	Retry again later
*	Any other code	Do further analysis

928

929

930

Changes to NEMA Standards Publications PS 3.6

931

There are no new attributes to be added to table 6-1 of section 6.

932

Changes to NEMA Standards Publications PS 3.15

933

There are no new attributes to be added to table E.1-1 of annex E.

934