Digital Imaging and Communications in Medicine (DICOM)

Supplement 246: DICOMweb Modality Workflow Services

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# 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. |
| 2025.03 | Version 03 | JM, DK | Split into two services; reworked comments from WG06. |

# Open Issues

|  |  |
| --- | --- |
| 2 | **Context**: The notified parties of the MPPS notification service as specified in [PS3.4, F.9](https://dicom.nema.org/medical/dicom/current/output/chtml/part04/sect_F.9.html).  **Issue**: This service does not specify how the MPPS Notification SCP knows what SCUs to notify on MPPS changes.  **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.  **Decision**: [WGxx: YYYY-MM-DD] None yet. |
| 3 | **Context**: Unsolicited notifications for MPPS.  **Issue**: In HTTP there is no way for an origin server to open a connection to a user agent. Therefore, unsolicited MPPS notifications as present in DIMSE cannot be mimicked in DICOMweb. There are several ways to deal with this:   1. Do not allow for MPPS notifications at all; 2. Have user agents always open a WebSocket pipeline as defined in Section 8.10, without knowing whether they are notified or not (see issue 2); 3. Use a subscription mechanism like is done in UPS(-RS). 4. Use HTTP/2 Server Push mechanism (suggested in a WG27 meeting).   **Proposal**: Go for the third alternative, as the functionality of getting messages is useful for some use cases (rejecting option 1), and having all user agents creating a pipeline to the origin server is ‘suboptimal’ (rejecting option 2). Option 4 sounds great, but HTTP Server Push seems to be deprecated, both in browser implementations and specification (of HTTP/3), and hence does not seem to be the way forward.  **Decision**: [WGxx, YYYY-MM-DD] None yet. |

# Closed Issues

|  |  |
| --- | --- |
| 1 | **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.  **Issue**: It proved very hard, if not impossible, to map MWL/MPPS to UPS, as, among other things, the two serve different purposes.  **Proposal**: Create new Modality Workflow Services and Resources based on the MWL/MPPS DIMSE model instead of basing them on UPS-RS.  **Decision**: [WG06: 2025-01-14] Agreed with proposal. |
|  |  |

# Scope and Field of Application

This supplement defines the means to perform modality workflow management in DICOMweb. Modality workflow services enable a user agent to use and create workflow-related resources on an origin server. They are an extension to the existing DICOMweb services, providing RESTful interfaces to the Modality Worklist (MWL) and Modality Performed Procedure Step (MPPS) services that are already available in DIMSE. The modality workflow 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 Worklist Service and Resources, immediately before section X below

# Y Modality Worklist Service and Resources

## Y.1 Overview

The Modality Worklist 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 Worklist 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 |
| --- | --- | --- |
| Worklist | /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 |

## Y.2 Conformance

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

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

Table Y.2-1. Required and Optional Transactions

| Transaction | Support | Section |
| --- | --- | --- |
| Retrieve Capabilities | Required | Section 8.9 |
| Search | Required | Section Y.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).

## Y.3 Transactions Overview

The Modality Worklist Service consists of the Transactions listed in Table Y.3-1.

Table Y.3-1. Modality Worklist 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 Y.3-2 lists the Modality Worklist Service Transactions and their corresponding DIMSE Operations used in MWL.

Table Y.3-2. Mapping of Modality Worklist 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.

## Y.4 Search Transaction

This Transaction searches the Worklist 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).

### Y.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

#### Y.4.1.1 Target Resources

The Target Resource for this Transaction is the Worklist.

#### Y.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.

#### Y.4.1.3 Request Header Fields

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

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

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. |

See also Section 8.4.

#### Y.4.1.4 Request Payload

The request shall have no payload.

### Y.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.

### Y.4.3 Response

The response shall have the following syntax:

version SP status-code SP reason-phrase CRLF

CRLF

[payload]

#### Y.4.3.1 Status Codes

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

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. |

#### Y.4.3.2 Response Header Fields

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

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. |

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.

#### Y.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

# 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.

### X.1.1 Resource Descriptions

There are three resources defined by this service:

MPPS Journal The collection of Modality Performed Procedure Steps managed by the origin server.

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.

Subscription A resource that specifies a Subscriber, to whom notifications about changes in the resource's state should be sent.

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.

{step} The MPPS UID.

{aetitle} The Application Entity Title of a Subscriber.

The Modality Performed Procedure Step Service manages an MPPS Journal; its resources are given in Table X.1.1-1.

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

| Resource | URI Template | Description |
| --- | --- | --- |
| MPPS Journal | /modality-performed-procedure-steps | The entire collection of modality performed procedure steps managed by the origin server. |
| Modality Performed Procedure Step | /modality-performed-procedure-steps/{step} | A single Modality Performed Procedure Step. |
| Modality Performed Procedure Step Subscription | /modality-performed-procedure-steps/{step}/subscribers/{aetitle} | The subscription to a 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 |

### X.1.3 Common Media Types

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

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 |

## X.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 X.2-1 and may support Transactions listed as Optional. The support of the Subscribe and Unsubscribe transactions is mutually dependent.

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 |
| Subscribe | Optional | Section X.7 |
| Unsubscribe | Optional | Section X.8 |

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).

## X.3 Transactions Overview

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

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 |
| 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 |
| Subscribe | POST | none | none | Subscribes to state changes of the target Modality Performed Procedure Step |
| Unsubscribe | DELETE | none | none | Unsubscribes to state changes of the target Modality Performed Procedure Step |

In Table X.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 X.3-2. Resources by Transaction

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Resource** | **Create** | **Update** | **Retrieve** | **Subscribe** | **Unsubscribe** |
| MPPS Journal |  |  |  |  |  |
| MPPS | M | M | M |  |  |
| Subscription |  |  |  | M | M |

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

Table X.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.

Some Modality Performed Procedure Step Service Transactions do not have corresponding DIMSE Operations but they relate to DIMSE Notifications instead. These Transactions are listed in Table X.3-4, together with the DIMSE Notifications.

Table X.3-4. Relation between Modality Performed Procedure Step Service Transactions and DIMSE Notifications

| Transaction | Notification | Reference | DIMSE Service |
| --- | --- | --- | --- |
| Subscribe | Receive Event Notification | PS3.4, F.9.2.1 | N-EVENT-REPORT |
| Unsubscribe | Provide Event Notification | PS3.4, F.9.2.2 |

Note The pair of Notifications relate to the pair of Transactions; there is *no* one-to-one mapping between DIMSE Notifications and Modality Workflow Service Transactions. See also Section 8.10 for more information about how DICOMweb deals with Notifications.

## X.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).

### X.4.1 Request

The request shall have the following syntax:

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

Accept: 1#media-type CRLF

\*(header-field CRLF)

CRLF

payload

#### X.4.1.1 Target Resource

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

#### X.4.1.2 Query Parameters

The request has no Query Parameters.

#### X.4.1.3 Request Header Fields

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

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

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. |

See Section 8.4.

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

### X.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.

### X.4.3 Response

The response shall have the following syntax:

version SP status-code SP reason-phrase CRLF

CRLF

[payload]

#### X.4.3.1 Status Codes

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

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. |

#### X.4.3.2 Response Header Fields

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

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. |

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.

#### X.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.

## X.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).

### X.5.1 Request

The request shall have the following syntax:

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

Accept: 1#media-type CRLF

\*(header-field CRLF)

CRLF

payload

#### X.5.1.1 Target Resources

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

#### X.5.1.2 Query Parameters

The request has no Query Parameters.

#### X.5.1.3 Request Header Fields

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

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

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. |

See also Section 8.4.

#### X.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 request payload shall contain the Modality Performed Procedure Step attributes with which the user agent requests the origin server to update a Modality Performed Procedure Step resource.

The request payload shall contain a dataset according to PS3.4, Table F.7.2-1, requirement type N-SET (SCU).

### X.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.

### X.5.3 Response

The response shall have the following syntax:

version SP status-code SP reason-phrase CRLF

CRLF

[payload]

#### X.5.3.1 Status Codes

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

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. |

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.

#### X.5.3.2 Response Header Fields

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

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. |

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.

#### X.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.

## X.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).

### X.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

#### X.6.1.1 Target Resources

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

#### X.6.1.2 Query Parameters

The origin server shall support the includefield Query Parameter as described in Section 8.3.4.3.

The user agent may supply the includefield Query Parameter as described in Section 8.3.4.3.

#### X.6.1.3 Request Header Fields

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

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

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. |

See Section 8.4.

#### X.6.1.4 Request Payload

The request shall have no payload.

### X.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.

### X.6.3 Response

The response shall have the following syntax:

version SP status-code SP reason-phrase CRLF

CRLF

[payload]

#### X.6.3.1 Status Codes

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

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. |

#### X.6.3.2 Response Header Fields

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

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. |

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.

#### X.6.3.3 Response Payload

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

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

## X.7 Subscribe Transaction

This Transaction creates a Subscription to an existing Modality Performed Procedure Step resource. It relates to the DIMSE MPPS N-EVENT-REPORT Notification (see PS3.4, Section F.9.1).

Once a Subscription has been created, the user agent will receive notifications regarding the state of the associated Modality Performed Procedure Step. To receive the notifications generated by Subscriptions, the user agent must first open a Notification Connection between itself and the origin server using the Open Notification Connection Transaction; see Section 8.10.4.

### X.7.1 Request

The request shall have the following syntax:

POST SP /modality-performed-procedure-steps/{mppsUID}/subscribers/{aetitle} SP version CRLF

Accept: 1#media-type CRLF

\*(header-field CRLF)

CRLF

#### X.7.1.1 Target Resources

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

#### X.7.1.2 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.

#### X.7.1.3 Request Header Fields

The origin server shall support header fields as required in Table X.7.1-1.

The user agent shall supply in the request header fields as defined in Table X.7.1-1.

Table X.7.1-1. 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.

#### X.7.1.4 Request Payload

The request shall have no payload.

### X.7.2 Behavior

The origin server shall create and manage a Subscription to the Target Modality Performed Procedure Step for the user agent. It will notify the user agent when changes occur, see Section 8.10.

### X.7.3 Response

The response shall have the following syntax:

version SP status-code SP reason-phrase CRLF

CRLF

[payload]

#### X.7.3.1 Status Codes

Table X.7.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5 for additional status codes.

Table X.7.3-1. Status Code Meaning

|  |  |  |
| --- | --- | --- |
| **Status** | **Code** | **Meaning** |
| Success | 200 (OK) | The origin server subscribed the user agent to the target Modality Performed Procedure Step. In case the user agent was already subscribed to this Modality Performed Procedure Step, there is no change. |
| Failure | 400 (Bad Request) | The origin server cannot handle the subscription 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 subscription to the target Modality Performed Procedure Step; this may be a temporal or permanent state. |

#### X.7.3.2 Response Header Fields

The origin server shall support header fields as required in Table X.7.3-2.

Table X.7.3-2. 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.

#### X.7.3.3 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.

## X.8 Unsubscribe Transaction

This Transaction removes a Subscription to a Modality Performed Procedure Step resource. It relates to the DIMSE MPPS N-EVENT-REPORT Notification (see PS3.4, Section F.9.1).

### X.8.1 Request

The request shall have the following syntax:

DELETE SP /modality-performed-procedure-steps/{mppsUID}/subscribers/{aetitle} SP version CRLF

Accept: 1#media-type CRLF

\*(header-field CRLF)

CRLF

#### X.8.1.1 Target Resources

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

#### X.8.1.2 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.

#### X.8.1.3 Request Header Fields

The origin server shall support header fields as required in Table X.8.1-1.

The user agent shall supply in the request header fields as defined in Table X.8.1-1.

Table X.8.1-1. 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.

#### X.8.1.4 Request Payload

The request shall have no payload.

### X.8.2 Behavior

Upon receipt of an Unsubscribe request, the origin server shall remove the Modality Performed Procedure Step Subscription.

### X.8.3 Response

The response shall have the following syntax:

version SP status-code SP reason-phrase CRLF

CRLF

[payload]

#### X.8.3.1 Status Codes

Table X.8.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5 for additional status codes.

Table X.8.3-1. Status Code Meaning

|  |  |  |
| --- | --- | --- |
| **Status** | **Code** | **Meaning** |
| Success | 200 (OK) | The origin server unsubscribed the user agent from the target Modality Performed Procedure Step. In case the user agent was already not subscribed to this Modality Performed Procedure Step, there is no change. |
| Failure | 400 (Bad Request) | The origin server cannot handle the unsubscribe 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 unsubscribe request for the target Modality Performed Procedure Step; this may be a temporal or permanent state. |

#### X.8.3.2 Response Header Fields

The origin server shall support header fields as required in Table X.8.3-2.

Table X.8.3-2. 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.

#### X.8.3.3 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.

## X.9 Modality Performed Procedure Step Event Reports

The origin server uses the Send Event Report Transaction (see Section 8.10.5) to send a Modality Performed Procedure Step Event Report, containing the details of any state change in the Modality Performed Procedure Step to the user agent.

The origin server shall send Modality Performed Procedure Step Event Reports as described in Section F.9.2 in PS3.4.

The Event Report shall contain all mandatory Attributes described in Table F.9.2-1 “Performed Procedure Step Notification Event Information” in PS3.4 and Table 10.3-2 “N-EVENT-REPORT-RSP Message Fields” in PS3.7.

The following is an example application/dicom+json Modality Performed Procedure Step Event Report payload:

{  
"00000002": {"vr": "UI", "Value": ["1.2.840.10008.5.1.4.34.6.4"] },  
"00000110": {"vr": "US", "Value": [23] },  
"00001000": {"vr": "UI", "Value": ["1.2.840.10008.5.1.4.34.6.4.2.3.44.22231"] },  
"00001002": {"vr": "US", "Value": [2] }  
} CRLF

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 (also known as 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 8.1.1 Request Message Syntax by removing unused methods and adding PATCH

…

method = **~~"CONNECT" /~~** "DELETE" / "GET" / **~~"HEAD" /~~** "OPTIONS" / **"PATCH" /** "POST" / "PUT"

…

#### 8.1.1.1 Method

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

Update Section 8.3.4.3 Attributes Included in the Response

#### 8.3.**4.3 Attributes Included in the Response**

…

The request may contain one or more include parameters; however, if a parameter with the value of "all" is present, then other includefield parameters shall not be present. If an attribute is a value of an includefield parameter **and is used in the context of searching**, it is equivalent to C-FIND Universal matching for that attribute. See Section C.2.2.2.3 in PS3.4.

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

# B Examples (Informative)

…

## B.X1 Searching for Modality Scheduled Procedure Steps with JSON

This section lists an example of an HTTP request and response for searching the modality worklist using JSON.

## B.X2 Creating a Modality Performed Procedure Step with JSON

This section lists an example of an HTTP request and response for creating a modality performed procedure step using JSON.

## B.X3 Updating a Modality Performed Procedure Step with JSON

This section lists an example of an HTTP request and response for updating a modality performed procedure step using JSON.

Include in this an example of updating a sequence, e.g. the instances created during this performed procedure step. Make clear that sequences are to be given in their entirety, as required in DIMSE F.7.2.2.2.

## B.X4 Retrieving a Modality Performed Procedure Step with JSON

This section lists an example of an HTTP request and response for retrieving a modality performed procedure step in JSON.

Include in this the use of the includefield parameter.

## B.X5 Bi-directional Proxies for Searching the Modality Worklist

The DICOMweb Modality Worklist 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.X5-1 shows how a proxy could facilitate a request for searching a modality worklist from a DIMSE SCU to a DICOMweb origin server.

A screenshot of a computer program

Description automatically generated

Figure B.X5-1. Modality Worklist DIMSE Proxy for DICOMweb Origin Server

Figure B.X5-2 shows how a proxy could facilitate a request for searching a modality worklist from a DICOMweb user agent to a DIMSE SCP.

A screenshot of a computer program

Description automatically generated

Figure B.X5-2. Modality Worklist DICOMweb Proxy for DIMSE SCP

## B.X6 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.X6.1 Create

Figure B.X6.1-1 shows how a proxy could facilitate a request for creating a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.

A screenshot of a computer program

Description automatically generated

Figure B.X6.1-1. MPPS Create DIMSE Proxy for DICOMweb Origin Server

Figure B.X6.1-2 shows how a proxy could facilitate a request for creating a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.

A screenshot of a software application

Description automatically generated

Figure B.X6.1-2. MPPS Create DICOMweb Proxy for DIMSE SCP

### B.X6.2 Update

Figure B.X6.2-1 shows how a proxy could facilitate a request for updating a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.

A screenshot of a computer program

Description automatically generated

Figure B.X6.2-1. MPPS Update DIMSE Proxy for DICOMweb Origin Server

Figure B.X6.2-2 shows how a proxy could facilitate a request for updating a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.

A screenshot of a computer program

Description automatically generated

Figure B.X6.2-2. MPPS Update DICOMweb Proxy for DIMSE SCP

### B.X6.3 Retrieve

Figure B.X6.3-1 shows how a proxy could facilitate a request for retrieving a modality performed procedure step from a DIMSE SCU to a DICOMweb origin server.

A screenshot of a computer

Description automatically generated

Figure B.X6.2-1. MPPS Retrieve DIMSE Proxy for DICOMweb Origin Server

Figure B.X6.4-2 shows how a proxy could facilitate a request for retrieving a modality performed procedure step from a DICOMweb user agent to a DIMSE SCP.

A screenshot of a computer program

Description automatically generated

Figure B.X6.2-2. MPPS Retrieve DICOMweb Proxy for DIMSE SCP

### B.X6.4 Notify

Update Table H-1 Resources and Methods: add new resources and methods for Modality Workflow 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 Worklist Service (see section Y.1.1)** | | | |
|  | **modality-scheduled-procedure-steps** | **Search** | **Section Y.4** |
| **Modality Performed Procedure Step Service (see Section X.1.1)** | | | |
|  | **modality-performed-procedure-steps** | **Create** | **Section X.4** |
| **Update** | **Section X.5** |
|  | **Retrieve** | **Section X.6** |
| **Subscribe** | **Section X.7** |
| **Unsubscribe** | **Section X.8** |

**Changes to NEMA Standards Publications PS 3.2**

Add new sections to N.1.3 for the Modality Workflow Services

## N.1 Overview

…

### N.1.3 DICOM Web Services

…

#### N.1.3.Y Modality Worklist Service

Table N.1.3.Y-1 lists details on the support of the Modality Worklist Service.

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

Table N.1.3.Y‑1 Modality Worklist Service

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Service** | **Transaction** | **Resource** | **User Agent** | **Origin Server** |
| Modality Worklist Service | *Search* | 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 Workflow Service

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

Add a new subsection on the Modality Workflow 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.Y Modality Worklist Web Service

This section provides details regarding the Modality Worklist Web Service. For an overview of supported Transactions and resources see Table N.1.3.Y‑1 Modality Worklist Service.

##### N.5.3.Y.1 Search Transaction – Modality Workflow Service

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

###### N.5.3.Y.1.1 User Agent

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

[List the supported resources for your Modality Worklist 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.Y.1.1-1: Resources for Search Transaction – User Agent

|  |  |
| --- | --- |
| Resource | Comments |
|  | See Resources path in table Y.1.1-1 in PS3.18 |
| *modality-scheduled-procedure-steps* |  |

The Search Transaction user agent supports Header Fields listed in Table N.5.3.Y.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.Y.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.Y.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.Y.

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

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

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 |
| *modality-scheduled-procedure-steps* |  |

The Search Transaction origin server supports Header Fields listed in Table N.5.3.Y.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.Y.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.X 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.X‑1 Modality Performed Procedure Step Service.

##### N.5.3.X.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.X.1.1 User Agent

The Create Transaction user agent can request to create resources listed in Table N.5.3.X.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.X.1.1-1: Resources for Create Transaction – User Agent

|  |  |
| --- | --- |
| Resource | Comments |
|  | See Resources path in table X.1.1-1 in PS3.18 |
| *modality-performed-procedure-steps* |  |

The Create Transaction user agent supports Header Fields listed in Table N.5.3.X.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.X.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.X.1.2 Origin Server

The Create Transaction origin server receives PUT 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.X.

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

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

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 |
| *modality-performed-procedure-steps* |  |

The Create Transaction origin server supports Header Fields listed in Table N.5.3.X.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.X.1.2-2: Header Fields for Create 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.X.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.X.2.1 User Agent

The Update Transaction user agent can request to update resources listed in Table N.5.3.X.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.X.2.1-1: Resources for Update Transaction – User Agent

|  |  |
| --- | --- |
| Resource | Comments |
|  | See Resources path in table X.1.1-1 in PS3.18 |
| *modality-performed-procedure-steps* |  |

The Update Transaction user agent supports Header Fields listed in Table N.5.3.X.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.X.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.X.2.2 Origin Server

The Update Transaction origin server receives PATCH 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.X.

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

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

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 |
| *modality-performed-procedure-steps* |  |

The Update Transaction origin server supports Header Fields listed in Table N.5.3.X.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.X.2.2-2: Header Fields for Update 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.X.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.X.3.1 User Agent

The Retrieve Transaction user agent can request to retrieve resources listed in Table N.5.3.X.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.X.3.1-1: Resources for Retrieve Transaction – User Agent

|  |  |
| --- | --- |
| Resource | Comments |
|  | See Resources path in table X.1.1-1 in PS3.18 |
| *modality-performed-procedure-steps* |  |

The Retrieve Transaction user agent supports Header Fields listed in Table N.5.3.X.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.X.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.X.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.X.

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

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

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 |
| *modality-performed-procedure-steps* |  |

The Retrieve Transaction origin server supports Header Fields listed in Table N.5.3.X.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.X.3.2-2: Header Fields for Retrieve 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.X.4 Subscribe Transaction – Modality Performed Procedure Step Service

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

###### N.5.3.X.4.1 User Agent

The Subscribe Transaction user agent can request resources listed in Table N.5.3.X.4.1-1.

[List the supported resources for your Modality Performed Procedure Step Subscribe 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.X.4.1-1: Resources for Subscribe Transaction – User Agent

|  |  |
| --- | --- |
| Resource | Comments |
|  | See Resources path in table X.1.1-1 in PS3.18 |
| *modality-performed-procedure-steps* |  |

The Subscribe Transaction user agent supports Header Fields listed in Table N.5.3.X.4.1-2.

[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.X.4.1-2: Header Fields for Subscribe 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.X.4.2 Origin Server

The Subscribe Transaction origin server receives POST requests to subscribe to changes of 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.X.

The Subscribe Transaction origin server supports resources listed in Table N.5.3.X.4.2-1.

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

Table N.5.3.X.4.2-1: Resources for Subscribe Transaction – Origin Server

|  |  |
| --- | --- |
| Resource | Comments |
|  | See Resources path in Table X.1.1-1 in PS3.18 |
| *modality-performed-procedure-steps* |  |

The Subscribe Transaction origin server supports Header Fields listed in Table N.5.3.X.4.2-2.

[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.X.4.2-2: Header Fields for Retrieve 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.X.5 Unsubscribe Transaction – Modality Performed Procedure Step Service

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

###### N.5.3.X.5.1 User Agent

The Unsubscribe Transaction user agent can request resources listed in Table N.5.3.X.5.1-1.

[List the supported resources for your Modality Performed Procedure Step Unsubscribe 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.X.5.1-1: Resources for Unsubscribe Transaction – User Agent

|  |  |
| --- | --- |
| Resource | Comments |
|  | See Resources path in table X.1.1-1 in PS3.18 |
| *modality-performed-procedure-steps* |  |

The Unsubscribe Transaction user agent supports Header Fields listed in Table N.5.3.X.5.1-2.

[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.X.5.1-2: Header Fields for Unsubscribe 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.X.5.2 Origin Server

The Unsubscribe Transaction origin server receives DELETE requests to unsubscribe from changes of 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.X.

The Unsubscribe Transaction origin server supports resources listed in Table N.5.3.X.5.2-1.

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

Table N.5.3.X.5.2-1: Resources for Subscribe Transaction – Origin Server

|  |  |
| --- | --- |
| Resource | Comments |
|  | See Resources path in Table X.1.1-1 in PS3.18 |
| *modality-performed-procedure-steps* |  |

The Unsubscribe Transaction origin server supports Header Fields listed in Table N.5.3.X.5.2-2.

[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.X.5.2-2: Header Fields for Retrieve 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]* |

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

## N.7 Network and Media Communication Details

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### N.7.3 Status Codes

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#### N.7.3.3 DICOM Web Services

…

##### N.7.3.3.Y Modality Worklist Service

###### N.7.3.3.Y.1 Search Transaction as Origin Server

Table N.7.3.3.Y.1-1 lists the Status Codes that an origin server supports for the Search Transaction of the Modality Workflow 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.Y.1-1: Status Codes of Origin Server for Search Transaction

| **Status** | **Code** | **Condition** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section Y when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *503 (Service Unavailable)* |  |

###### N.7.3.3.Y.2 Search Transaction as User Agent

Table N.7.3.3.Y.2-1 lists the Status Codes that a user agent supports for the Search Transaction of the Modality Workflow 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.Y.2-1: Status Codes of User Agent for Search Transaction

| **Status** | **Code** | **Behavior** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section Y when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *\** | *Any other code* |  |

##### N.7.3.3.X Modality Performed Procedure Step Service

###### N.7.3.3.X.1 Create Transaction as Origin Server

Table N.7.3.3.X.1-1 lists the Status Codes that an origin server supports for the Create Transaction of the Modality Workflow 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.X.1-1: Status Codes of Origin Server for Create Transaction

| **Status** | **Code** | **Condition** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *503 (Service Unavailable)* |  |

###### N.7.3.3.X.2 Create Transaction as User Agent

Table N.7.3.3.X.2-1 lists the Status Codes that a user agent supports for the Create Transaction of the Modality Workflow 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.X.2-1: Status Codes of User Agent for Create Transaction

| **Status** | **Code** | **Behavior** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *\** | *Any other code* |  |

###### N.7.3.3.X.3 Update Transaction as Origin Server

Table N.7.3.3.X.3-1 lists the Status Codes that an origin server supports for the Update Transaction of the Modality Workflow 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.X.3-1: Status Codes of Origin Server for Update Transaction

| **Status** | **Code** | **Condition** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *503 (Service Unavailable)* |  |

###### N.7.3.3.X.4 Update Transaction as User Agent

Table N.7.3.3.X.4-1 lists the Status Codes that a user agent supports for the Update Transaction of the Modality Workflow 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.X.4-1: Status Codes of User Agent for Update Transaction

| **Status** | **Code** | **Behavior** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *\** | *Any other code* |  |

###### N.7.3.3.X.5 Retrieve Transaction as Origin Server

Table N.7.3.3.X.5-1 lists the Status Codes that an origin server supports for the Retrieve Transaction of the Modality Workflow 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.X.5-1: Status Codes of Origin Server for Retrieve Transaction

| **Status** | **Code** | **Condition** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *503 (Service Unavailable)* |  |

###### N.7.3.3.X.6 Retrieve Transaction as User Agent

Table N.7.3.3.X.6-1 lists the Status Codes that a user agent supports for the Retrieve Transaction of the Modality Workflow 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.X.6-1: Status Codes of User Agent for Retrieve Transaction

| **Status** | **Code** | **Behavior** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *\** | *Any other code* |  |

###### N.7.3.3.X.7 Subscribe Transaction as Origin Server

Table N.7.3.3.X.7-1 lists the Status Codes that an origin server supports for the Subscribe Transaction of the Modality Workflow 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 Subscribe Transaction response as origin server.]

Table N.7.3.3.X.7-1: Status Codes of Origin Server for Subscribe Transaction

| **Status** | **Code** | **Condition** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *503 (Service Unavailable)* |  |

###### N.7.3.3.X.8 Subscribe Transaction as User Agent

Table N.7.3.3.X.8-1 lists the Status Codes that a user agent supports for the Subscribe Transaction of the Modality Workflow 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 Subscribe Transaction response]

Table N.7.3.3.X.8-1: Status Codes of User Agent for Subscribe Transaction

| **Status** | **Code** | **Behavior** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *\** | *Any other code* |  |

###### N.7.3.3.X.9 Unsubscribe Transaction as Origin Server

Table N.7.3.3.X.9-1 lists the Status Codes that an origin server supports for the Unsubscribe Transaction of the Modality Workflow 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 Unsubscribe Transaction response as origin server.]

Table N.7.3.3.X.9-1: Status Codes of Origin Server for Unsubscribe Transaction

| **Status** | **Code** | **Condition** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *503 (Service Unavailable)* |  |

###### N.7.3.3.X.10 Unsubscribe Transaction as User Agent

Table N.7.3.3.X.10-1 lists the Status Codes that a user agent supports for the Unsubscribe Transaction of the Modality Workflow 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 Unsubscribe Transaction response]

Table N.7.3.3.X.10-1: Status Codes of User Agent for Unsubscribe Transaction

| **Status** | **Code** | **Behavior** |
| --- | --- | --- |
| *Success* | *200 (OK)* | *Copy table from Section X when reviewed* |
| *202 (Accepted)* |  |
| *Failure* | *400 (Bad Request)* |  |
| *409 (Conflict)* |  |
| *\** | *Any other code* |  |

**Changes to NEMA Standards Publications PS 3.4**

Update section F.9 with a note of how an SCP knows what SCUs to notify about changes

**F.9**

…

Note

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1. The terms IS and PACS used in the previous example are provided for clarification purposes only. This document does not define nor constrain the purpose or role of any IS, PACS or acquisition Application Entity conforming to this Service Class Specification.
2. **It is beyond the scope of the specification to define how the SCP knows about what SCUs to notify about changes. A conceivable way would be to make this a configuration item of the SCP.**

…

**Changes to NEMA Standards Publications PS 3.6**

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

**Changes to NEMA Standards Publications PS 3.15**

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