

Digital Imaging and Communications in Medicine (DICOM)

Supplement 248: DICOMweb Send

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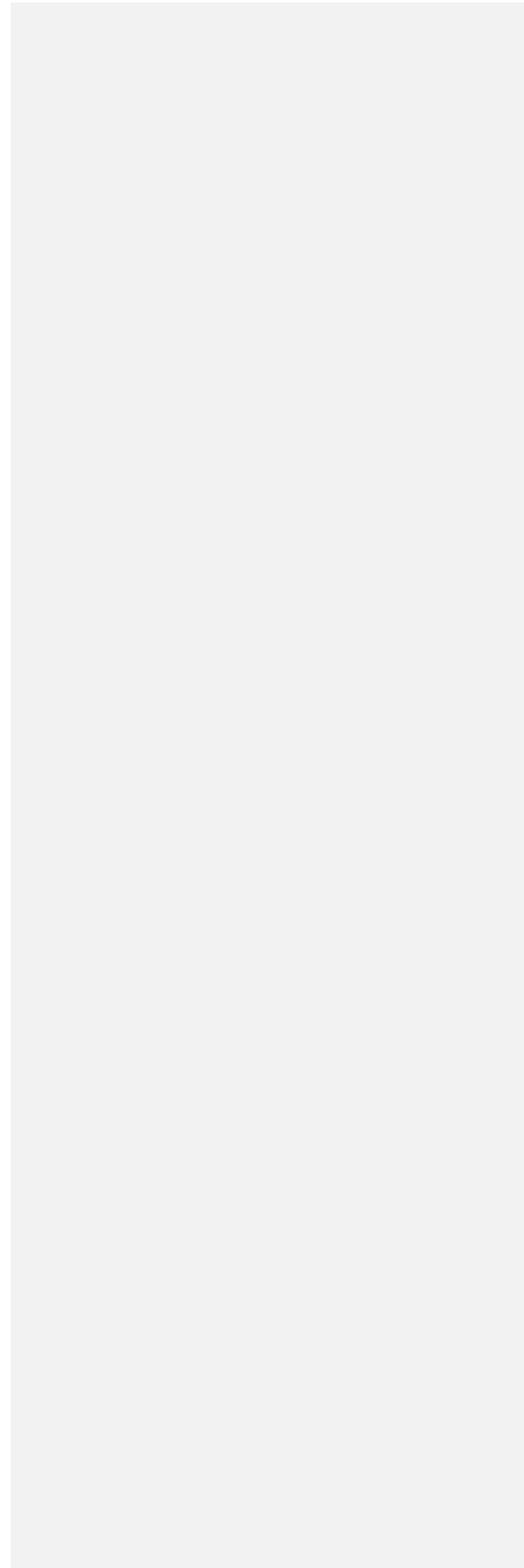
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1

Document History

2025.06	Version 00	JM	Initial version with proposed approach, document structure and content.
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2

Open Issues

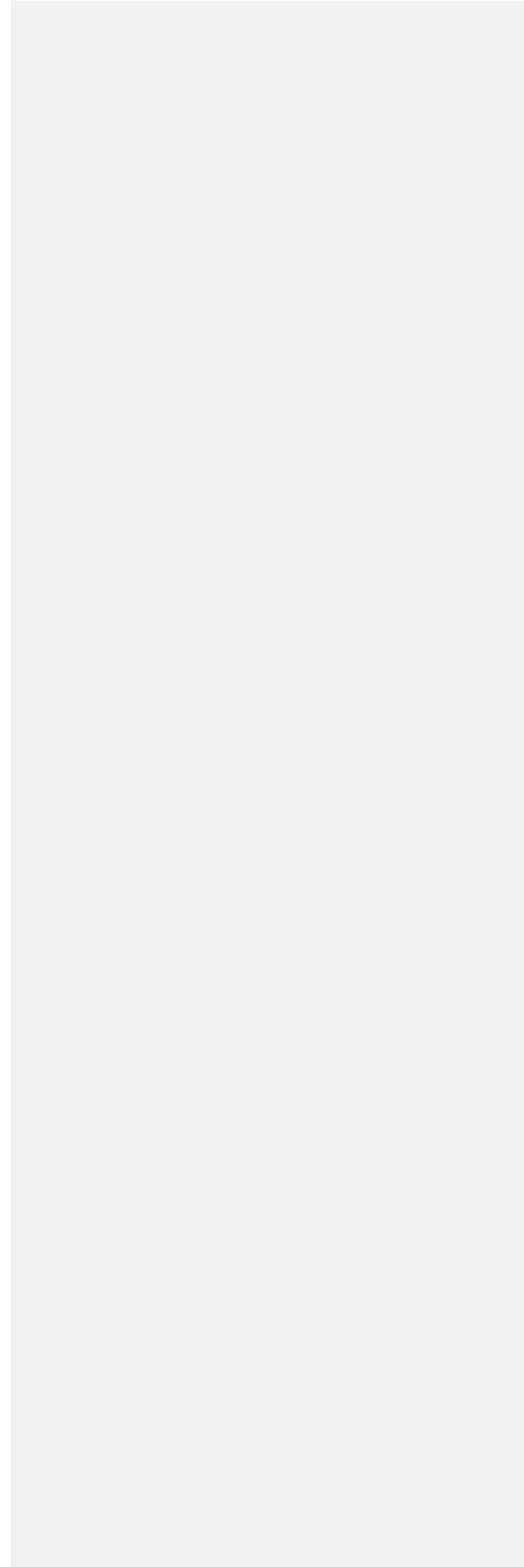
	Are there any third party HTTP push use cases, so beyond imaging, that we potentially could learn from how these are addressed?
	Name of the transactions and supplement
	The Forward is mixture between Search and Storage Commitment leads to requests being resources in the Studies and NPI services, which are otherwise about data resources. Is there another pattern that can be used?

3

Closed Issues

4

5



6

Scope and Field of Application

7 This supplement defines the means to perform forward transactions in DICOMweb. Forward transactions
8 enable a user agent to request an origin server to forward Instances and non-patient information to
9 another server. They are an extension to the existing DICOMweb services, providing RESTful interfaces
10 to the C-MOVE operations that are already available in DIMSE. The forward transactions have been
11 designed with the intention of facilitating proxies from/to DIMSE.

12

Kommentiert [JM1]: Remodel text to what we did with
Modality Procedure Step Service

Changes to NEMA Standards Publications PS 3.18

Update first part of section 10 Studies Service and Resources as indicated below

10 Studies Service and Resources

10.1 Overview

The Studies Resource enables a user agent to store, retrieve, update, and search an origin server for DICOM Studies, Series, and Instances, along with their /metadata, /rendered, and /thumbnail variants; as well as Frames and Bulkdata. **It also enables a user agent to request a server to forward DICOM Studies, Series, and Instances to another server.**

The Retrieve transaction of this Service is also known as WADO-RS. The Store transaction of this Service is also known as STOW-RS. The Search transaction of this Service is also known as QIDO-RS. See Section 10.3.

Kommentiert [JM2]: Should we introduce SEND-RS or so for this?

10.1.1 Resource Descriptions

The Studies Service manages a collection of DICOM Study resources. Each Study is organized in a hierarchy of sub-resources that correspond to the DICOM Information Model. See Section 7 "DICOM Model of the Real World" in PS3.3.

There are three top level resources:

/studies references all Studies managed by the service.

/series references all Series managed by the service.

/instances references all Instances managed by the service.

The following URI Template variables are used in resource definitions in this Section.

{study} the Study Instance UID of a Study managed by the Studies Service.

{series} the Series Instance UID of a Series contained within a Study resource.

{instance} the SOP Instance UID of an Instance contained within a Series resource.

{frames} a comma-separated list of frame numbers, in ascending order, contained within an Instance.

{bulkdataURI} an opaque URI that references a Bulkdata Value.

The Studies Service defines the following resources:

Table 10.1-1. Resources and Descriptions

Resource	Description
Studies Service	The Base URI of the Studies Service.

Resource	Description
All Studies	The All Studies resource references the entire collection of Studies contained in the Studies Service.
Study	The Study resource references a single Study.
Study Metadata	The Study Metadata resource references the Metadata of a Study.
Study Bulkdata	The Study Bulkdata resource references the Bulkdata of a Study.
Study Pixel Data	The Study Pixel Data resource references the Pixel Data of a Study.
Rendered Study	The Rendered Study resource references an alternate Media Type rendering of a Study.
Rendered MPR Volume Study	The Rendered MPR Volume Study resource references a multiplanar reformat rendering of a Study.
Rendered 3D Volume Study	The Rendered 3D Volume Study resource references a volume rendering of a Study.
Study Thumbnail	The Study Thumbnail resource references a thumbnail image of a Study.
Study's Series	The Study's Series resource references the collection of all Series contained in a Study.
Study's Instances	The Study's Instances resource references the collection of all Instances in a single Study.
<u>Study's Forward Requests</u>	<u>The Study Forward Requests resource references the collection of forward requests associated with a single study.</u>
All Series	The All Series resource references the collection of all Series in all Studies contained in the Studies Service.
Series	The Series resource references a single Series.
Series Metadata	The Series Metadata resource contains the Metadata of a Series in a Study.
Series Bulkdata	The Series Bulkdata resource references the Bulkdata of a Series.
Series Pixel Data	The Series Pixel Data resource references the Pixel Data of a Series.
Rendered Series	The Rendered Series resource references an alternate Media Type rendering of a Series.
Rendered MPR Volume Series	The Rendered MPR Volume Series resource references a multiplanar reformat rendering of a Series.
Rendered 3D Volume Series	The Rendered 3D Volume Series resource references a volume rendering of a Series.
Series Thumbnail	The Series Thumbnail resource references a thumbnail image of a Series.
Series' Instances	The Series' Instances resource references the collection of all Instances in a single Series.
<u>Series' Forward Requests</u>	<u>The Series' Forward Requests resource references the collection of forward requests associated with a single Series.</u>

Resource	Description
All Instances	The All Instances resource references the collection of all Instances in all Series in all Studies contained in the Studies Service.
Instance	The Instance resource references a single Instance.
Instance Metadata	The Instance Metadata resource contains the Metadata of an Instance.
Instance Bulkdata	The Instance Bulkdata resource references the Bulkdata of a Instance.
Instance Pixel Data	The Instance Pixel Data resource references the Pixel Data of a Instance.
Rendered Instance	The Rendered Instance resource references an alternate Media Type rendering of an Instance.
Rendered MPR Volume Instance	The Rendered MPR Volume Instance resource references a multiplanar reformat rendering of an Instance.
Rendered 3D Volume Instance	The Rendered 3D Volume Instance resource references a volume rendering of an Instance.
Instance Thumbnail	The Instance Thumbnail resource references a thumbnail image of an Instance.
Instance's Forward Requests	The Instance's Forward Requests resource references the collection of forward requests associated with a single Instance.
Frames	The Frames resource references an ordered collection of frames in a single multi-frame Instance.
Rendered Frames	The Rendered Frames resource references an alternate Media Type rendering of an ordered collection of frames of a single multi-frame Instance.
Rendered MPR Volume Frames	The Rendered MPR Volume Frames resource references a multiplanar reformat rendering of a collection of frames.
Rendered 3D Volume Frames	The Rendered 3D Volume Frames resource references a volume rendering of a collection of frames.
Frame Thumbnail	The Frame Thumbnail resource references a thumbnail image for frames within an Instance.
Bulkdata	The Bulkdata resource contains a Bulkdata Value.

Kommentiert [JM3]: We cannot do a frame forward. Have to put a note somewhere that this is not possible.

42

43 **10.1.2 Common Query Parameters**

44 ...

45 **10.1.3 Common Media Types**

46 ...

47 **10.2 Conformance**

48 An origin server claiming conformance to one or more of the ~~Retrieve~~ Transactions of the Studies Service:

- 49 • shall support the Retrieve Capabilities Transaction (see Section 8.9.1);
- 50 • shall support these ~~Retrieve~~ Transactions for all their respective mandatory resources in Table 10.3-2.

Kommentiert [JM4]: Rewrote a bit, as adding more and more transactions here makes it bulky and not easy to read.

51 ~~An origin server claiming conformance to the Store Transaction of the Studies Service:~~

- 52 ~~• shall support the Retrieve Capabilities Transaction (see Section 8.9.1);~~
- 53 ~~• shall support the Store Transaction for all mandatory resources in Table 10.3-2.~~

54 ~~An origin server claiming conformance to the Search Transaction of the Studies Service:~~

- 55 ~~• shall support the Retrieve Capabilities Transaction (see Section 8.9.1);~~
- 56 ~~• shall support the Search Transaction for all mandatory resources in Table 10.3-2.~~

57 An origin server claiming conformance to the Forward Result Check Transaction shall also support the
58 Forward Transaction.

59 The user agent may support any of the transactions for any of the corresponding resources in Table 10.3-2.

Kommentiert [JM5]: Either none or both transactions.

60 **10.3 Transactions Overview**

61 The Studies Service consists of the transactions listed in Table 10.3-1.

62 **Table 10.3-1. Studies Service Transactions**

63

Transaction Name	Method	Payload		Description
		Request	Success Response	
Retrieve	GET	N/A	Instance(s), Metadata, Renderings, Pixel Data, or Bulkdata	Retrieve one or more representations of DICOM Resources.
Store	POST	Instance(s)	Store Instances Response Module	Stores one or more representations of DICOM Resources, contained in the request payload, in the location referenced by the Target Resource.
Search	GET	N/A	Result(s)	Searches the Target Resource for DICOM objects that match the search parameters and returns a list of matches in an Acceptable Media Type.
<u>Forward</u>	<u>POST</u>	<u>N/A</u>	<u>Forward Request Response Module</u>	<u>Searches the Target Resource for DICOM objects that match the search parameters and forwards or starts to forward these to another server.</u>
<u>Forward Result Check</u>	<u>GET</u>	<u>N/A</u>	<u>Forward Request Response Module</u>	<u>Gets the status and results of a Forward transaction.</u>

Kommentiert [JM6]: Consider starting with a verb e.g. check send result.

64 In Table 10.3-2, the Target Resources permitted for each transaction are marked with M if support is
65 mandatory for the origin server and O if it is optional. A blank cell indicates that the resource is not allowed
66 in the transaction.

67 **Table 10.3-2. Resources by Transaction**

Resource	Retrieve	Store	Search	<u>Forward</u>	<u>Forward Result Check</u>
Studies Service					
All Studies		M	M		

Resource	Retrieve	Store	Search	Forward	Forward Result Check
Study	M	M			
Study Metadata	M				
Study Bulkdata	O				
Study Pixel Data	O				
Rendered Study	M				
Rendered MPR Volume Study	O				
Rendered 3D Volume Study	O				
Study Thumbnail	O				
Study's Series			M		
Study's Instances			M		
<u>Study's Forward Requests</u>				<u>M</u>	<u>M</u>
All Series			M		
Series	M				
Series Metadata	M				
Series Bulkdata	O				
Series Pixel Data	O				
Series' Instances			M		
<u>Series' Forward Requests</u>				<u>M</u>	<u>M</u>
Rendered Series	M				
Rendered MPR Volume Series	O				
Rendered 3D Volume Series	O				
Series Thumbnail	O				
All Instances			M		
Instance	M				
Instance Metadata	M				
Instance Bulkdata	O				

Resource	Retrieve	Store	Search	Forward	Forward Result Check
Instance Pixel Data	O				
Rendered Instance	M				
Rendered MPR Volume Instance	O				
Rendered 3D Volume Instance	O				
Instance Thumbnail	O				
<u>Instance's Forward Requests</u>				<u>M</u>	<u>M</u>
Frames	M				
Rendered Frames	M				
Rendered MPR Volume Frames	O				
Rendered 3D Volume Frames	O				
Frame Thumbnail	O				
Bulkdata	M	M			

68

69 ...

70

Add new section 10.X Forward Transaction, immediately before new Section 10.Y given below

10.X Forward Transaction

This Transaction uses the POST method to initiate Forwarding Studies, Series, and Instances managed by the origin server to an other server. Together with the Forward Result Check Transaction, Section 10.Y, this Transaction corresponds to the DIMSE C-MOVE Operation (see PS3.4, Section C.4.2).

Note The user agent could be the other server of this transaction.

The origin server may choose to divide forwarding Instances into the use of these two Transactions, due to the typically long-running nature of this activity. These transactions are: 1) requesting the forward, and—when the origin server is unable to provide the complete result immediately—2) checking for the result, like the method described in Section 13 Storage Commitment.

Also at the discretion of the origin server is the method of performing the store sub-operations that are necessary to fulfil the forward request: these can be executed using DIMSE or DICOMweb, or even a combination of the two, also depending on the capabilities of the destination.

10.X.1 Request

The request shall have the following syntax:

```
POST SP "/" {resource} "/forward-requests/" {transactionUID} "?" destination {&search*} SP version CRLF
Accept: 1#media-type
*(header-field CRLF)
CRLF
```

where

destination = "destination" "=" {aetitle}

10.X.1.1 Target Resources

The Target Resource Path component of the Target URI specifies the collection of resources that is **the target of the forward**.

An origin server that is a native implementation shall support all Mandatory (M) resources specified in the Native column in Table 10.X.1-1.

An origin server that is a DIMSE Proxy implementation shall support all Mandatory (M) resources specified in the Proxy column in Table 10.X.1-1.

Table 10.X.1-1. Forward Transaction Resources

Resource	URI Template	Native	Proxy	Query Type
All Study Forward Requests	/studies/forward-requests/{transactionUID}?destination={aetitle}&search*	M	M	hierarchical
Study's Series Forward Requests	/studies/{study}/series/forward-requests/{transactionUID}?destination={aetitle}&search*	M	M	hierarchical
Study's Instances Forward Requests	/studies/{study}/instances/forward-requests/{transactionUID}?destination={aetitle}&search*	M	O	relational

Kommentiert [JM7]: Need to finesse the wording: this post is not about the comm between the origin server and another server, but it is about requesting.

Kommentiert [JM8]: Is about the comm of the status and outcome of the forward request. So rephrase it like that.

Resource	URI Template	Native	Proxy	Query Type
All Series Forward Requests	/series/forward-requests/{transactionUID}?destination={aetitle}&search*	M	O	relational
Study Series' Instances Forward Requests	/studies/{study}/series/{series}/instances/forward-requests/{transactionUID}?destination={aetitle}&search*	M	M	hierarchical
All Instances Forward Requests	/instances/forward-requests/{transactionUID}?destination&search*	M	O	relational

100

101 For more information about Hierarchical Queries see Section C.4.1.3.1.1 "Hierarchical Search Method" in
102 PS3.4. For more information about Relational Queries see Section C.4.1.2.2.1 "Relational-Queries" in
103 PS3.4 and Section C.4.1.3.2.1 "Relational-Queries" in PS3.4.

104 Table 10.X.1-2 shows the resources supported by the Forward transaction along with a description of the
105 search performed and the results returned.

106

Table 10.X.1-2. Forward Resource Descriptions

Resource	Description
All Studies' Forward Requests	Searches the entire service for Studies that match the search parameters, and forwards these to the requested destination.
Study's Series' Forward Requests	Searches for all Series in the specified Study that match the search parameters, and forwards or starts to forward these to another server.
Study's Instances' Forward Requests	Searches for all Instances in the specified Study that match the search parameters, and forwards or starts to forward these to another server.
All Series' Forward Requests	Searches the entire service for Series that match the search parameters, and forwards or starts to forward these to another server.
Study Series' Instances' Forward Requests	Searches for all Instances in the specified Study and Series that match the search parameters, and forwards or starts to forward these to another server.
All Instances' Forward Requests	Searches the entire service for Instances that match the search parameters, and forwards or starts to forward these to another server.

Kommentiert [JM9]: Copy changes into next 5 entries.

107

108 10.X.1.2 Query Parameters

109 The origin server shall support Query Parameters as required in Table 8.3.4-1; however, the includefield
110 parameter is prohibited.

111 The user agent shall supply Query Parameters as required in Table 8.3.4-1; however, the includefield
112 parameter is prohibited.

113 The following sections further define details on the parameters of the search aspect of this transaction:

- 114 • Section 10.6.1.2.1 Attribute/Value Pair Requirements.

- 115 • Section 10.6.1.2.2 Search Key Types and Requirements.
- 116 • Section 10.6.1.2.3 Required Matching Attributes.
- 117 • Section 10.6.1.2.4 Optional Repository Query Attributes.

118 **10.X.1.3 Request Header Fields**

119 The origin server shall support request header fields as required in Table 10.X.1-3.

120 The user agent shall supply request header fields as required in Table 10.X.1-3.

121 Table 10.X.1-3. Request Header Fields

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

122

123 See also Section 8.4.

124 **10.X.1.4 Request Payload**

125 The request shall have no payload.

126 **10.X.2 Behavior**

127 The origin server shall perform a search according to the requirements specified in Section 8.3.4 and forwards the Instances found to the specified server.

128 [Elaborate on starting/initiating, taking time, ... Also describe completing immediately, or later.]

130 **10.X.3 Response**

131 The response shall have the following syntax:

```

132 version SP status-code SP reason-phrase CRLF
133 Content-Type: media-type CRLF
134 [retry-after CRLF]
135 *(header-field CRLF)
136 CRLF
137 payload

```

138 **10.X.3.1 Status Codes**

139 Table 10.X.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5 for additional status codes.

141

Table 10.X.3-1. Status Code Meaning

Status	Code	Meaning
Success	200 (OK)	The origin server finished processing the forward request; the payload describes in detail what has been achieved.
	202 (Accepted)	The origin server has not finished processing the forward request; the payload describes in detail what has been achieved until now. The user agent is expected to follow-up with a Forward Check transaction, described in Section 10.Y, to get to know the full result of the forward request.

Failure	400 (Bad Request)	The origin server cannot handle the search request because of errors in the request headers or parameters.
	409 (Conflict)	The origin server cannot handle the forward request because the provided transaction UID is already is use.
	503 (Service Unavailable)	The origin server cannot handle the forward request; this may be a temporary or permanent state.

142

143 **10.X.3.2 Response Header Fields**

144 The origin server shall support header fields as required in Table 10.X.3-2.

145

Table 10.X.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.
Retry-After	uint	O	The number of seconds the user agent is requested to wait until starting a forward result check transaction.

146

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

149 **10.X.3.3 Response Payload**

150 A success response shall contain a Forward Request Response Module. See Annex @.

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

Add new section 10.Y Forward Result Check Transaction, immediately after section 10.X as above

10.Y Forward Result Check Transaction

This transaction uses the GET method to allow a user agent to request an origin server to provide the (intermediate) result of an earlier Forward Transaction, see Section 10.X. Together with that Forward Transaction, this Transaction corresponds to the DIMSE C-MOVE Operation (see PS3.4, Section C.4.2).

Note The user agent uses this transaction when the origin server has responded with status code 202 (Accepted) to either a Forward or a Forward Result Check transaction.

10.Y.1 Request

The request shall have the following syntax:

```
GET SP "/" {/resource} "/forward-requests/{transactionUID}" SP version CRLF
Accept: 1#media-type CRLF
*(header-field CRLF)
CRLF
```

10.Y.1.1 Target Resource

The Target Resource of this transaction is an individual forward request identified by its transaction UID. See section 10.X.1.1 for the applicable resources, where for the Forward Result Check transaction the URI templates do not have the endpoint and search parameters.

10.Y.1.2 Query Parameters

The request has no Query Parameters.

10.Y.1.3 Request Header Fields

The origin server shall support Request Header Fields as required in Table 10.Y.1-1.

The user agent shall supply Request Header Fields as required in Table 10.Y.1-1.

Note The presence and values of the forward result check Header Fields should be the same as those of the forward Request Header Fields.

Table 10.Y.1-1. Forward Result Check 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.

10.Y.1.4 Request Payload

The request shall have no payload.

10.Y.2 Behavior

The origin server provides the latest results of the forward request in an Acceptable Media Type (see section 8.7.4).

188 **10.Y.3 Response**

189 The response shall have the following syntax:

```
190 version SP status-code SP reason-phrase CRLF
191 Content-Type: media-type CRLF
192 [retry-after CRLF]
193 *(header-field CRLF)
194 CRLF
195 [Payload]
```

196 **10.Y.3.1 Status Codes**

197 Table 10.Y.3-1 shows some common status codes corresponding to this transaction. See also Section
198 8.5 for additional status codes.

199 **Table 10.Y.3-1. Status Code Meaning**

Status	Code	Meaning
Success	200 (OK)	The origin server finished processing the forward request; the payload describes in detail what has been achieved.
	202 (Accepted)	The origin server has not finished processing the forward request; the payload describes in detail what has been achieved until now. The user agent is expected to follow-up with a Forward Check transaction to get to know the entire result of the forward request.
Failure	404 (Not Found)	The origin server cannot find the forward request result identified by the supplied Transaction UID.
	410 (Gone)	The origin server can no longer provide the forward request result identified by the supplied Transaction UID.
	503 (Service Unavailable)	The origin server cannot handle the Forward Result Check request; this may be a temporary or permanent state.

200 Note

- 201 1. The 404 (Not Found) status code may be caused by an incorrect Transaction UID that has been
202 supplied by the user agent, or the origin server may have deleted the applicable result.
- 203 2. The 410 (Gone) status code may be caused by the origin server deleting the applicable result, but still
204 having a record of the Transaction UID.
- 205 3. When the 503 (Service Unavailable) status code is returned, the user agent might retry later with
206 another Forward Result Check transaction.

207 **10.Y.3.2 Response Header Fields**

208 See Section 10.X.3.2.

209 **10.Y.3.3 Response Payload**

210 See Section 10.X.3.3.

211

Update first part of section 12 Non-Patient Instance Service and Resources as indicated below

12 Non-Patient Instance Service and Resources

12.1 Overview

The Non-Patient Instance (NPI) Storage Service enables a user agent to retrieve, store, and search an origin server for Instances that are not related to an individual patient. **It also enables a user agent to forward these kind of Instances to another server.**

Note

1. Non-Patient Instances adhere to a Composite Instance IOD Information Model that does not have at its root the Patient Information Entity representing an individual Patient.
2. "Non-patient" does not imply that there is no patient-related identifiable information in the Instances. E.g., the Inventory IOD does include Attributes of the patient, but it does not have a Patient IE at the root of its information model.

An NPI Storage Service manages a collection of resources belonging to the categories specified in Table 12.1.1-1.

All NPI Storage Service origin servers shall support the Retrieve Capabilities, Retrieve, and Search transactions. Support for the Store transaction is optional. All NPI Storage Service user agents support one or more of the Retrieve Capabilities, Retrieve, Store, or Search transactions.

12.1.1 Resource Descriptions

An NPI Service manages resources from the same NPI Category. Target URIs have the following templates:

```
/{npi-name}
/{npi-name}/{uid}
/{npi-name}/forward-request?{transaction-uid}
```

Where

```
npi-name = "color-palettes"
          / "defined-procedure-protocols"
          / "hanging-protocols"
          / "implant-templates"
          / "inventories"
uid       ; is the Unique Identifier of an NPI Instance
```

Table 12.1.1-1 contains the templates for the NPI Resource Categories.

Table 12.1.1-1. Resource Categories, URI Templates and Descriptions

Resource Category	URI Template and Description	Corresponding IOD	Storage Class	Information Model
Color Palette	/color-palettes/{uid}	Section A.58 "Color Palette IOD" in PS3.3	Section GG "Non-Patient Object Storage Service Class" in PS3.4	Section X.1.3 "Query/Retrieve Information Model" in PS3.4

Resource Category	URI Template and Description	Corresponding IOD	Storage Class	Information Model
Defined Procedure Protocol	/defined-procedure-protocols{/uid}	Section A.82 "Procedure Protocol IODs" in PS3.3	Section GG "Non-Patient Object Storage Service Class" in PS3.4	Section HH.1.3 "Query/Retrieve Information Model" in PS3.4
Hanging Protocol	/hanging-protocols{/uid}	Section A.44 "Hanging Protocol IOD" in PS3.3	Section GG "Non-Patient Object Storage Service Class" in PS3.4	Section U.1.3 "Query/Retrieve Information Model" in PS3.4
Implant Template	/implant-templates{/uid}	Section A.61 "Generic Implant Template IOD" in PS3.3	Section GG "Non-Patient Object Storage Service Class" in PS3.4	Section BB.1.3 "Query/Retrieve Information Model" in PS3.4
Inventory	/inventories{/uid}	Section A.88 "Inventory IOD" in PS3.3	Section GG "Non-Patient Object Storage Service Class" in PS3.4	Section JJ.2 "Inventory Q/R Information Model" in PS3.4

248 The NPI SOP Classes are listed in Table GG.3-1 "Standard SOP Classes" in PS3.4.

249 **12.1.2 Common Query Parameters**

250 ...

251 **12.1.3 Common Media Types**

252 ...

253 **12.2 Conformance**

254 An origin server conforming to the NPI Service shall implement the Retrieve Capabilities Transaction (see
255 Section 8.9.1).

256 The origin server shall support the transactions listed as Required in Table 12.2-1.

257 **Table 12.2-1. Required and Optional Transactions**

Transaction	Support	Section
Retrieve Capabilities	Required	Section 8.9
Retrieve	Required	Section 12.4
Store	Optional	Section 12.5
Search	Required	Section 12.6
Forward	Optional	Section 12.X
Forward Result Check	Optional	Section 12.Y

258 **An origin server supporting the Forward Result Check Transaction must also support the Forward Transaction.**

259 Implementations shall specify in their Conformance Statement (see PS3.2) and the Retrieve Capabilities Transaction
260 (see Section 8.9 and Annex H):

- 261 • The implementations role: origin server, user agent, or both.
- 262 • The supported resources (IODs) for each role.

263 In addition, for each supported transaction they shall specify:

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

267 **12.3 Transactions Overview**

268 The NPI Service consists of the transactions listed in Table 12.3-1.

269 **Table 12.3-1. NPI Service Transactions**

Transaction	Method	Resource	Payload		Description
			Request	Success Response	
Retrieve Capabilities	OPTIONS	/	N/A	Capabilities Description	Retrieves a description of the capabilities of the NPI Service, including transactions, resources, query parameters, etc.
Retrieve	GET	/{npi-name}/{uid}	N/A	Instance and/or Status Report	Retrieves an Instance, specified by the Target Resource in an Acceptable DICOM Media Type.
Store	POST	/{npi-name}/{uid}	Instance(s)	Status Report	Stores one or more DICOM Instances contained in the request payload, in the location referenced by the Target URL.
Search	GET	/{npi-name} ?{params*}	N/A	Result(s) and/or Status Report	Searches the Target Resource for Instances that match the search parameters and returns a list of matches in an Acceptable DICOM Media Type.
<u>Forward</u>	<u>POST</u>	<u>/{npi-name}/forward-request?{transaction-uid}</u>	<u>N/A</u>	<u>Forward Request Response Module</u>	<u>Searches the Target Resource for Instances that match the search parameters and forwards or starts to forward these to another server.</u>
<u>Forward Result Check</u>	<u>GET</u>	<u>/{npi-name}/forward-request?{transaction-uid}</u>	<u>N/A</u>	<u>Forward Request Response Module</u>	<u>Gets the result of a Forward transaction.</u>

270 The npi-name specifies the type of resource(s) contained in the payload.

271 Table 12.3-2 summarizes the Target Resources permitted for each transaction.

272

Table 12.3-2. Resources by Transaction

Resource	URI	Retrieve	Store	Search	Forward	Forward Result Check	Capabilities
NPI Service	/						X
All Instances	/{npi-name}		X	X			
Instance	/{npi-name}/{uid}	X	X				
<u>Forward Request</u>	<u>/{npi-name}/forward-request?{transaction-uid}</u>				<u>X</u>	<u>X</u>	

273

274 ...

Add new section 12.X Forward Transaction, immediately before new Section 12.Y below

12.X Forward Transaction

This Transaction uses the POST method to Forward Non-Patient Instances managed by the origin server to another server. Together with the Forward Result Check Transaction, Section 12.Y, this Transaction corresponds to the DIMSE C-MOVE Operation (see PS3.4, Sections X.4.2, BB.4.2, HH.4.2, II.4.2, and JJ.3.2 for each kind of NPI respectively).

The origin server may choose to divide forwarding Instances into the use of these two Transactions, due to the typically long-running nature of this activity. These transactions are: 1) requesting the forward, and—when the origin server is unable to provide the complete result immediately—2) checking for the result, like the method described in Section 13 Storage Commitment.

Also at the discretion of the origin server is the method of performing the store sub-operations that are necessary to fulfil the forward request: these can be executed using DIMSE or DICOMweb, or even a combination of the two, also depending on the capabilities of the destination.

12.X.1 Request

The request shall have the following syntax:

```
POST SP /{npi-name}/forward-requests?{transactionUID}? destination {&search*} SP version CRLF
Accept: 1#media-type
*(header-field CRLF)
CRLF
```

where

destination = "destination" "=" {aetitle}

12.X.1.1 Target Resources

The Target URI shall reference one of the resources shown in Table 12.X.1-1.

An origin server shall specify all supported npi-names in its Conformance Statement and in its response to the Retrieve Capabilities transaction.

Table 12.X.1-1. Forward Transaction Resources

Resource	URI Template	Description
All Instances	/{npi-name}/forward-requests?{transactionUID}	Searches a collection of NPI Instances and forwards or starts to forward these to another server.

12.X.1.2 Query Parameters

The user agent shall supply, and the origin server shall support, the Common Query Parameters in Section 12.1.2.

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.

For each Resource Category the origin server supports, it shall support the behaviors and matching key Attributes specified in the corresponding sections in Table 12.X.1-2.

Table 12.X.1-2. NPI Resource Forward Attributes

Resource Category	Behaviors and Matching Key Attributes
Color Palette	Section X.6.1.2 "Color Palette Attributes" in PS3.4.
Defined Procedure Protocol	Section HH.6.1.2 "Defined Procedure Protocol Attributes" in PS3.4.
Hanging Protocol	Section U.6.1.2 "Hanging Protocol Attributes" in PS3.4.
Implant Template	Section BB.6.1.2 "Implant Template Attributes" in PS3.4.
Inventory	Section JJ.2.2 "Inventory Q/R Information Model Attributes" in PS3.4.

12.6.1.3 Request Header Fields

Table 12.6.1-3. Request Header Fields

Name	Values	Usage		Description
		User Agent	Origin Server	
Accept	1#-dicom-media-type	M	M	The Acceptable Media Types of the response payload

See also Section 8.4.

12.X.1.4 Request Payload

The request has no payload.

12.X.2 Behavior

The origin server shall perform the search indicated by the request, using the matching behavior specified in Section 8.3.4.1.1 and in the corresponding sections in Table 8.3.4-1. It forwards or starts to forward the resulting instances to the supplied server.

The rules for search results are specified in Section 8.3.4.

12.X.3 Response

The response shall have the following syntax:

```

version SP status-code SP reason-phrase CRLF
Content-Type: media-type CRLF
[retry-after CRLF]
*(header-field CRLF)
CRLF
payload
    
```

12.X.3.1 Status Codes

Table 12.X.3-1 shows some common status codes corresponding to this transaction. See also Section 8.5 for additional status codes.

Table 12.X.3-1. Status Code Meaning

Status	Code	Meaning
Success	200 (OK)	The origin server finished processing the forward request; the payload describes in detail what has been achieved.

	202 (Accepted)	The origin server has not finished processing the forward request; the payload describes in detail what has been achieved until now. The user agent is expected to follow-up with a Forward Check transaction, described in Section 12.Y, to get to know the full result of the forward request.
Failure	400 (Bad Request)	The origin server cannot handle the search request because of errors in the request headers or parameters.
	409 (Conflict)	The origin server cannot handle the forward request because the provided transaction UID is already is use.
	503 (Service Unavailable)	The origin server cannot handle the forward request; this may be a temporary or permanent state.

333

334 **12.X.3.2 Response Header Fields**

335 The origin server shall support header fields as required in Table 12.X.3-2.

336 **Table 12.X.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.
Retry-After	uint	O	The number of seconds the user agent is requested to wait until starting a forward check transaction.

337

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

340 **12.X.3.3 Response Payload**

341 A success response shall contain a Forward Request Response Module. See Annex @.

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

Add new section 12.Y Forward Result Check Transaction, immediately after section 12.X above

12.Y Forward Result Check Transaction

This transaction uses the GET method to allow a user agent to request an origin server to provide the (intermediate) result of an earlier Forward Transaction, see Section 12.X. Together with that Forward Transaction, this Transaction corresponds to the DIMSE C-MOVE Operation (see PS3.4, Sections see PS3.4, Sections X.4.2, BB.4.2, HH.4.2, II.4.2, and JJ.3.2 for each kind of NPI respectively).

Note The user agent uses this transaction when the origin server has responded with status code 202 (Accepted) to either a Forward or a Forward Result Check transaction.

12.Y.1 Request

The request shall have the following syntax:

```
GET SP "/" {/resource} "/forward-requests/{transactionUID} SP version CRLF
Accept: 1#media-type CRLF
*(header-field CRLF)
CRLF
```

12.Y.1.1 Target Resource

The Target Resource of this transaction is an individual forward request identified by its transaction UID. See section 12.X.1.1 for the applicable resources, where for the Forward Result Check transaction the URI templates do not have the endpoint and do not have the search parameters.

12.Y.1.2 Query Parameters

The request has no Query Parameters.

12.Y.1.3 Request Header Fields

The origin server shall support Request Header Fields as required in Table 12.Y.1-1.

The user agent shall supply Request Header Fields as required in Table 12.Y.1-1.

Note The presence and values of the forward result check Header Fields should be the same as those of the forward Request Header Fields.

Table 12.Y.1-1. Forward Result Check 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.

12.Y.1.4 Request Payload

The request shall have no payload.

12.Y.2 Behavior

The origin server provides the latest results of the forward request in an Acceptable Media Type (see section 8.7.4).

379 **12.Y.3 Response**

380 The response shall have the following syntax:

```

381 version SP status-code SP reason-phrase CRLF
382 Content-Type: media-type CRLF
383 [retry-after CRLF]
384 *(header-field CRLF)
385 CRLF
386 [Payload]
```

387 **12.Y.3.1 Status Codes**

388 Table 12.Y.3-1 shows some common status codes corresponding to this transaction. See also Section
389 8.5 for additional status codes.

390 **Table 12.Y.3-1. Status Code Meaning**

Status	Code	Meaning
Success	200 (OK)	The origin server finished processing the forward request; the payload describes in detail what has been achieved.
	202 (Accepted)	The origin server has not finished processing the forward request; the payload describes in detail what has been achieved until now. The user agent is expected to follow-up with a Forward Check transaction to get to know the entire result of the forward request.
Failure	404 (Not Found)	The origin server cannot find the forward request result identified by the supplied Transaction UID.
	410 (Gone)	The origin server can no longer provide the forward request result identified by the supplied Transaction UID.
	503 (Service Unavailable)	The origin server cannot handle the Forward Result Check request; this may be a temporary or permanent state.

391 Note

- 392 1. The 404 (Not Found) status code may be caused by an incorrect Transaction UID that has been
393 supplied by the user agent, or the origin server may have deleted the applicable result.
- 394 2. The 410 (Gone) status code may be caused by the origin server deleting the applicable result, but still
395 having a record of the Transaction UID.
- 396 3. When the 503 (Service Unavailable) status code is returned, the user agent might retry later with
397 another Forward Result Check transaction.

398 **12.Y.3.2 Response Header Fields**

399 See Section 12.X.3.2.

400 **12.Y.3.3 Response Payload**

401 See Section 12.X.3.3.

402 **Update Section B Examples: add new examples for the respective Forward Transactions**

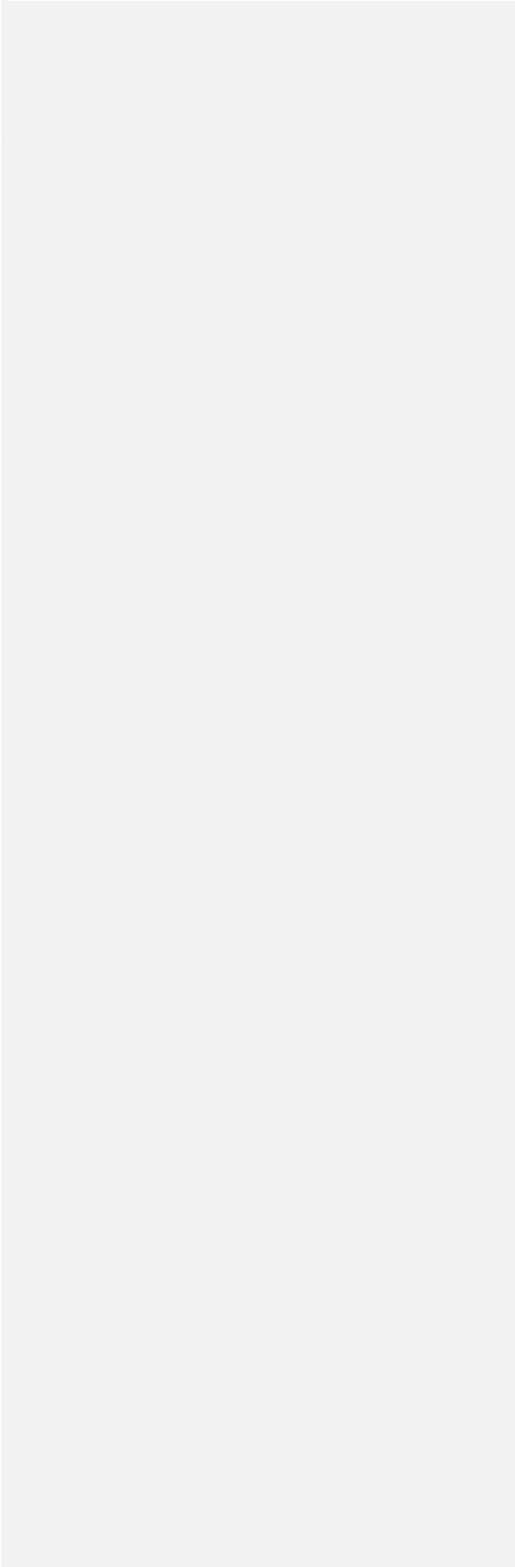
403 **B Examples (Informative)**

404 ...

405 **B.X1**

406

407



408 **Update Table H-1 Resources and Methods: add new resources and methods for Forward**
409 **Transactions**

410 **H Capabilities Description**

Service	Resource	Transactions	Reference
Studies (see Section 10.1.1)			
	studies	Search for Studies Store Instances <u>Forward Studies</u> <u>Forward Studies Result Check</u>	Section 10.6 Section 10.5 <u>Section 10.X</u> <u>Section 10.Y</u>
	{StudyInstance}	Retrieve Study Store Study Instances <u>Forward Study</u> <u>Forward Study Result Check</u>	Section 10.4 Section 10.5 <u>Section 10.X</u> <u>Section 10.Y</u>
	metadata	Retrieve Study Metadata	Section 10.4
	rendered	Retrieve Rendered Study	Section 10.4
	renderedmpr	Retrieve Rendered MPR Volume Study	Section 10.4
	rendered3d	Retrieve Rendered 3D Volume Study	Section 10.4
	thumbnail	Retrieve Study Thumbnail	Section 10.4
	bulkdata	Retrieve Study Bulkdata	Section 10.4
	pixeldata	Retrieve Study Pixel Data	Section 10.4
	series	Search for Study Series <u>Forward Series</u> <u>Forward Series Result Check</u>	Section 10.6 <u>Section 10.X</u> <u>Section 10.Y</u>
	{SeriesInstance}	Retrieve Series <u>Forward Series</u> <u>Forward Series Result Check</u>	Section 10.4 <u>Section 10.X</u> <u>Section 10.Y</u>
	metadata	Retrieve Series Metadata	Section 10.4
	rendered	Retrieve Rendered Series	Section 10.4

Kommentiert [JM10]: Check whether these are at the right spot. Does not seem to be correct.

Service	Resource	Transactions	Reference
	renderedmpr	Retrieve Rendered MPR Volume Series	Section 10.4
	rendered3d	Retrieve Rendered 3D Volume Series	Section 10.4
	thumbnail	Retrieve Series Thumbnail	Section 10.4
	bulkdata	Retrieve Series Bulkdata	Section 10.4
	pixeldata	Retrieve Series Pixel Data	Section 10.4
	instances	Search for Study Series Instances <u>Forward Instances</u> <u>Forward Instances Result Check</u>	Section 10.4 <u>Section 10.X</u> <u>Section 10.Y</u>
	{SOPInstance}	Retrieve Instance <u>Forward Instance</u> <u>Forward Instance Result Check</u>	Section 10.4 <u>Section 10.X</u> <u>Section 10.Y</u>
	metadata	Retrieve Instance Metadata	Section 10.4
	rendered	Retrieve Rendered Instance	Section 10.4
	renderedmpr	Retrieve Rendered MPR Volume Instance	Section 10.4
	rendered3d	Retrieve Rendered 3D Volume Instance	Section 10.4
	thumbnail	Retrieve Instance Thumbnail	Section 10.4
	bulkdata	Retrieve Instance Bulkdata	Section 10.4
	pixeldata	Retrieve Instance Pixel Data	Section 10.4
	frames	N/A	N/A
	{framelist}	Retrieve Frames	Section 10.4
	rendered	Retrieve Rendered Frames	Section 10.4
	renderedmpr	Retrieve Rendered MPR Volume Frames	Section 10.4
	rendered3d	Retrieve Rendered 3D Volume Frames	Section 10.4
	thumbnail	Retrieve Frame Thumbnail	Section 10.4
	pixeldata	Retrieve Frame Pixel Data	Section 10.4
	instances	Search for Study Instances	Section 10.6
	series	Search for Series	Section 10.6

Service	Resource	Transactions	Reference
	{SeriesInstance}	N/A	N/A
	{instances}	Search for Instances	Section 10.6
	instances	Search for Instances	Section 10.6
	{BulkDataReference}	Retrieve Bulkdata	Section 10.4
Worklist (see Section 11.1.1)			
	workitems	Search for Workitem Create Workitem	Section 11.9 Section 11.4
	{Workitem}	Retrieve Workitem Update Workitem	Section 11.4 Section 11.6
	state	Change Workitem State	Section 11.7
	cancelrequest	Request Workitem Cancellation	Section 11.8
	subscribers	N/A	N/A
	{AETitle}	Subscribe Unsubscribe	Section 11.10 Section 11.11
	1.2.840.10008.5.1.4.34.5	N/A	N/A
	subscribers	N/A	N/A
	{AETitle}	Subscribe Unsubscribe	Section 11.10 Section 11.11
	suspend	Unsubscribe	Section 11.11
	1.2.840.10008.5.1.4.34.5.1	N/A	N/A
	subscribers	N/A	N/A
	{AETitle}	Subscribe Unsubscribe	Section 11.10 Section 11.11
	suspend	Suspend Worklist Subscription	Section 11.11
Non-Patient Instance (see Section 12.1.1)			
	color-palettes	N/A	N/A
	{uid}	Retrieve	Section 12.4

Service	Resource	Transactions	Reference
		Store	Section 12.5
		Search	Section 12.6
		<u>Forward</u>	<u>Section 12.X</u>
		<u>Forward Result Check</u>	<u>Section 12.Y</u>
	defined-procedure-protocol	N/A	N/A
	{uid}	Retrieve	Section 12.4
		Store	Section 12.5
		Search	Section 12.6
		<u>Forward</u>	<u>Section 12.X</u>
		<u>Forward Result Check</u>	<u>Section 12.Y</u>
	hanging-protocol	N/A	N/A
	{uid}	Retrieve	Section 12.4
		Store	Section 12.5
		Search	Section 12.6
	<u>Forward</u>	<u>Section 12.X</u>	
	<u>Forward Result Check</u>	<u>Section 12.Y</u>	
implant-templates	N/A	N/A	
{uid}	Retrieve	Section 12.4	
	Store	Section 12.5	
	Search	Section 12.6	
	<u>Forward</u>	<u>Section 12.X</u>	
	<u>Forward Result Check</u>	<u>Section 12.Y</u>	
inventories	N/A	N/A	
{uid}	Retrieve	Section 12.4	
	Store	Section 12.5	
	Search	Section 12.6	
	<u>Forward</u>	<u>Section 12.X</u>	
	<u>Forward Result Check</u>	<u>Section 12.Y</u>	
Storage Commitment Requests (see Section 13.1.1)			

Service	Resource	Transactions	Reference
	commitment-requests	Request	Section 13.4
		Result Check	Section 13.5

411

412

413 **Add new Annex @ – Forward Request Response Module**

414 **Annex @ Forward Request Response Module**

415 **@.1 Response Message Body**

416 Table @.1-1 specifies the Attributes for of the Forward Request Response Module.

417 **Table @.1-1. Forward Request Response Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Status	(0000,0900)	1	The return status of the Forward Request. Values are according Table C.4-2 in PS3.4, excluding Cancel.
Number of Remaining Sub-operations	(0000,1020)	1C	The number of remaining store sub-operations necessary to complete this Forward Request. Required when the Status is Pending.
Number of Completed Sub-operations	(0000,1021)	1C	The number of store sub-operations generated by this Forward Request that have completed successfully. Required when the Status is Pending. May be present otherwise.
Number of Failed Sub-operations	(0000,1022)	1C	The number of store sub-operations generated by this Forward Request that have failed. Required when the Status is Pending. May be present otherwise.
Number of Warning Sub-operations	(0000,1023)	1C	The number of store sub-operations generated by this Forward Request that had a status of warning. Required when the Status is Pending. May be present otherwise.
Failed SOP Instance UID List	(0008,0058)	1C	A list of UIDs of SOP Instances for which this Forward Transaction's store sub-operation has failed. Required when the Status is Warning or Failure.

418

419

Changes to NEMA Standards Publications PS 3.2

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

421 **N.1 Overview**

422 ...

423 **N.1.3 DICOM Web Services**

424 ...

425 **N.1.3.Y Modality Scheduled Procedure Step Service**

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

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

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

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

429

430 **N.1.3.X Modality Performed Procedure Step Service**

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

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

433 **Table N.1.3.X-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			

434

435 *[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.]*

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

440 *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.Y 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.Y-1 Modality Scheduled Procedure Step Service.

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

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

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

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

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

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

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

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

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

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

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

475

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

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

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

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

480

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

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

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

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

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

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

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

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

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

494

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

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

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

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

499

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

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

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

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

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

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

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

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

509

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

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

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

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

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

514

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

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

N.5.3.X.2.1 User Agent

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

520 *[List the supported resources for your Modality Performed Procedure Step Update Transaction user agent. Remove*
 521 *the non-supported resources rows. Fill in information on your implementation in the Comments column when*
 522 *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
<i>modality-performed-procedure-steps</i>	

524

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

526 *[List the supported Header Fields and their supported Values. Fill in information on your implementation in the*
 527 *"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	<i>application/dicom+json (Default)</i> <i>application/dicom+xml</i> <i>multipart/related;</i> <i>type="application/dicom+json"</i> <i>multipart/related;</i> <i>type="application/dicom+xml"</i>	
Content-Length		<i>[If Content-Encoding is not present]</i>
Content-Encoding		<i>[If Content-Length is not present]</i>

529

N.5.3.X.2.2 Origin Server

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

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

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

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

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

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

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

539

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

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

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

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

544

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

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

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

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

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

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

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

554

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

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

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

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

559

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

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

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

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

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

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

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

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

569

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

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

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

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

574

575

Add a new subsection on the Modality Workflow Services 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 Scheduled Procedure Step 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)	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.

590

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

597

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

598

N.7.3.3.X Modality Performed Procedure Step Service

599

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

600

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.

601

602

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

603

604

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

605

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

606

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

607

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.

608

609

610

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

611

612

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

613

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

614

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

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

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

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

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

621

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

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

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

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

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

629

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

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

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

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

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

636

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

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

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

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

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

644

645

646

Changes to NEMA Standards Publications PS 3.6

647

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

648

Changes to NEMA Standards Publications PS 3.15

649

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

650