Digital Imaging and Communications in Medicine (DICOM)

Supplement 246: DICOMweb Modality Procedure Step Services

Prepared by:

DICOM Standards Committee, Working Group 27

1812 N. Moore St, Suite 2200

Arlington, VA 22209, USA

Status: 16 Sep 2025, Final Text

Developed pursuant to DICOM Work Item 2023-10-C

Table of Contents

Scope and Field of Application

This supplement adds the Modality Scheduled Procedure Step Service and the Modality Performed Procedure Step Service to DICOMweb to mirror the Modality Worklist (MWL) and Modality Performed Procedure Step (MPPS) services that are already available in DIMSE respectively. The modality procedure step services have been designed with the intention of facilitating proxies from/to DIMSE.

Changes to NEMA Standards Publications PS 3.18

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

14   Modality Scheduled Procedure Step Service and Resources

14.1   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.

14.1.1   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 14.1.1-1.

Table 14.1.1-1. 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.

14.1.2   Common Query Parameters

The origin server shall support Query Parameters as required in Table 14.1.2-1.

The user agent shall supply in the request Query Parameters as required in Table 14.1.2-1.

Table 14.1.2-1. 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

14.1.3   Common Media Types

The origin server shall support the media types specified as Default or Required in Table 14.1.3-1.

Table 14.1.3-1. 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

14.2   **Conformance**

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

An origin server conforming to the Modality Scheduled Procedure Step Service shall support the Transactions listed as Required in Table 14.2-1 and may support Transactions listed as Optional.

Table 14.2-1. Required and Optional Transactions

Transaction	Support	Section
Retrieve Capabilities	Required	Section 8.9
Search	Required	Section 14.4

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

In addition, for each supported Transaction they shall specify:

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

14.3   **Transactions Overview**

The Modality Scheduled Procedure Step Service consists of the Transactions listed in Table 14.3-1.

Table 14.3-1. 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

Table 14.3-2 lists the Modality Scheduled Procedure Step Service Transactions and their corresponding DIMSE Operations used in MWL.

Table 14.3-2. Mapping of Modality Scheduled Procedure Step Service Transactions and DIMSE Operations

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

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

14.4 Search Transaction

This Transaction searches the Modality Scheduled Procedure Steps for scheduled procedure steps that match the specified Query Parameters and returns a list of matching scheduled procedure steps. Each scheduled procedure step in the returned list includes return Attributes specified in the request. The Transaction corresponds to the DIMSE MWL C-FIND Operation (see PS3.4, Section K.4.1).

14.4.1 Request

The request shall have the following syntax:

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

The user agent shall conform to the SCU behavior specified in Section K.2.2 "Attribute Types" in PS3.4.

14.4.1.1 Target Resources

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

14.4.1.2 Query Parameters

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

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

14.4.1.3 Request Header Fields

The origin server shall support header fields as required in Table 14.4.1-1.

The user agent shall supply in the request header fields as defined in Table 14.4.1-1.

Table 14.4.1-1. Request Header Fields

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

See also Section 8.4.

14.4.1.4 Request Payload

The request shall have no payload.

14.4.2 Behavior

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

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

- All Attributes in Table K.6-1 "Attributes for the Modality Worklist Information Model" in PS3.4 with a Return Key Type of 1 or 2.
- All Attributes in Table K.6-1 "Attributes for the Modality Worklist Information Model" in PS3.4 with a Return Key Type of 1C or 2C for which the conditional requirements are met.
- All other Attributes passed as match parameters that are supported by the origin server as either matching or return Attributes.

- All other Attributes passed as includefield parameter values that are supported by the origin server as return Attributes.

14.4.3 Response

The response shall have the following syntax:

```
version SP status-code SP reason-phrase CRLF
*(header-field CRLF)
CRLF
[payload]
```

14.4.3.1 Status Codes

Table 14.4.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5 for additional status codes.

Table 14.4.3-1. 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.

14.4.3.2 Response Header Fields

The origin server shall support header fields as required in Table 14.4.3-2.

Table 14.4.3-2. 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.

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

14.4.3.3 Response Payload

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

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

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

15 Modality Performed Procedure Step Service and Resources

15.1 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.

> Note   To achieve notification-like behavior, it is suggested to mimic the approach taken in IHE's Scheduled Workflow integration profile [IHE RAD TF-1], where the Performed Procedure Step Manager Actor forwards the creation and updating of Modality Performed Procedure Steps to other interested Actors.

15.1.1 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 Section 15.

{mppsUID}   The UID of the MPPS.

The Modality Performed Procedure Step Service manages a number of MPPSs; its resources are given in Table 15.1.1-1.

Table 15.1.1-1. Modality Performed Procedure Step Service Resource Descriptions

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

15.1.2 Common Query Parameters

The origin server shall support Query Parameters as required in Table 15.1.2-1.

The user agent shall supply in the request Query Parameters as required in Table 15.1.2-1.

Table 15.1.2-1. 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

15.1.3 Common Media Types

The origin server shall support the media types specified as Default or Required in Table 15.1.3-1.

Table 15.1.3-1. 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

15.2 Conformance

An origin server conforming to the Modality Performed Procedure Step Service shall support the Retrieve Capabilities Transaction (see Section 8.9.1). Furthermore, it shall support the transactions listed as Required in Table 15.2-1 and may support Transactions listed as Optional.

Table 15.2-1. Required and Optional Transactions

Transaction	Support	Section
Retrieve Capabilities	Required	Section 8.9
Create	Required	Section 15.4
Update	Required	Section 15.5
Retrieve	Optional	Section 15.6

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

In addition, for each supported Transaction they shall specify:

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

15.3 Transactions Overview

The Modality Performed Procedure Step Service consists of the Transactions listed in Table 15.3-1.

Table 15.3-1. Modality Performed Procedure Step Service Transactions

Transaction Name	Method	Payload		Description
		Request	Success Response	
Create	POST	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	POST	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

In Table 15.3-2, the Target Resources permitted for each transaction are marked with M if support is mandatory for the origin server and O if it is optional. A blank cell indicates that the resource is not allowed in the transaction.

Table 15.3-2. Resources by Transaction

Resource	Create	Update	Retrieve
MPPS	M	M	O

Table 15.3-3 lists the Modality Performed Procedure Step Service Transactions that have a corresponding DIMSE Operation in DIMSE MPPS.

Table 15.3-3. Mapping of Modality Performed Procedure Step Service Transactions and DIMSE Operations

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

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

15.4   Create Transaction

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

15.4.1   Request

The request shall have the following syntax:

```
POST SP /modality-performed-procedure-steps/{mppsUID} SP version CRLF
Accept: 1#media-type CRLF
*(header-field CRLF)
CRLF
payload
```

15.4.1.1 Target Resource

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

15.4.1.2 Query Parameters

The request has no Query Parameters.

15.4.1.3 Request Header Fields

The origin server shall support Request Header Fields as required in Table 15.4.1-1.

The user agent shall supply Request Header Fields as required in Table 15.4.1-1.

Table 15.4.1-1. Request Header Fields

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

See Section 8.4.

15.4.1.4 Request Payload

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

The Modality Performed Procedure Step attributes in the payload shall comply with the SCU requirements in the Usage N-CREATE (SCU/SCP) column of PS3.4, Table F.7.2-1 "Modality Performed Procedure Step SOP Class N-CREATE, N-SET and Final State Attributes".

15.4.2 Behavior

The origin server shall create a Modality Performed Procedure Step identified by the provided MPPS UID and filled with the provided attributes in the payload. The origin server shall create and maintain the Modality Performed Procedure Step as specified by the SCP behavior defined in Section F.7.2.1 in PS3.4.

15.4.3 Response

The response shall have the following syntax:

```
version SP status-code SP reason-phrase CRLF
*(header-field CRLF)
CRLF
[payload]
```

15.4.3.1 Status Codes

Table 15.4.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5 for additional status codes.

Table 15.4.3-1. Status Code Meaning

Status	Code	Meaning

Success	201 (Created)	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.

15.4.3.2   Response Header Fields

The origin server shall support header fields as required in Table 15.4.3-2.

Table 15.4.3-2. 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.

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

15.4.3.3   Response Payload

A success response shall have no payload.

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

15.5   Update Transaction

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

15.5.1   Request

The request shall have the following syntax:

```
POST SP /modality-performed-procedure-steps/{mppsUID}?update SP version CRLF
Accept: 1#media-type CRLF
*(header-field CRLF)
CRLF
payload
```

15.5.1.1   Target Resources

The Target Resource of this transaction is an individual Modality Performed Procedure Step identified by the provided MPPS UID.

15.5.1.2   Query Parameters

The origin server shall support Query Parameters as required in Table 15.5.1.2-1.

The user agent shall supply in the request Query Parameters as required in Table 15.5.1.2-1.

Table 15.5.1.2-1   Query Parameters by Resource

Key	Resource	Usage	
		User Agent	**Origin Server**
update	Modality Performed Procedure Step	M	M

The "update" parameter indicates that this is an update of an existing Modality Performed Procedure Step identified by the provided MPPS UID and distinguishes an Update Transaction from a Create Transaction.

15.5.1.3   Request Header Fields

The origin server shall support Request Header Fields as required in Table 15.5.1-1.

The user agent shall supply Request Header Fields as required in Table 15.5.1-1.

Table 15.5.1-1. Request Header Fields

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

See also Section 8.4.

15.5.1.4   Request Payload

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

The Modality Performed Procedure Step attributes in the payload shall comply with the SCU requirements in the Usage N-SET (SCU/SCP) column of PS3.4, Table F.7.2-1 "Modality Performed Procedure Step SOP Class N-CREATE, N-SET and Final State Attributes".

15.5.2   Behavior

The origin server shall update the Modality Performed Procedure Step identified by the provided MPPS UID with the provided attributes in the payload. The origin server shall update and maintain the Modality Performed Procedure Step as specified by the SCP behavior defined in Section F.7.2.2 in PS3.4.

15.5.3   Response

The response shall have the following syntax:

```
version SP status-code SP reason-phrase CRLF
*(header-field CRLF)
CRLF
[payload]
```

15.5.3.1   Status Codes

Table 15.5.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5 for additional status codes.

Table 15.5.3-1. 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.

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

15.5.3.2   Response Header Fields

The origin server shall support header fields as required in Table 15.5.3-2.

Table 15.5.3-2. 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.

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

15.5.3.3   Response Payload

A success response should have no payload.

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

15.6   Retrieve Transaction

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

15.6.1   Request

The request shall have the following syntax:

GET SP /modality-performed-procedure-steps/{mppsUID}{?includefield*} SP version CRLF

```
Accept: 1#media-type CRLF
*(header-field CRLF)
CRLF
```

15.6.1.1   Target Resources

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

15.6.1.2   Query Parameters

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

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

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

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

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

15.6.1.3   Request Header Fields

The origin server shall support Request Header Fields as required in Table 15.6.1-1.

The user agent shall supply Request Header Fields as required in Table 15.6.1-1.

Table 15.6.1-1. Request Header Fields

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

See Section 8.4.

15.6.1.4   Request Payload

The request shall have no payload.

15.6.2   Behavior

If the Modality Performed Procedure Step exists on the origin server, the attributes of this as specified in the includefield shall be returned in an Acceptable Media Type (see Section 8.7.4). When the includefield is absent, all attributes shall be returned. The origin server shall return the Modality Performed Procedure Step as specified by the SCP behavior defined in Section F.8.2 in PS3.4.

15.6.3   Response

The response shall have the following syntax:

```
version SP status-code SP reason-phrase CRLF
*(header-field CRLF)
CRLF
[payload]
```

15.6.3.1 Status Codes

Table 15.6.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5 for additional status codes.

Table 15.6.3-1. 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.

15.6.3.2 Response Header Fields

The origin server shall support header fields as required in Table 15.6.3-2.

Table 15.6.3-2. 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.

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

15.6.3.3 Response Payload

A success response has a payload containing the requested Modality Performed Procedure Step in the Selected Media Type. The Modality Performed Procedure Step attributes in the payload shall comply with the SCP requirements in the Usage N-GET (SCU/SCP) column of PS3.4, Table F.8.2-1 " Modality Performed Procedure Step Retrieve SOP Class N-GET Attributes".

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

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

Note to Editor:

Regarding the change of the Vol2: This way of referring to Technical Frameworks of IHE is used elsewhere in the standard, and hence should be used in this part too. So, please update the four references in PS3.18 to [IHE RAD TF-2] to match this aligned format too.

…
2.3 Other References
…
[FHIR Access Denied] HL7. . FHIR Security - Access Denied Response Handling. http://hl7.org/fhir/security.html#AccessDenied.
[IHE RAD TF-1] Integrating the Healthcare Enterprise (IHE). Radiology Technical Framework Volume 1. http://www.ihe.net/uploadedFiles/Documents/Radiology/IHE_RAD_TF_Vol1.pdf.
[IHE RAD TF-Vol-2] Integrating the Healthcare Enterprise (IHE). Radiology Technical Framework Volume 2. http://www.ihe.net/uploadedFiles/Documents/Radiology/IHE_RAD_TF_Vol2.pdf.
…

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

---

4   Symbols and Abbreviated Terms

…

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

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

DICOM   Digital Imaging and Communications in Medicine

…

JSON   JavaScript Object Notation

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

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

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

…

UID   Unique (DICOM) Identifier

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

UPS-RS   Unified Procedure Step by RESTful Services

…

Update Section B Examples: add new examples for the Modality Procedure Step Services

B　　　Examples (Informative)

…

B.36　　　Searching for Modality Scheduled Procedure Steps using JSON Media Type

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

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

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

```
HTTP/1.1 200 OK
Content-Length: 1191
Content-Type: application/dicom+json; charset=utf-8
…
[ {
 , …
 , "00100010": { "vr": "PN", "Value": [{ "Alphabetic": "Doe^Sally" }] }
 , "0020000D": { "vr": "UI", "Value": ["1.2.250.1.59.40211.30000008090412501082300000004"] }
 , "00401001": { "vr": "SH", "Value": ["P-ID-22"] }
 , …
 , "00400100": { "vr": "SQ", "Value":
  [ { "00400002": { "vr": "DA", "Value": ["20250101"] }
   , "00400007": { "vr": "LO", "Value": ["Specials^04a_HeadCTA"] }
   , "00400009": { "vr": "SH", "Value": ["PS-ID-23"] }
   , "00400010": { "vr": "SH", "Value": ["CTSCANNER"] }
   , …
   }
  , { "00400002": { "vr": "DA", "Value": ["20250101"] }
   , "00400007": { "vr": "LO", "Value": ["Specials^04a_SpineCTA"] }
   , "00400009": { "vr": "SH", "Value": ["PS-ID-24"] }
   , "00400010": { "vr": "SH", "Value": ["CTSCANNER"] }
   , …
   }
  , …
  ] }
 , …
 }
, …
]
```

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

- Patient's Name (0010,0010);
- Study Instance UID (0020,000D);
- Requested Procedure ID (0040,1001);
- Scheduled Procedure Step Sequence (0040,0100);
  - Scheduled Procedure Step Description (0040,0007);
  - Scheduled Station Name (0040,0010);
  - Scheduled Procedure Step Start Date (0040,0002);
  - Scheduled Procedure Step ID (0040,0009).

B.37   Creating a Modality Performed Procedure Step using JSON Content Type

This example illustrates a request to create a modality performed procedure step using JSON. The intention is to mark it in the state: "IN PROGRESS". This is a continuation of the previous example as given in B.36, where the Patient's Name (0010,0010), Study Instance UID (0020,000D), Scheduled Procedure Step Description (0040,0007), and Requested Procedure ID (0040,1001) have been taken over from the received modality scheduled procedure step, and the Performed Procedure Step Status (0040,0252), Performed Procedure Step ID (0040,0253), Accession Number (0008,0050), and Scheduled Procedure Step ID (0040,0009) have been added as "IN PROGRESS", 1.2.250.1.59.40211.12345678.987654, 1, and "PS-ID-23" respectively, some of which in the Scheduled Step Attributes Sequence (0040,0270).

```
POST /radiology/modality-performed-procedure-steps/ 1.2.250.1.59.40211.12345678.987654 HTTP/1.1
Host: www.hospital-stmarco
Content-Type: application/dicom+json
…
{
…
, "00100010": { "vr": "PN", "Value": [{ "Alphabetic": "Doe^Sally" }] }
, "00400242": { "vr": "SH", "Value": ["CTSCANNER"] }
, "00400252": { "vr": "CS", "Value": ["IN PROGRESS"] }
, "00400253": { "vr": "SH", "Value": ["1.2.250.1.59.40211.12345678.987654"] }
, …
, "00400270": { "vr": "SQ", "Value":
 [ { "00080050": { "vr": "SH", "Value": ["1"] }
   , "0020000D": { "vr": "UI", "Value": ["1.2.250.1.59.40211..30000008090412501082300000004"] }
   , "00400007": { "vr": "LO", "Value": ["Specials^04a_HeadCTA"] }
   , "00400009": { "vr": "SH", "Value": ["PS-ID-23"] }
   , "00401001": { "vr": "SH", "Value": ["P-ID-22"] }
   …
   }
 , …
 ] }
, …
}
…
```

A successful response to the request will be:

```
HTTP/1.1 200 OK
```

B.38   Updating a Modality Performed Procedure Step with Produced Image Data using JSON Content Type

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

This example is a continuation of the previous example as given in B.37, working on the same MPPS with UID 1.2.250.1.59.40211.12345678.987654. It adds a Performed Series Sequence (0040,0340), which contains:

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

```
POST /radiology/modality-performed-procedure-steps/1.2.250.1.59.40211.12345678.987654/update HTTP/1.1
Host: www.hospital-stmarco
Content-Type: application/dicom+json
…
{ …
, "00400340": { "vr": "SQ", "Value":
 [ { "0008103E": { "vr": "LO", "Value": ["Head 1.50 Hr64 ax"] }
  , "00081050": { "vr": "PN", "Value": [{ "Alphabetic": "House^Gregory" }] }
  , "00081140": { "vr": "SQ", "Value":
   [ { "00081150": { "vr": "UI", "Value": ["1.2.840.10008.5.1.4.1.1.2"] }
     , "00081155": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.30000020040718322284030000520"] }
      , …
      }
    , { "00081150": { "vr": "UI", "Value": ["1.2.840.10008.5.1.4.1.1.2"] }
      , "00081155": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.30000020040718322284030000521"] }
      , …
      }
    , …
    ]}
  , …
  , "00181030": { "vr": "LO", "Value": ["Special^99a_HeadCTA"] }
  , "0020000E": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.30000020040718322840300000007"] }
  , …
  }
 , …
 ]}
, …
}
…
```

A successful response to the request will be:

```
HTTP/1.1 200 OK
```

> Note   Updating sequences within the Modality Performed Procedure Step, like the Performed Series Sequence (0040,0340) and the Referenced Image Sequence (0008,0140), is only possible by providing these in their entirety, as is required in DIMSE. Updating sequences by only providing changes to them is not possible. See PS3.4, section F.7.2.2.2.
> If an origin server detects that the content of a sequence within the Modality Performed Procedure Step is not extended, i.e. not all elements of its current representation are present in the representation of the Update Transaction, it could yield a warning message. This need not be an error, as the behavior may be intentional, e.g. correcting an earlier mistake.

B.39 **Completing a Modality Performed Procedure Step using JSON Content Type**

This example illustrates an example of an HTTP request for completing a modality performed procedure step. It is a continuation of the previous example as given in B.38, working on the same MPPS with UID 1.2.250.1.59.40211.12345678.987654. Here, the mandatory Performed Procedure Step End Date (0040,0250) and Performed Procedure Step End Time (0040,0251) are added, and the Performed Procedure Step Status (0040,0252) is set to "COMPLETED".

```
POST /radiology/modality-performed-procedure-steps/1.2.250.1.59.40211.12345678.987654/update HTTP/1.1
Host: www.hospital-stmarco
Content-Type: application/dicom+json
…
{ …
, "00400250": { "vr": "DA", "Value": ["20200101"] }
, "00400251": { "vr": "TM", "Value": ["1300"] }
, "00400252": { "vr": "CS", "Value": ["COMPLETED"] }
, …
}
…
```

A successful response to the request will be:

```
HTTP/1.1 200 OK
```

B.40 **Retrieving a Modality Performed Procedure Step using JSON Media and Content Type**

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

B.40.1 **Return All Attributes**

This example illustrates a request to retrieve an existing modality performed procedure step in JSON returning all attributes. It is a culmination of the previous examples as given in B.37-B.39 in which all attributes that have been added are returned here.

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

A successful response to the request will be:

```
HTTP/1.1 200 OK
Content-Length: 2191
Content-Type: application/dicom+json; charset=utf-8
…
[ {
…
 , "00100010": { "vr": "PN", "Value": [{ "Alphabetic": "Doe^Sally" }] }
 , "00400242": { "vr": "SH", "Value": ["CTSCANNER"] }
 , "00400252": { "vr": "CS", "Value": ["COMPLETED"] }
 , "00400253": { "vr": "SH", "Value": ["1.2.250.1.59.40211.12345678.987654"] }
 , …
 , "00400270": { "vr": "SQ", "Value":
  [ { "00080050": { "vr": "SH", "Value": ["1"] }
    , "0020000D": { "vr": "UI", "Value": ["1.2.250.1.59.40211..30000008090412501082300000004"] }
    , "00400007": { "vr": "LO", "Value": ["Specials^04a_HeadCTA"] }
```

```
    , "00400009": { "vr": "SH", "Value": ["PS-ID-23"] }
    , "00401001": { "vr": "SH", "Value": ["P-ID-22"] }
    …
    }
  , …
  ] }
, …
, "00400340": { "vr": "SQ", "Value":
  [ { "0008103E": { "vr": "LO", "Value": ["Head 1.50 Hr64 ax"] }
    , "00081050": { "vr": "PN", "Value": [{ "Alphabetic": "House^Gregory" }] }
    , "00081140": { "vr": "SQ", "Value":
      [ { "00081150": { "vr": "UI", "Value": ["1.2.840.10008.5.1.4.1.1.2"] }
        , "00081155": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.30000020040718322840300000520"] }
        , …
        }
      , { "00081150": { "vr": "UI", "Value": ["1.2.840.10008.5.1.4.1.1.2"] }
        , "00081155": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.30000020040718322840300000521"] }
        , …
        }
      , …
      ] }
    , …
    , "00181030": { "vr": "LO", "Value": ["Special^99a_HeadCTA"] }
    , "0020000E": { "vr": "UI", "Value": ["1.2.250.1.59.40211.197132.30000020040718322840300000007"] }
    , …
    }
  , …
  ] }
, …
} ]
```

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

B.40.2   Returning Specific Attributes Only

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

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

A successful response to the request will be:

```
HTTP/1.1 200 OK
Content-Length: 289
Content-Type: application/dicom+json; charset=utf-8

[ { "00100010": { "vr": "PN", "Value": [{ "Alphabetic": "Doe^Sally" }] }
 , "00400242": { "vr": "SH", "Value": ["CTSCANNER"] }
 , "00400252": { "vr": "CS", "Value": ["COMPLETED"] }
} ]
```

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

B.41 **Bi-directional Proxies for Searching the Modality Scheduled Procedure Steps**

The DICOMweb Modality Scheduled 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.

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.

Figure B.41-1 shows how a proxy could facilitate a request for searching modality scheduled procedure steps from a DIMSE SCU to a DICOMweb origin server.

Figure B.41-1. Modality Scheduled Procedure Step DIMSE Proxy for DICOMweb Origin Server

Figure B.41-2 shows how a proxy could facilitate a request for searching modality scheduled procedure steps from a DICOMweb user agent to a DIMSE SCP.
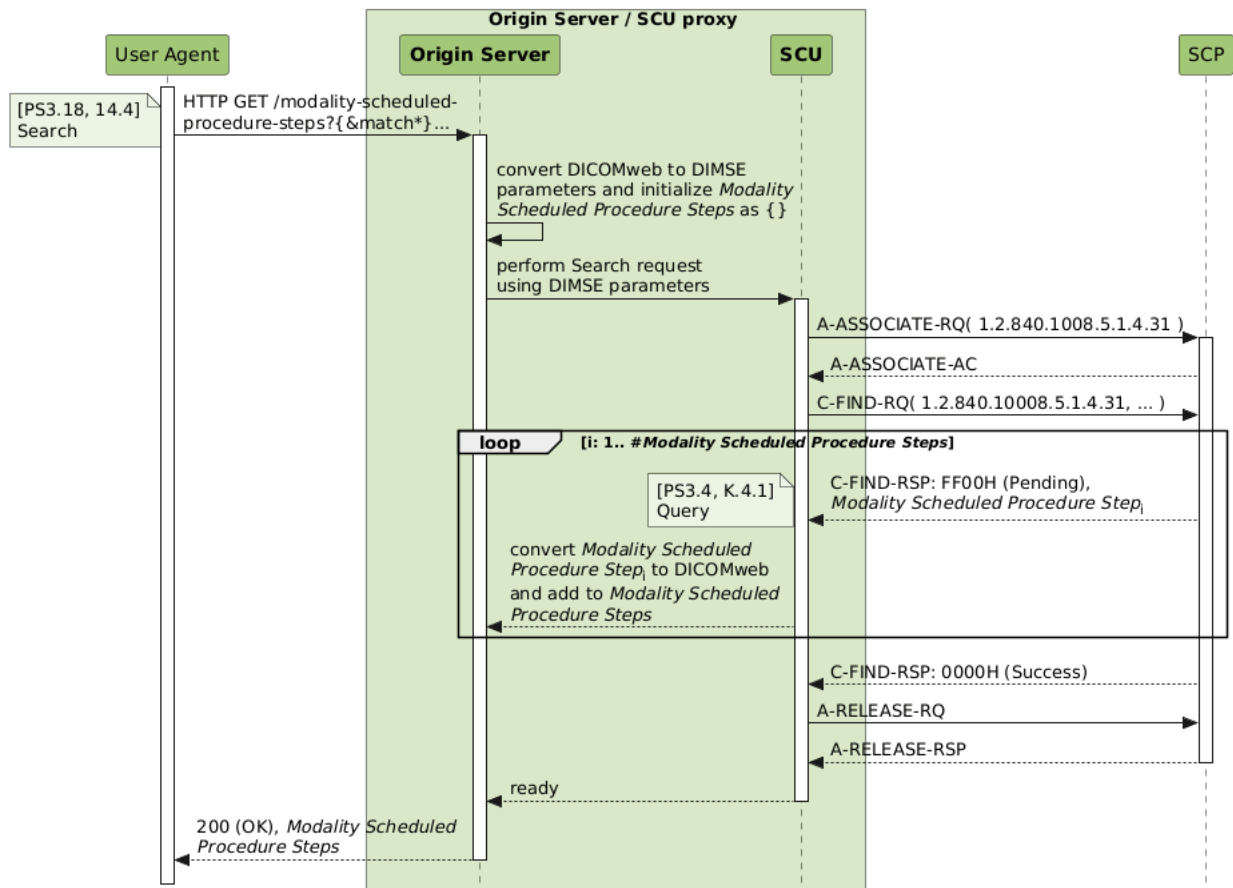
Figure B.41-2. Modality Scheduled Procedure Step DICOMweb Proxy for DIMSE SCP

B.42   Bi-directional Proxies for Managing a Modality Performed Procedure Step

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.

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.

B.42.1   Create

Figure B.42.1-1 shows how a proxy could facilitate a request for creating a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.

Figure B.42.1-1. MPPS Create DIMSE Proxy for DICOMweb Origin Server

Figure B.42.1-2 shows how a proxy could facilitate a request for creating a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.

Figure B.42.1-2. MPPS Create DICOMweb Proxy for DIMSE SCP

B.42.2 Update

Figure B.42.2-1 shows how a proxy could facilitate a request for updating a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.
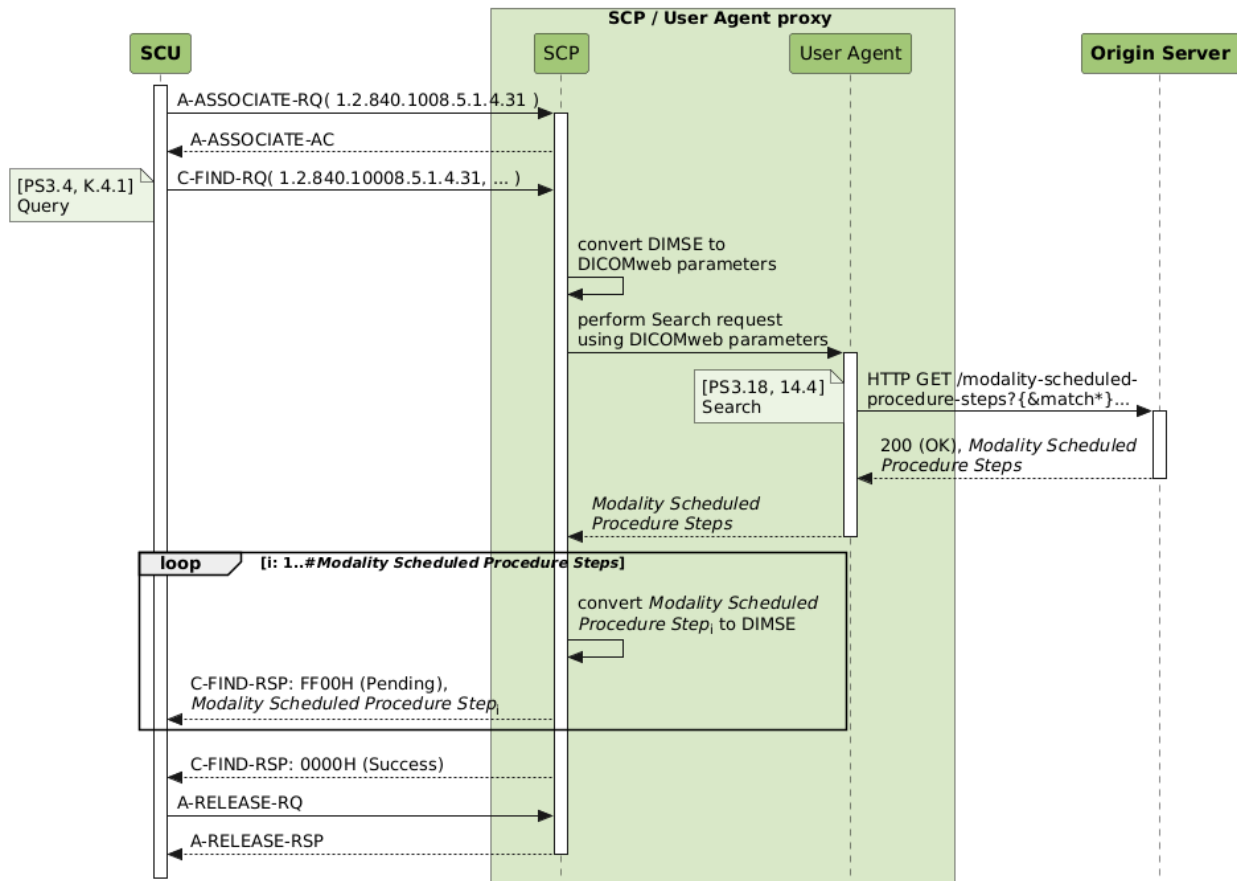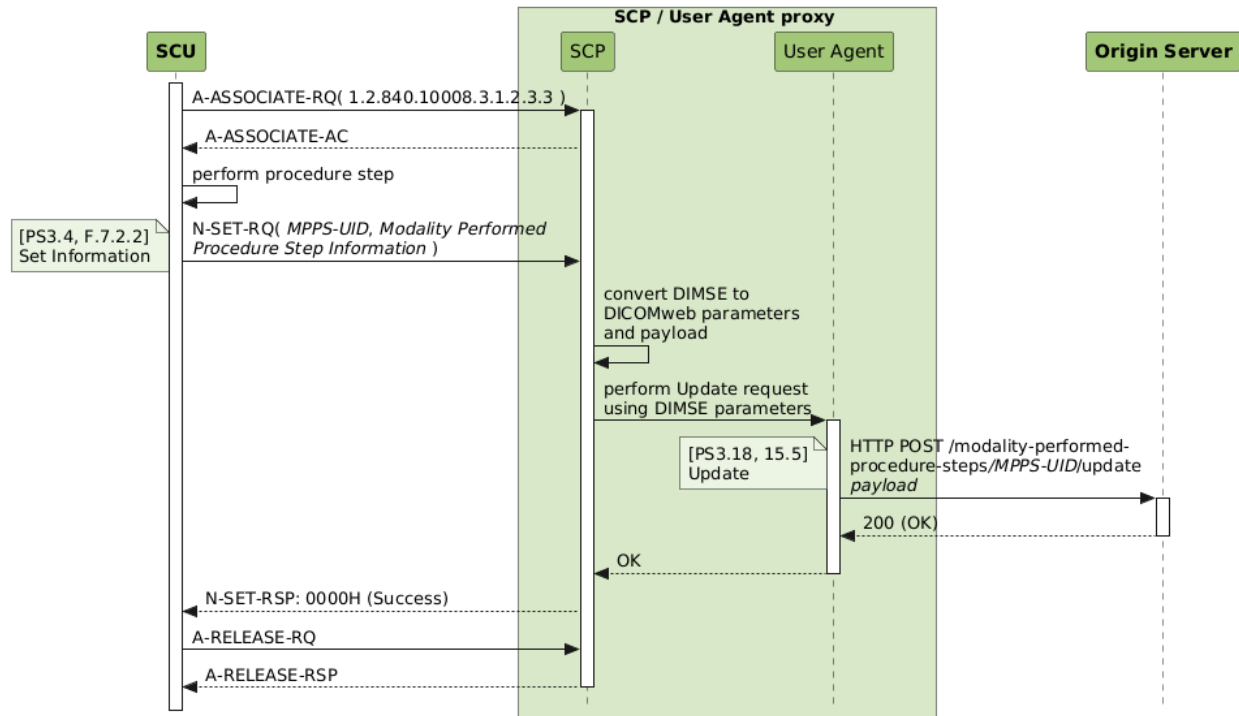

Figure B.42.2-1. MPPS Update DIMSE Proxy for DICOMweb Origin Server

Figure B.42.2-2 shows how a proxy could facilitate a request for updating a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.
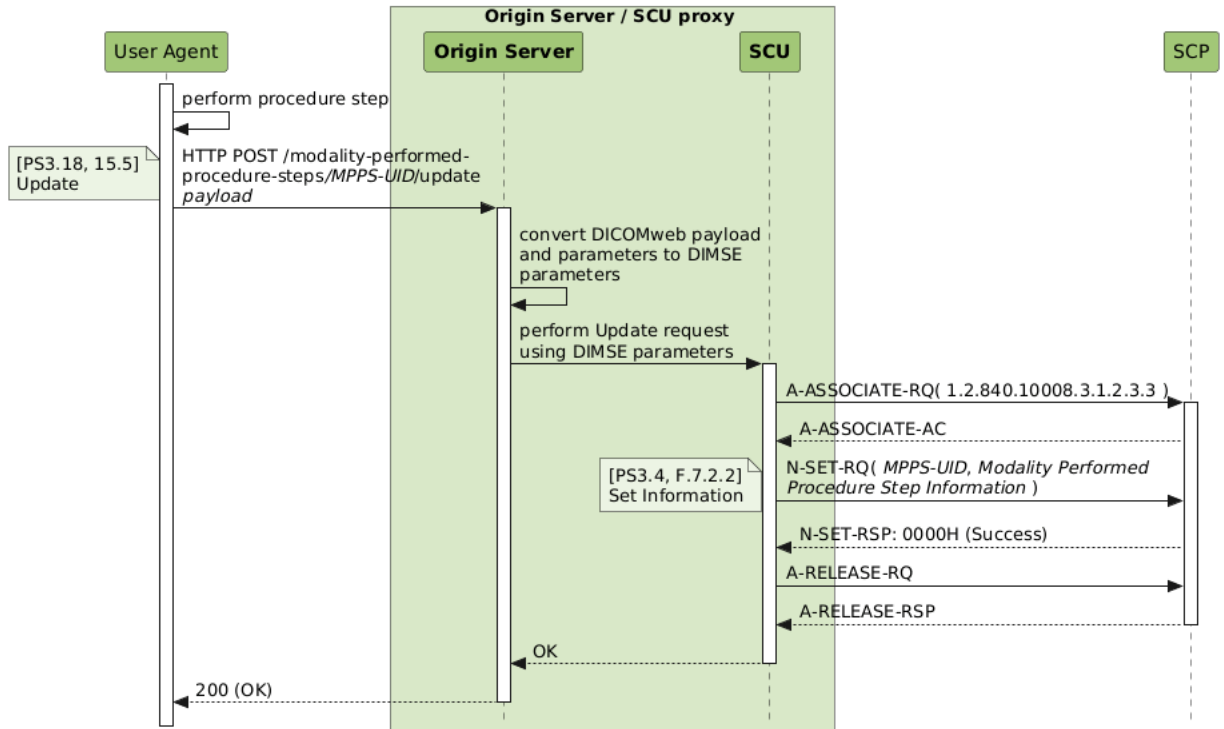
Figure B.42.2-2. MPPS Update DICOMweb Proxy for DIMSE SCP

B.42.3   Retrieve

Figure B.42.3-1 shows how a proxy could facilitate a request for retrieving a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.
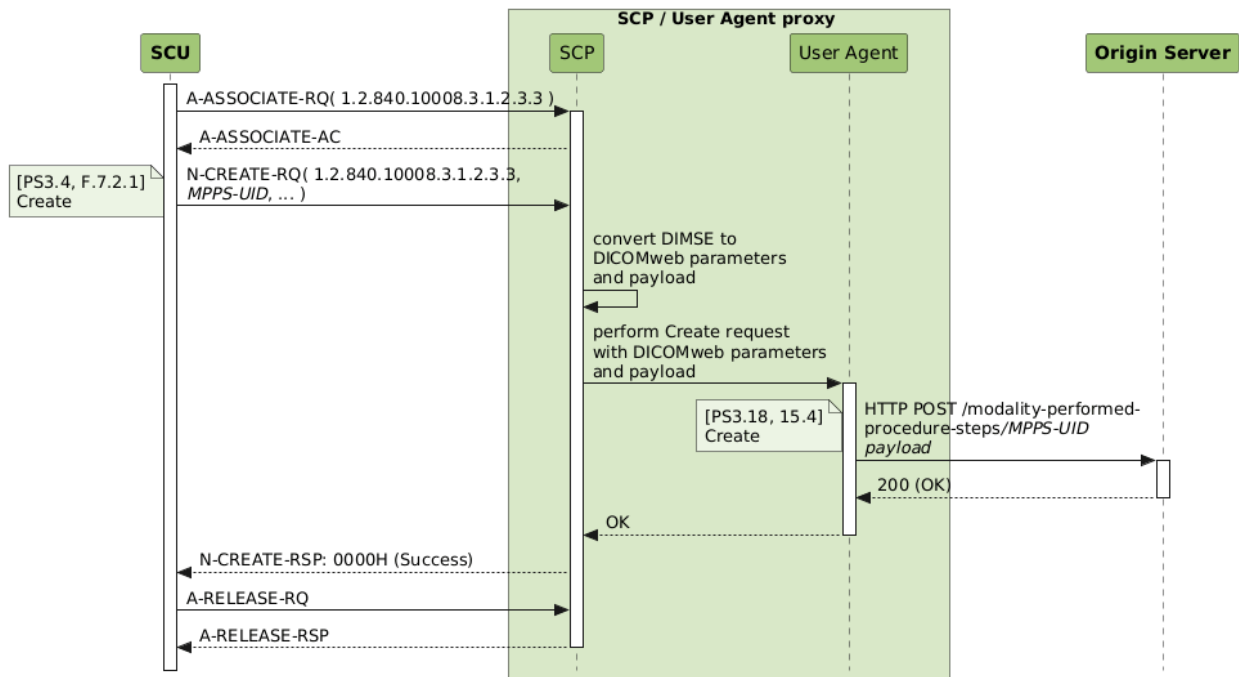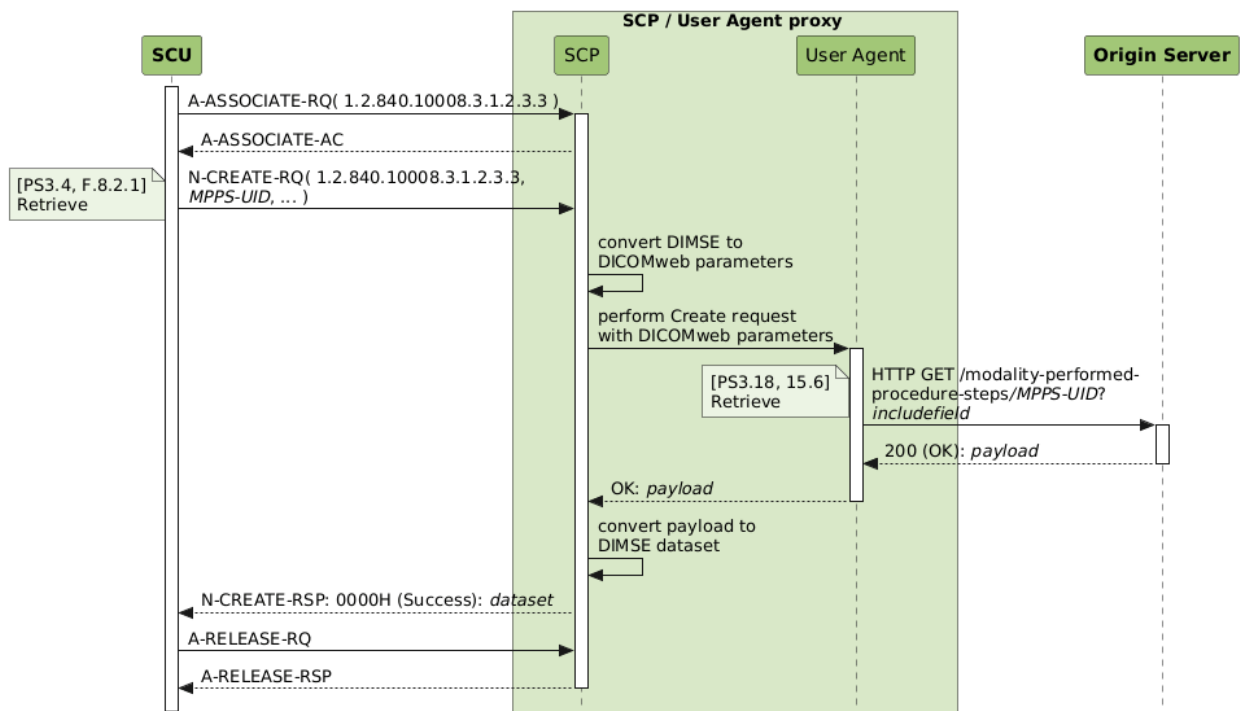
Figure B.42.3-1. MPPS Retrieve DIMSE Proxy for DICOMweb Origin Server

Figure B.42.3-2 shows how a proxy could facilitate a request for retrieving a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.
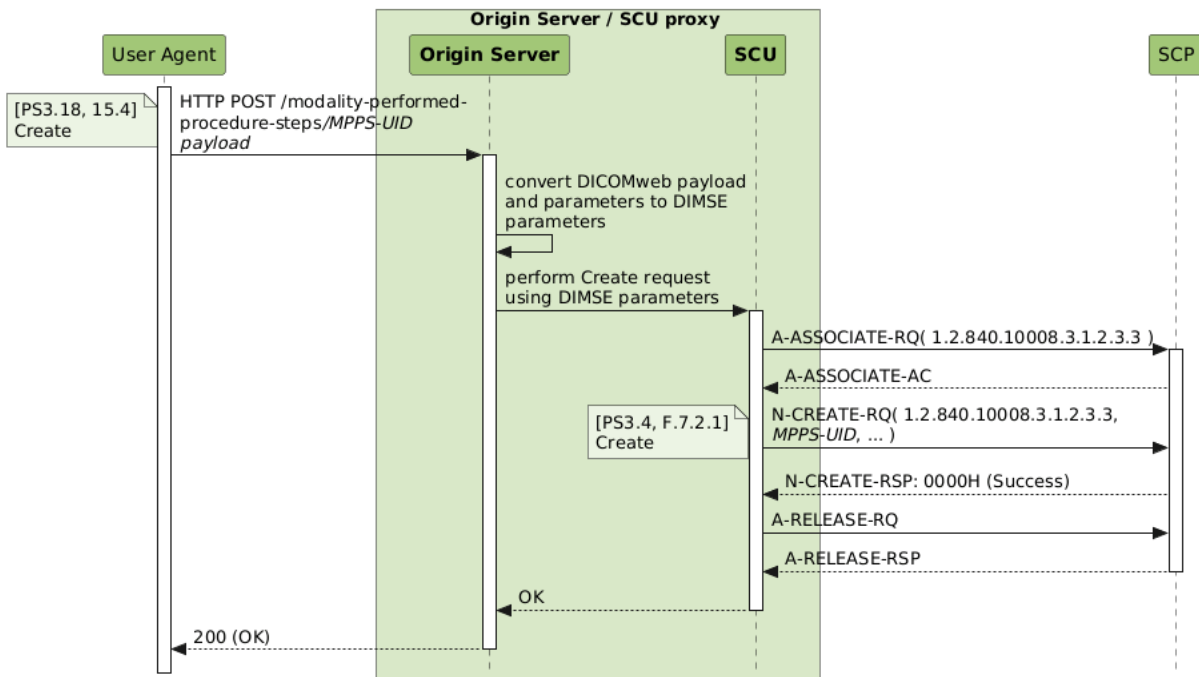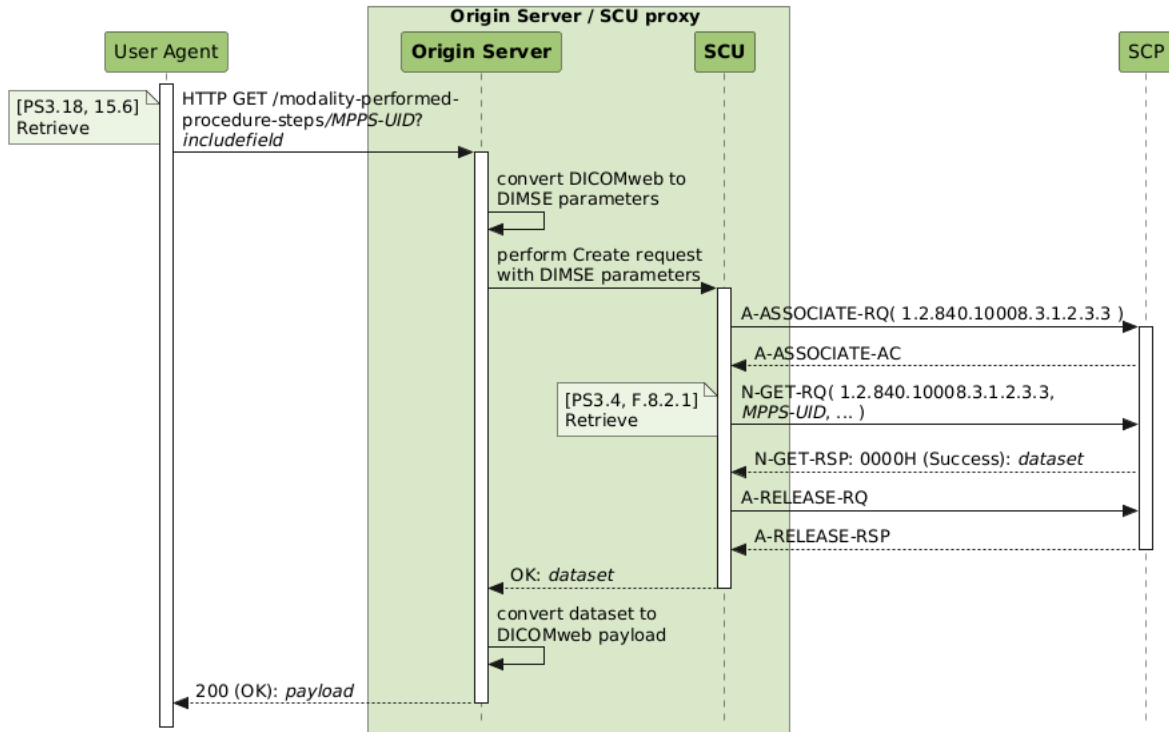

Figure B.42.3-2. MPPS Retrieve DICOMweb Proxy for DIMSE SCP

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

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 14.1.1)			
	modality-scheduled-procedure-steps	**Search**	**Section 14.4**
Modality Performed Procedure Step Service (see Section 15.1.1)			
	modality-performed-procedure-steps	**Create**	**Section 15.4**
		Update	**Section 15.5**
		Retrieve	**Section 15.6**

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.1.3.6   Modality Scheduled Procedure Step Service

Table N.1.3.6-1 lists details on the support of the Modality Scheduled Procedure Step Service.

[Complete Table N.1.3.6-1 to indicate support for the Modality Scheduled Procedure Step Web Service]

Table N.1.3.6-1 Modality Scheduled Procedure Step Service

Service	Transaction	Resource	User Agent	Origin Server
Modality Scheduled Procedure Step Service	*Search*	modality-scheduled-procedure-steps		

N.1.3.7   Modality Performed Procedure Step Service

Table N.1.3.7-1 lists details on the support of the Modality Performed Procedure Step Service.

[Complete Table N.1.3.7-1 to indicate support for the Modality Performed Procedure Step Web Service]

Table N.1.3.7-1 Modality Performed Procedure Step Service

Service	Transaction	Resource	User Agent	Origin Server
Modality Performed Procedure Step Service	*Create*	modality-performed-procedure-steps		
	Update			
	Retrieve			

[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.

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

N.5   Service and Interoperability Description

…

N.5.3   Supported DICOM Web Services

…

N.5.3.7   Modality Scheduled Procedure Step Web Service

This section provides details regarding the Modality Scheduled Procedure Step Web Service. For an overview of supported Transactions and resources see Table N.1.3.6-1 Modality Scheduled Procedure Step Service.

N.5.3.7.1   Search Transaction – Modality Scheduled Procedure Step Service

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

N.5.3.7.1.1   User Agent

The Search Transaction user agent can request resources listed in Table N.5.3.7.1.1-1.

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

Table N.5.3.7.1.1-1: Resources for Search Transaction – User Agent

Resource	Comments
	See Resources path in table 14.1.1-1 in PS3.18
modality-scheduled-procedure-steps	

The Search Transaction user agent supports Header Fields listed in Table N.5.3.7.1.1-2.

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

Table N.5.3.7.1.1-2: Header Fields for Search Transaction – User Agent

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

N.5.3.7.1.2 Origin Server

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

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

The URI is composed by a Base URI: see Base URI for the origin server in Section N.6.3.6.

The Request Transaction origin server supports resources listed in Table N.5.3.7.1.2-1.

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

Table N.5.3.7.1.2-1: Resources for Search Transaction – Origin Server

Resource	Comments
	See Resources path in Table 14.1.1-1 in PS3.18
modality-scheduled-procedure-steps	

The Search Transaction origin server supports Header Fields listed in Table N.5.3.7.1.2-2.

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

Table N.5.3.7.1.2-2: Header Fields for Search Transaction – Origin Server

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

N.5.3.8 Modality Performed Procedure Step Web Service

This section provides details regarding the Modality Performed Procedure Step Web Service. For an overview of supported Transactions and resources see Table N.1.3.7-1 Modality Performed Procedure Step Service.

N.5.3.8.1 Create Transaction – Modality Performed Procedure Step Service

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

N.5.3.8.1.1 User Agent

The Create Transaction user agent can request to create resources listed in Table N.5.3.8.1.1-1.

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

Table N.5.3.8.1.1-1: Resources for Create Transaction – User Agent

Resource	Comments
	See Resources path in table 15.1.1-1 in PS3.18
modality-performed-procedure-steps	

The Create Transaction user agent supports Header Fields listed in Table N.5.3.8.1.1-2.

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

Table N.5.3.8.1.1-2: Header Fields for Create Transaction – User Agent

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

N.5.3.8.1.2 Origin Server

The Create Transaction origin server receives POST requests to create a modality performed procedure step.

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

The URI is composed by a Base URI: see Base URI for the origin server in Section N.6.3.7.

The Create Transaction origin server supports resources listed in Table N.5.3.8.1.2-1.

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

Table N.5.3.8.1.2-1: Resources for Create Transaction – Origin Server

Resource	Comments
	See Resources path in Table 15.1.1-1 in PS3.18
modality-performed-procedure-steps	

The Create Transaction origin server supports Header Fields listed in Table N.5.3.8.1.2-2.

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

Table N.5.3.8.1.2-2: Header Fields for Create Transaction – Origin Server

Header Field	Supported Values	Comments
Content-Type	*application/dicom+json* *application/dicom+xml*	

Content-Length		*[If Content-Encoding is not present]*
Content-Encoding		*[If Content-Length is not present]*

N.5.3.8.2 Update Transaction – Modality Performed Procedure Step Service

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

N.5.3.8.2.1 User Agent

The Update Transaction user agent can request to update resources listed in Table N.5.3.8.2.1-1.

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

Table N.5.3.8.2.1-1: Resources for Update Transaction – User Agent

Resource	Comments
	See Resources path in table 15.1.1-1 in PS3.18
modality-performed-procedure-steps	

The Update Transaction user agent supports Header Fields listed in Table N.5.3.8.2.1-2.

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

Table N.5.3.8.2.1-2: Header Fields for Update Transaction – User Agent

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

N.5.3.8.2.2 Origin Server

The Update Transaction origin server receives POST requests to update a modality performed procedure step.

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

The URI is composed by a Base URI: see Base URI for the origin server in Section N.6.3.7.

The Update Transaction origin server supports resources listed in Table N.5.3.8.2.2-1.

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

Table N.5.3.8.2.2-1: Resources for Update Transaction – Origin Server

Resource	Comments
	See Resources path in Table 15.1.1-1 in PS3.18
modality-performed-procedure-steps	

The Update Transaction origin server supports Header Fields listed in Table N.5.3.8.2.2-2.

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

Table N.5.3.8.2.2-2: Header Fields for Update Transaction – Origin Server

Header Field	Supported Values	Comments
Content-Type	*application/dicom+json* *application/dicom+xml*	
Content-Length		*[If Content-Encoding is not present]*
Content-Encoding		*[If Content-Length is not present]*

N.5.3.8.3 Retrieve Transaction – Modality Performed Procedure Step Service

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

N.5.3.8.3.1 User Agent

The Retrieve Transaction user agent can request to retrieve resources listed in Table N.5.3.8.3.1-1.

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

Table N.5.3.8.3.1-1: Resources for Retrieve Transaction – User Agent

Resource	Comments
	See Resources path in table 15.1.1-1 in PS3.18
modality-performed-procedure-steps	

The Retrieve Transaction user agent supports Header Fields listed in Table N.5.3.8.3.1-2.

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

Table N.5.3.8.3.1-2: Header Fields for Retrieve Transaction – User Agent

Header Field	Supported Values	Comments
Content-Type	*application/dicom+json (Default)* *application/dicom+xml* *multipart/related; type="application/dicom+json"*	

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

N.5.3.8.3.2   Origin Server

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

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

The URI is composed by a Base URI: see Base URI for the origin server in Section N.6.3.7.

The Retrieve Transaction origin server supports resources listed in Table N.5.3.8.3.2-1.

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

Table N.5.3.8.3.2-1: Resources for Retrieve Transaction – Origin Server

Resource	Comments
	See Resources path in Table 15.1.1-1 in PS3.18
modality-performed-procedure-steps	

The Retrieve Transaction origin server supports Header Fields listed in Table N.5.3.8.3.2-2.

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

Table N.5.3.8.3.2-2: Header Fields for Retrieve Transaction – Origin Server

Header Field	Supported Values	Comments
Content-Type	*application/dicom+json* *application/dicom+xml*	
Content-Length		*[If Content-Encoding is not present]*
Content-Encoding		*[If Content-Length is not present]*

Add new subsections on the Modality Procedure Step Services to section N.6.3 Configuration of DICOM Web Services.

N.6.3.6   Modality Scheduled Procedure Step Service

N.6.3.6.1   Search Transaction Configuration

Table N.6.3.6-1 lists configuration parameters for the Search Transaction of the Modality Scheduled Procedure Step Service.

[Remove the unsupported parameters from the local and remote configuration parameters.]

Table N.6.3.6-1. Search Transaction Parameters

	Local Configuration Parameters - Search Transaction		
Parameter	**Configurable**	**Default Value**	**Comments**
	<<USER *SERVICE* *FIXED>>*	*[If there is no default, leave blank]*	*[Provide comments or Values/ranges if applicable]*
Search local Origin Server URL (Base URI)	*FIXED*	*http://<hostname>:<port>/modality-scheduled-procedure-steps*	
Port	*SERVICE*	*8081*	
Secured Search local Origin Server URL (Base URI)		*https://<hostname>:<securedport>/modality-scheduled-procedure-steps*	
Secured Port		*8081*	
<Specific Search Transaction parameter>			

	Remote Configuration Parameters - Search Transaction		
[Either document the number of supported remote hosts, e.g., <Product> supports configuration of up to <X> remote hosts, or state that there is no limitation other than those mandated by the operating system.]			
Parameter	**Configurable**	**Default Value**	**Comments**
	<<USER *SERVICE* *FIXED>>*	*[If there is no default, leave blank]*	*[Provide comments or Values/ranges if applicable]*
Search remote Origin Server URL	*SERVICE*		
Port	*SERVICE*		
Secured Search remote Origin Server URL	*SERVICE*		
Secured Port	*SERVICE*		
<Specific Search Transaction parameter>			

N.6.3.7 Modality Performed Procedure Step Service

N.6.3.7.1 Create Transaction

Table N.6.3.7-1 lists configuration parameters for the Create Transaction of the Modality Performed Procedure Step Service.

[Remove the unsupported parameters from the local and remote configuration parameters.]

Table N.6.3.7-1. Create, Update, and Retrieve Transaction Parameters

Local Configuration Parameters – Create, Update and Retrieve Transaction			
Parameter	**Configurable**	**Default Value**	**Comments**
	<<USER *SERVICE* *FIXED>>*	*[If there is no default, leave blank]*	*[Provide comments or Values/ranges if applicable]*
Search local Origin Server URL (Base URI)	*FIXED*	*http://<hostname>:<port>/modality-performed-procedure-steps*	
Port	*SERVICE*	*8081*	
Secured Search local Origin Server URL (Base URI)		*https://<hostname>:<securedport>/modality-performed-procedure-steps*	
Secured Port		*8081*	
<Specific Search Transaction parameter>			
Remote Configuration Parameters – Create, Update, and Retrieve Transaction			
[Either document the number of supported remote hosts, e.g., <Product> supports configuration of up to <X> remote hosts, or state that there is no limitation other than those mandated by the operating system.]			
Parameter	**Configurable**	**Default Value**	**Comments**
	<<USER *SERVICE* *FIXED>>*	*[If there is no default, leave blank]*	*[Provide comments or Values/ranges if applicable]*
Search remote Origin Server URL	*SERVICE*		
Port	*SERVICE*		
Secured Search remote Origin Server URL	*SERVICE*		
Secured Port	*SERVICE*		

Local Configuration Parameters – Create, Update and Retrieve Transaction			
Parameter	**Configurable**	**Default Value**	**Comments**
<Specific Search Transaction parameter>			

N.6.3.7.2 Update Transaction

Table N.6.3.7-1 lists configuration parameters for the Update Transaction of the Modality Performed Procedure Step Service.

N.6.3.7.3 Retrieve Transaction

Table N.6.3.7-1 lists configuration parameters for the Retrieve Transaction of the Modality Performed Procedure Step Service.

> ***Add new subsections on the Modality Procedure Step Services to section N.7.3.3 DICOM Web Services.***

N.7 Network and Media Communication Details

…

N.7.3 Status Codes

…

N.7.3.3 DICOM Web Services

…

N.7.3.3.7 Modality Scheduled Procedure Step Service

N.7.3.3.7.1 Search Transaction as Origin Server

Table N.7.3.3.7.1-1 lists the Status Codes that an origin server supports for the Search Transaction of the Modality Scheduled Procedure Step Service and the condition in which any of the listed Status Codes is sent.

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

Table N.7.3.3.7.1-1: 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*

Status	Code	Condition
		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.*

N.7.3.3.7.2 Search Transaction as User Agent

Table N.7.3.3.7.2-1 lists the Status Codes that a user agent supports for the Search Transaction of the Modality Scheduled Procedure Step Service and defines the application behavior, when encountering any of the listed Status Codes.

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

Table N.7.3.3.7.2-1: 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*
Failure	*400 (Bad Request)*	*Reformat the request to proper HTTP*
	413 (Payload Too Large)	*Try again with a smaller limit parameter*
	503 (Service Unavailable)	*Try again later*
*	*Any other code*	*Do further analysis*

N.7.3.3.8 Modality Performed Procedure Step Service

N.7.3.3.8.1 Create Transaction as Origin Server

Table N.7.3.3.8.1-1 lists the Status Codes that an origin server supports for the Create Transaction of the Modality Performed Procedure Step Service and the condition in which any of the listed Status Codes is sent.

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

Table N.7.3.3.8.1-1: Status Codes of Origin Server for Create Transaction

Status	Code	Condition
Success	*201 (Created)*	*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*

Status	Code	Condition
	503 (Service Unavailable)	The origin server cannot handle the creation of the Modality Performed Procedure Step; this may be a temporal or permanent state

N.7.3.3.8.2   Create Transaction as User Agent

Table N.7.3.3.8.2-1 lists the Status Codes that a user agent supports for the Create Transaction of the Modality Performed Procedure Step Service and defines the application behavior, when encountering any of the listed Status Codes.

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

Table N.7.3.3.8.2-1: Status Codes of User Agent for Create Transaction

Status	Code	Behavior
Success	201 (Created)	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

N.7.3.3.8.3   Update Transaction as Origin Server

Table N.7.3.3.8.3-1 lists the Status Codes that an origin server supports for the Update Transaction of the Modality Performed Procedure Step Service and the condition in which any of the listed Status Codes is sent.

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

Table N.7.3.3.8.3-1: 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

Status	Code	Condition
	503 (Service Unavailable)	The origin server cannot handle the creation of the Modality Performed Procedure Step; this may be a temporal or permanent state

N.7.3.3.8.4 Update Transaction as User Agent

Table N.7.3.3.8.4-1 lists the Status Codes that a user agent supports for the Update Transaction of the Modality Performed Procedure Step Service and defines the application behavior, when encountering any of the listed Status Codes.

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

Table N.7.3.3.8.4-1: 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

N.7.3.3.8.5 Retrieve Transaction as Origin Server

Table N.7.3.3.8.5-1 lists the Status Codes that an origin server supports for the Retrieve Transaction of the Modality Performed Procedure Step Service and the condition in which any of the listed Status Codes is sent.

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

Table N.7.3.3.8.5-1: 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

Status	Code	Condition
	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*

N.7.3.3.8.6 Retrieve Transaction as User Agent

Table N.7.3.3.8.6-1 lists the Status Codes that a user agent supports for the Retrieve Transaction of the Modality Performed Procedure Step Service and defines the application behavior, when encountering any of the listed Status Codes.

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

Table N.7.3.3.8.6-1: 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*