

**SCENARA® .connect**  
DICOM Conformance Statement



PRODUCT INFO

OR1™

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## 1 Conformance Statement Overview

The DICOM Server (DS) is a self-contained networked computer system used for receiving and sending diagnostic medical images. As an integration server, it provides DICOM storage connectivity to the proprietary medical documentation system (MDS). It allows external systems to send images to it for image integration, report generation. Images are temporarily stored in the DS, they can be forwarded to storage systems (PACS). The system conforms to the DICOM standard to allow the sharing of medical information with other digital imaging systems.

The modules are using parts of the OFFIS DCMTK Toolkit to provide DICOM services.

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
<b>Transfer</b>		
US Image Storage (Retired)	Yes	Yes
US Image Storage	Yes	Yes
US Multi-frame Storage (Retired)	Yes	Yes
US Multi-frame Storage	Yes	Yes
Computed Radiography Image Storage	Yes	Yes
CT Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
VL Endoscopic Image Storage	Yes	Yes
Video Endoscopic Image Storage	Yes	Yes
BasicText SR Storage	Yes	Yes
Enhanced SR Storage	Yes	Yes
Comprehensive SR Storage	Yes	Yes
<b>Workflow management</b>		
Modality worklist	No	Yes
Modality Performed Procedure Step	No	Yes
Storage Commitment Push Model	No	Yes
<b>Query/Retrieve</b>		
Study Root Q/R - FIND	Yes	No
Study Root Q/R - MOVE	Yes	No

**Table 1-1: Network services**

## **2 Introduction**

### **2.1 Audience**

The audience for this Conformance Statement consists of those who would be involved in the integration of DS with complementary products, e.g. Modalities. All that is required of the reader is a working knowledge of the DICOM Standard. Experience and familiarity with DICOM Conformance Statements is helpful but not required.

### **2.2 Remarks**

The fact that a product has a DICOM Conformance Statement that is complementary to that of DS, e.g. specifies support for STORAGE as an SCU, does not in and of itself guarantee interoperability between said product and DS. The comparison of Conformance Statements is a step to determining interoperability but other steps are required including:

- Analysis of interoperability requirements of communicating applications
- Creation of a Test Plan to verify interoperability
- Execution of the Test Plan

DICOM is an evolving standard, constantly being amended and augmented. In consideration of this fact, we reserve the right to make changes to DS as it sees fit to keep abreast of these changes.

## 2.3 Definitions, Terms and Abbreviations

• MDS	GUI-based proprietary medical documentation system
• Database	The database that indexes procedures, orders and patients
• AE	Application Entity
• CR	Computerized radiography
• CT	Computerized Tomography
• DICOM	Digital Imaging and Communications in Medicine
• DS	DICOM Server
• HIS	Hospital Information System
• IE	Information Entity
• IOD	Information Object Definition
• ISO	International Standards Organization
• MPPS	Modality Performed Procedure Step
• MR	Magnetic Resonance
• MWL	Modality Worklist
• PACS	Picture Archiving and Communication System
• PDU	Protocol Data Unit
• SC	Secondary Capture
• SCP	Service Class Provider
• SCU	Service Class User
• SOP	Service-Object Pair
• SPS	Scheduled Procedure Step
• SR	Structured Report
• TCP/IP	Transmission Control Protocol/Internet Protocol
• UID	Unique Identifier
• US	Ultrasound
• VL	Visible Light
• VM	Value Multiplicity
• VR	Value Representation

## 2.4 References

IHE Technical Framework, Revision 14.0, 2015

### 3 Networking

#### 3.1 Implementation Model

##### 3.1.1 Application Data Flow

The division of DS into the separate DICOM Application Entities represents a somewhat arbitrary partitioning of functionality. For the purpose of this document they are organized in this manner so as to detail their independent logical functionality.

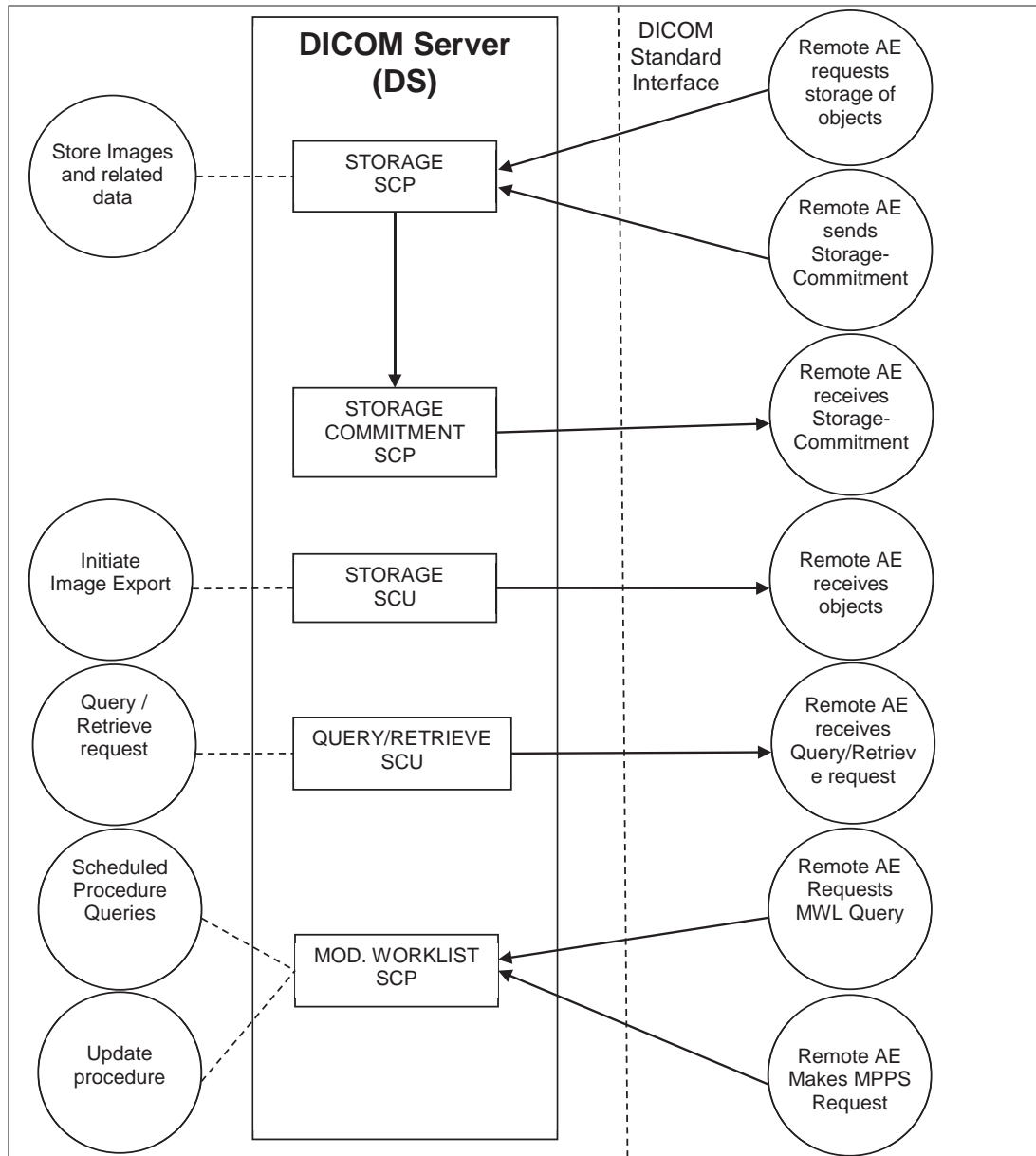


Figure 3-1: DS DICOM data flow diagram

The Application Entities detailed in the Application Data Flow Diagram are all Windows applications / services.

- The STORAGE-SCU AE can send SOP Instances. It either handles requests from the MDS to transmit Images to a specific DICOM destination or does so automatically. The STORAGE-SCU AE functions as a C-STORE SCU.
- The STORAGE-SCP AE can receive incoming DICOM images and add them to the DS database. It can respond to external Storage and Verification Requests as a Service Class Provider (SCP) for C-STORE and C-ECHO requests. It also acts as a move target for C-MOVE operations and can receive Storage Commitment N-ACTION messages.
- The STORAGE-COMMITMENT-SCP AE can send Storage Commitment N-EVENT-REPORT messages in reply to previously received Storage Commitment requests by the STORAGE-SCP.
- The QUERY/RETRIEVE SCU AE can initiate C-FIND and C-MOVE requests to remote systems in order to retrieve images.
- The MODALITY-WORKLIST SCP responds to Association Requests for Modality Worklist from MWL SCUs and responds to queries from these SCUs. When a query is received DS engages in local real-world activity Scheduled Procedure Queries. This results in a set of matching responses that DS returns to the MWL SCU.
- It also accepts Association Requests for Modality Performed Procedure Step from MPPS SCUs and responds to N-CREATE and N-SET Requests from these SCUs. When an N-CREATE or N-SET is received DS engages in local real-world activity Update Procedure. This results in updates to the MDS Database per the contents of the received message. DS then returns N-SET or N-CREATE status to the MPPS SCU.

### **3.1.2 Functional Definition of AEs**

#### **3.1.2.1 Functional Definition of STORAGE-SCU Application Entity**

The STORAGE-SCU AE can be invoked by the MDS either by a local interactive user or by an automatic rule-based event to trigger the transfer of specific images to a remote destination AE. The STORAGE-SCU AE must be correctly configured with the host and port number of any external DICOM AE's that are to be C-STORE destinations. The Presentation Contexts to use are determined from the headers of the DICOM files to be transferred.

#### **3.1.2.2 Functional Definition of STORAGE-SCP Application Entity**

The STORAGE-SCP AE waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the STORAGE-SCP AE expects it to be a DICOM application. The STORAGE-SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification, the Storage Service and Storage Commitment Classes. Any images or storage commitment requests received on such Presentation Contexts will be added to the DS database.

#### **3.1.2.3 Functional Definition of STORAGE-COMMITMENT-SCP Application Entity**

The Storage Commitment SCP AE sends N-EVENT-REPORT messages in reply to previously received Storage Commitment requests. It uses a database driven queue and a configured set of remote recipients to answer N-ACTION messages received by the DS STORAGE SCPs.



### 3.1.2.4 Functional Definition of QUERY/RETRIEVE-SCU Application Entity

The Query/Retrieve SCU acts as a SCU for the Query/Retrieve SOP classes. Query and Retrieve requests can be invoked by the MDS. If configured as a C-MOVE target images can be retrieved through a DS STORAGE-SCP and made available to the MDS.

### 3.1.2.5 Functional Definition of WORKLIST-SCP Application Entity

DS will accept Presentation Contexts for the Modality Worklist, Modality Performed Procedure Step and Verification SOP Classes. Upon receipt of a Verification Request DS will respond with a successful Verification response. When a MWL query is received DS will query the DS database for a list of Scheduled Procedure Steps matching the query and will return a pending C-Find response for each match. Before DS can include patient and order information in response to a Modality Worklist query, patients must be registered and there must be orders for those patients in the MDS database. Registration and order information is typically interfaced to the MDS from a HIS but can also be entered directly into the MDS using registration and order entry applications. Reception of an MPPS N-Create or N-Set Request may result in updates to various tables in the MDS database and may result in changes to the procedure state of the Requested Procedure(s) referenced within the message. If an MPPS message containing non-matching procedure data is received it will be ignored.

### 3.1.3 Sequencing of Real-World Activities

- DS can be configured to automatically forward all or a subset of all objects received by the STORAGE-SCP to a remote STORAGE-SCU
- DS can be configured to automatically answer Storage Commitment requests received by the STORAGE-SCP via the STORAGE-COMMITMENT-SCP

## 3.2 AE Specifications

### 3.2.1 STORAGE-SCP Application Entity Specification

#### 3.2.1.1 SOP Classes

The STORAGE-SCP AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	No	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	No	Yes (on separate association)
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	No	Yes
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	No	Yes
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	No	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	No	Yes

SOP Class Name	SOP Class UID	SCU	SCP
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	No	Yes
BasicText SR Storage	1.2.840.10008.5.1.4.1.1.88.11	No	Yes
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	No	Yes
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	No	Yes

**Table 3-1: SOP classes for STORAGE-SCP AE**

- ① These are the default SOP Classes supported. By altering the configuration it is possible to support additional or fewer SOP Classes.

### 3.2.1.2 Association Policies

#### 3.2.1.2.1 General

The STORAGE-SCP AE can accept Association Requests. The STORAGE-SCP AE will accept Association Requests for the Verification, Storage and Storage Commitment Services.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed:

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

**Table 3-2: DICOM application context for STORAGE-SCP AE**

#### 3.2.1.2.2 Number of Associations

The STORAGE-SCP AE supports only one simultaneous Association requested by peer AE. To support multiple peer AEs the DS can create unlimited individual storage SCPs, each using its own port.

Maximum number of simultaneous Associations	1
---	---

**Table 3-3: Number of simultaneous associations as an SCP for STORAGE-SCP AE**

#### 3.2.1.2.3 Asynchronous Nature

Asynchronous communication is not supported.

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

**Table 3-4: Asynchronous nature as a SCP for STORAGE-SCP AE**

#### 3.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Implementation Class UID	1.2.276.0.76.3.1.87.0.2.0.2
Implementation Version Name	MNDWS2.0.2

**Table 3-5: DICOM Implementation class and version for STORAGE-SCP AE**

### 3.2.1.3 Association Initiation Policy

DS STORAGE-SCP AE does not initiate associations.

### 3.2.1.4 Association Acceptance Policy

The STORAGE-SCP AE may reject Association attempts as shown in the Table below. The Result, Source and Reason/Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ. The following abbreviations are used in the Source column:

a - DICOM STORE service-user

b - DICOM STORE service-provider (ASCE related function)

c - DICOM STORE service-provider (Presentation related function)

Result	Source	Reason/Diag	Explanation
2 – rejected-transient	c	2 – local-limit-exceeded	The (configurable) maximum number of simultaneous Associations has been reached. An Association request with the same parameters may succeed at a later time.
2 – rejected-transient	c	1 – temporary-congestion	No Associations can be accepted at this time due to the real-time requirements of higher priority activities (e.g. during image acquisition no Associations will be accepted) or because insufficient resources are available (e.g. memory, processes, threads). An Association request with the same parameters may succeed at a later time.
1 – rejected-permanent	a	2 – application-context-name-not-supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will not succeed at a later time.
1 – rejected-permanent	a	7 – called-AE-title-not-recognized	The Association request contained an unrecognized Called AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association initiator is incorrectly configured and attempts to address the Association acceptor using the wrong AE Title.
1 – rejected-permanent	a	3 – calling-AE-title-not-recognized	The Association request contained an unrecognized Calling AE Title. An Association request with the same parameters will not succeed at a later time unless configuration changes are made. This rejection reason normally occurs when the Association acceptor has not been configured to recognize the AE Title of the Association initiator.
1 – rejected-permanent	b	1 – no-reason-given	The Association request could not be parsed. An Association request with the same format will not succeed at a later time.

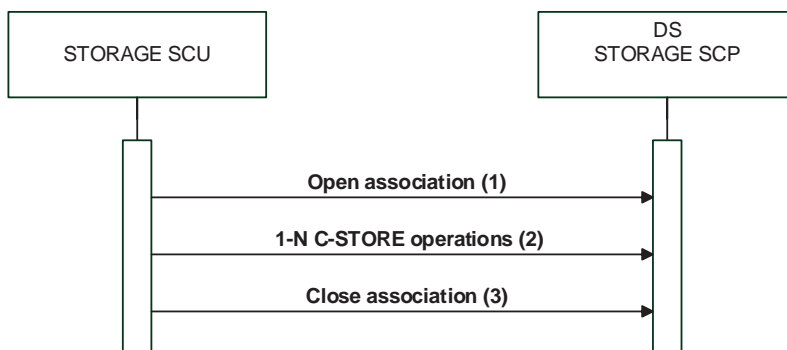
**Table 3-6: Association rejection reasons**

#### 3.2.1.4.1 Activity – Receive Images

##### 3.2.1.4.1.1 Description and Sequencing of Activity

The STORAGE-SCP AE accepts Associations only if they have valid Presentation Contexts and if they use preconfigured Application Entity Titles. If none of the requested Presentation Contexts are accepted then the Association Request itself is rejected.

The following sequencing constraints apply to the STORAGE-SCP AE for handling Storage Requests over the original Association:



**Figure 3-2: Sequencing diagram for activity: Receive Images**

1. Peer AE opens an Association with the STORAGE-SCP AE.
2. Peer AE sends zero or more Composite SOP Instances.
3. Peer AE closes the Association.

### 3.2.1.4.1.2 Accepted Presentation Contexts

If multiple Transfer Syntaxes are proposed per Presentation Context then only the most preferable Transfer Syntax is accepted. The order of Transfer Syntax preference for the STORAGE-SCP AE is configurable.

Any of the Presentation Contexts shown in the following table are acceptable to the STORAGE-SCP AE for receiving images.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Implicit VR Little Endian (uncompressed)	1.2.840.10008.1.2	SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit VR Little Endian (uncompressed)	1.2.840.10008.1.2.1	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCP	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Implicit VR Little Endian (uncompressed)	1.2.840.10008.1.2	SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit VR Little Endian (uncompressed)	1.2.840.10008.1.2.1	SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCP	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit JPEG lossy compression	1.2.840.10008.1.2.4.50	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCP	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	DICOM Explicit JPEG lossy compression	1.2.840.10008.1.2.4.50	SCP	None
Video Endoscopic Image Storage	1.2.840.10008.1.2.4.100	MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	SCP	None
Video Endoscopic Image Storage	1.2.840.10008.1.2.4.101	MPEG2 Main Profile @ High Level	1.2.840.10008.1.2.4.101	SCP	None
Video Endoscopic Image Storage	1.2.840.10008.1.2.4.102	MPEG4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102	SCP	None
Video Endoscopic Image Storage	1.2.840.10008.1.2.4.103	MPEG4 AVC/H.264 BD compatible High Profile / Level 4.1	1.2.840.10008.1.2.4.103	SCP	None
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	SCP	None
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	MPEG2 Main Profile @ High Level	1.2.840.10008.1.2.4.101	SCP	None
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	MPEG4 AVC/H.264 High Profile / Level 4.1	1.2.840.10008.1.2.4.102	SCP	None
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	MPEG4 AVC/H.264 BD compatible High Profile / Level 4.1	1.2.840.10008.1.2.4.103	SCP	None
BasicText SR Storage	1.2.840.10008.5.1.4.1.1.88.11	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
BasicText SR Storage	1.2.840.10008.5.1.4.1.1.88.11	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

**Table 3-7: Accepted presentation contexts for activity “Receive Images”**

### 3.2.1.4.1.3 SOP Specific Conformance for Storage SOP Classes

The associated Activity with the Storage service is the storage of medical image data received over the network on a designated hard disk. The STORAGE-SCP AE will return a failure status if it is unable to store the images onto the hard disk.

The STORAGE-SCP AE does not have any dependencies on the number of Associations used to send images to it. Images belonging to more than one Study or Series can be sent over a single or multiple Associations. Images belonging to a single Study or Series can also be sent over different Associations. There is no limit on either the number of SOP Instances or the maximum amount of total SOP Instance data that can be transferred over a single Association.

The STORAGE-SCP AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. The STORAGE-SCP AE is Level 2 (Full) conformant as a Storage SCP. In addition, all Private and SOP Class Extended Elements are maintained in the DICOM format files. In addition to saving all Elements in files a subset of the Elements are stored in the DS database. Refer to the Annex for the list of Elements that are checked and/or processed upon receiving a Composite SOP Instance.

The Behavior for handling duplicate SOP Instances is to accept but not replace the original object with the conflicting instance.

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000	The Composite SOP Instance was successfully received, verified, and stored in the system database.
Refused	Out of Resources	A700	Indicates that there was not enough disk space to store the image. Error message is output to the Service Log. The SOP Instance will not be saved.
Error	Data Set does not match SOP Class	A900	Indicates that the Data Set does not encode a valid instance of the SOP Class specified. This status is returned if the DICOM Object stream can be successfully parsed but does not contain values for one or more mandatory Elements of the SOP Class. The STORAGE-SCP AE does not perform a comprehensive check, as it only checks a subset of required Elements. In addition, if the SOP Class is for a type of image but the SOP Instance does not contain values necessary for its display then this status is returned.  Error message is output to the Service Log. The system can be configured to temporarily save such Data Sets in order to aid problem diagnosis.
	Cannot understand	C000	Indicates that the STORAGE-SCP AE cannot parse the Data Set into Elements. Error message is output to the Service Log. The system can be configured to temporarily save such Data Sets in order to aid problem diagnosis.

**Table 3-8: STORAGE-SCP AE C-STORE response status return reasons**

- i** If a failure condition does occur when handling an Association then all images previously received successfully over the Association are maintained in the DS database. No previously successfully received images are discarded. Even if an image is successfully received but an error occurs transmitting the C-STORE Response then this final image is maintained rather than discarded. If the loss of an Association is detected then the Association is closed.

The behavior of STORAGE-SCP AE during communication failure is summarized in the following table:

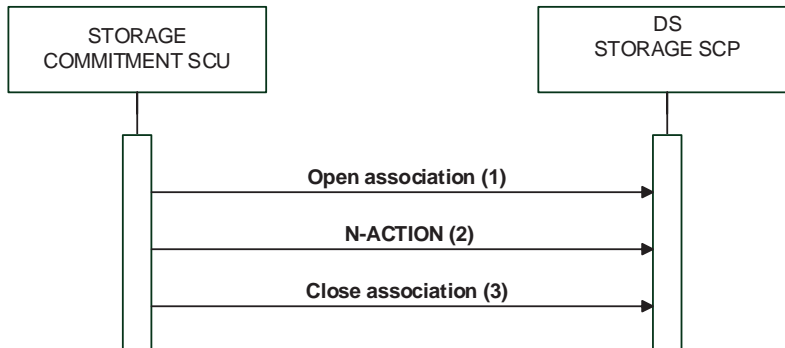
Exception	Reason
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. The STORAGE-SCP AE is waiting for the next C-STORE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If some Composite SOP Instances have already been successfully received then they are maintained in the database. They are not automatically discarded because of a later failure.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout). I.e. The STORAGE-SCP AE is waiting for the next C-STORE Data Set PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. Error message is output to the Service Log. If a C-STORE Data Set has not been fully received then the data already received is discarded. If some Composite SOP Instances have already been successfully received over the Association then they are maintained in the database.
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error message is output to the Service Log. If some Composite SOP Instances have already been successfully received then they are maintained in the database. They are not automatically discarded because of a later failure.

**Table 3-9: STORAGE-SCP AE storage service communication failure reasons**

### 3.2.1.4.2 Activity – Receive Storage Commitment Request

#### 3.2.1.4.2.1 Description and Sequencing of Activity

The following sequencing constraints apply to the STORAGE-SCP AE for handling Storage Commitment Requests:



**Figure 3-3: Sequencing diagram for activity: Receive Storage Commitment Request**

1. Peer AE opens an Association with the STORAGE-SCP AE.
2. Peer AE sends on N-ACTION (Storage Commitment RQ) message.
3. Peer AE closes the Association.

#### 3.2.1.4.2.2 Accepted Presentation Contexts

Any of the Presentation Contexts shown in the following table are acceptable to the STORAGE-SCP AE for receiving Storage Commit Requests:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

**Table 3-10: Accepted Presentation Contexts for activity: Receive Storage Commitment Request**

#### 3.2.1.4.2.3 SOP Specific Conformance for Storage Commitment SOP Classes

Incoming N-ACTION messages will be stored in a database driven queue and answered by the STORAGE-COMMITMENT-SCP AE described in its own section.



### 3.2.2 STORAGE-COMMITMENT-SCP Application Entity Specification

#### 3.2.2.1 SOP Classes

The STORAGE-COMMITMENT-SCP AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No

**Table 3-11: SOP classes for STORAGE-COMMITMENT-SCP AE**

#### 3.2.2.2 Association Policies

##### 3.2.2.2.1 General

The STORAGE-COMMITMENT-SCP AE will form Associations automatically when

N-ACTION messages were previously received through the STORE-SCP AE and appropriate remote receiving AEs are configured.

The DICOM standard Application Context Name for DICOM is always proposed:

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

**Table 3-12: DICOM application context for STORAGE-COMMITMENT-SCP AE**

##### 3.2.2.2.2 Number of Associations

The maximum number of simultaneous Associations is one. Pending send requests from the database queue are processed sequentially.

If the first attempt to open an Association fails then the STORAGE-COMMITMENT-SCP AE will reschedule the task to attempt it again.

Maximum number of simultaneous Associations	1 (Not Configurable)
---	----------------------

**Table 3-13: Number of associations as a SCU for STORAGE-COMMITMENT-SCP AE**

##### 3.2.2.2.3 Asynchronous Nature

Asynchronous communication is not supported.

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

**Table 3-14: Asynchronous nature as a SCP for STORAGE-COMMITMENT-SCP AE**

##### 3.2.2.2.4 Implementation Identifying Information

Implementation Class UID	1.2.276.0.76.3.1.87.0.2.0.2
Implementation Version Name	MNDWS2.0.2

**Table 3-15: DICOM implementation class and version for STORAGE-COMMITMENT-SCP AE**

### 3.2.2.3 Association Acceptance Policy

The STORAGE-COMMITMENT-SCP AE does not accept Associations.

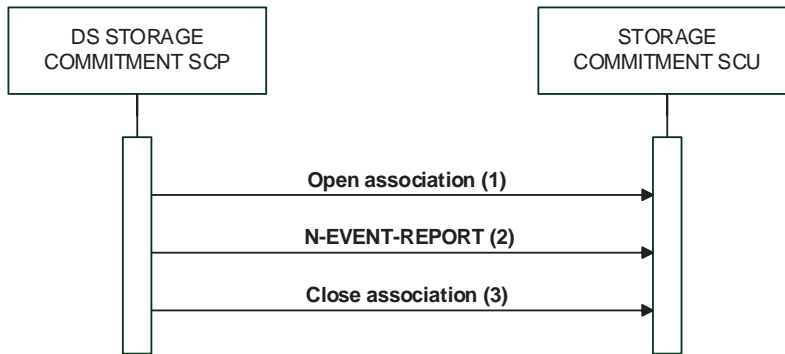
### 3.2.2.4 Association Initiation Policy

#### 3.2.2.4.1 Activity – Send Storage Commitment Report

##### 3.2.2.4.1.1 Description and Sequencing of Activity

The STORAGE-COMMITMENT-SCP AE will initiate a new Association automatically when unanswered N-ACTION messages are found in the DS database. An Association Request is sent to the specified Destination AE and upon successful negotiation of the required Presentation Context the N-EVENT-REPORT transfer is started. In all cases an attempt will be made to transmit all the indicated messages in separate Associations. The Associations will be released after the messages have been sent. If an error occurs during transmission over an open Association then the STORAGE-COMMITMENT-SCP AE will attempt to independently retry the transfer.

The following sequencing applies to the STORAGE-COMMITMENT-SCP AE:



**Figure 3-4: Sequencing diagram for activity: Send Storage Commitment Report**

1. STORAGE-COMMITMENT SCP AE opens a new Association with the configured destination AE.
2. STORAGE-COMMITMENT-SCP AE sends the indicated N-EVENT-REPORT message.
3. STORAGE-COMMITMENT-SCP AE closes the Association.

##### 3.2.2.4.1.2 Proposed Presentation Contexts

STORAGE-COMMITMENT-SCP AE will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Storage Commitment Push	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Presentation Context Table					
Model		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

**Table 3-16: Proposed presentation contexts for activity “Send Storage Commitment Report”**

**3.2.2.4.1.3 SOP Specific Conformance for Storage Commitment**

The STORAGE-COMMIT-SCP AE will exhibit the following Behavior according to the Status Code value returned in an N-EVENT-REPORT Response from a destination STORAGE-COMMIT-SCU:

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully send the N-ACTION-REPORT. Success indication message is output to the Service Logs. No message is posted to the User Interface.
*	*	Any other status code.	This is treated as a permanent Failure. Error indication message is output to the Service Logs. No message is posted to the User Interface.

**Table 3-17: STORAGE-COMMITMENT-SCP AE N-EVENT-REPORT response status handling behavior**

The behavior of STORAGE-COMMITMENT-SCP AE during communication failure is summarized in the following table:

Exception	Behavior
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout).	The Association is aborted using a DICOM A-ABORT. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).	The Association is aborted using a DICOM A-ABORT. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error indication message is output to the Service Logs. No message is posted to the User Interface.

**Table 3-18: STORAGE-COMMITMENT-SCP AE communication failure behavior**

### 3.2.3 STORAGE-SCU Application Entity Specification

#### 3.2.3.1 SOP Classes

The STORAGE-SCU AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Yes	No
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Yes	No
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	No
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	No
BasicText SR Storage	1.2.840.10008.5.1.4.1.1.88.11	Yes	No
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	No
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	No

**Table 3-19: SOP classes for STORAGE-SCU AE**

**i** By altering the configuration it is possible to support additional or fewer SOP Classes.

#### 3.2.3.2 Association Policies

##### 3.2.3.2.1 General

The STORAGE-SCU AE will only form Associations when triggered by the MDS or if automatically sending is configured. The STORAGE-SCU AE can only request the opening of an Association. It cannot accept requests to open Associations from external Application Entities.

The DICOM standard Application Context Name for DICOM is always proposed:

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

**Table 3-20: DICOM application context for STORAGE-SCU AE**

##### 3.2.3.2.2 Number of Associations

The maximum number of simultaneous Associations is one. Pending send requests from the MDS are processed sequentially.

If the first attempt to open an Association fails then the STORAGE-SCU AE will reschedule the task to attempt it again.

Maximum number of simultaneous Associations	1 (Not Configurable)
---	----------------------

**Table 3-21: Number of associations as a SCU for STORAGE-SCU AE**

### 3.2.3.2.3 Asynchronous Nature

Asynchronous communication is not supported.

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

**Table 3-22: Asynchronous nature as a SCU for STORAGE-SCU AE**

### 3.2.3.2.4 Implementation Identifying Information

Implementation Class UID	1.2.276.0.76.3.1.87.0.2.0.2
Implementation Version Name	MNDWS2.0.2

**Table 3-23: DICOM implementation class and version for STORAGE-SCU AE**

### 3.2.3.3 Association Acceptance Policy

The STORAGE-SCU AE does not accept Associations.

### 3.2.3.4 Association Initiation Policy

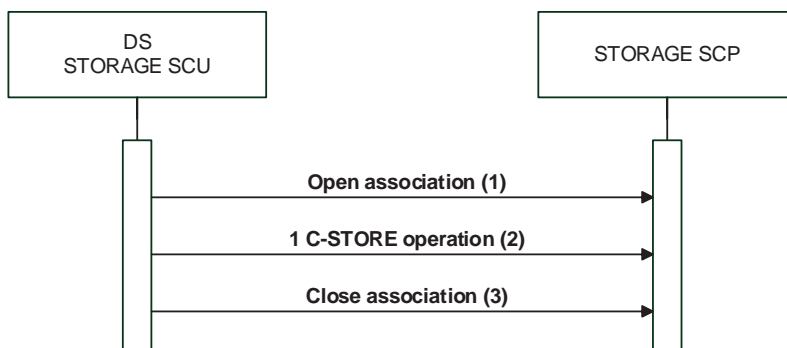
#### 3.2.3.4.1 Activity – Send Images Unsolicited as Requested by MDS Trigger

##### 3.2.3.4.1.1 Description and Sequencing of Activity

The STORAGE-SCU AE will initiate a new Association when the MDS triggers the STORAGE-SCU AE to transmit images. An Association Request is sent to the specified C-MOVE Destination AE and upon successful negotiation of the required Presentation Context the image transfer is started. In all cases an attempt will be made to transmit all the indicated images in separate Associations. The Associations will be released after the images have been sent. If an error occurs during transmission over an open Association then the image transfer is halted. The STORAGE-SCU AE will not attempt to independently retry the image export.

Note that the STORAGE-SCU AE only supports the unsolicited sending of SOP Instances using the DICOM Storage Service Class. It will not response to a C-MOVE Request from a peer AE.

The following sequencing applies to the STORAGE-SCU AE.



**Figure 3-5: Sequencing diagram for activity: Send Images Unsolicited as Requested by MDS Trigger**

1. STORAGE-SCU AE opens a new Association with the configured Destination AE.
2. STORAGE-SCU AE sends the indicated SOP Instance.
3. STORAGE-SCU AE closes the Association.

**3.2.3.4.1.2 Proposed Presentation Contexts**

STORAGE-SCU AE will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
US Multi-frame Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
Computer Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Computer Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	DICOM Explicit JPEG baseline lossy compression	1.2.840.10008.1.2.4.50	SCU	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	DICOM Explicit JPEG lossy compression	1.2.840.10008.1.2.4.50	SCU	None
Video Endoscopic Image Storage	1.2.840.10008.1.2.4.100	MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit JPEG lossy compression	1.2.840.10008.1.2.4.50	SCU	None
BasicText SR Storage	1.2.840.10008.5.1.4.1.1.88.11	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
BasicText SR Storage	1.2.840.10008.5.1.4.1.1.88.11	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

**Table 3-24: Proposed presentation contexts for activity “Send Images unsolicited as requested by MDS Trigger”**

❶ The SOP Classes and Transfer Syntaxes that the STORAGE-SCU AE proposes, as listed above, represent the default behavior. The STORAGE-SCU AE can be configured to propose a subset of

these contexts or additional Presentation Contexts. Also, the default behavior is to propose just a single Transfer Syntax per Presentation Context. However, this can be altered so that every proposed Presentation Context has a unique SOP Class and one or more Transfer Syntaxes. That is, the default behavior is to determine the Transfer Syntaxes the SCP can accept as opposed to which it prefers.

### 3.2.3.4.1.3 SOP Specific Conformance for Image SOP Classes

Composite DICOM SOP Instances are maintained as DICOM Part 10 compliant files in the DS storage system. A subset of tags received with the image will be saved in DS; this includes all Private and SOP Extended Elements. When a SOP Instance is selected for export from DS, its content will be exported as it was originally received except for a few possible exceptions. Refer to the Annex for the specific details of which Elements can have their values altered at time of export.

The DS modules create log files that can be used to monitor their status and diagnose any problems that may arise. If any error occurs during DICOM communication then appropriate messages are always output to these Service Logs. In addition, error messages may be output as alerts to the User Interface in certain cases.

The STORAGE-SCU AE will exhibit the following Behavior according to the Status Code value returned in a C-STORE Response from a destination C-STORE SCP:

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully stored the exported SOP Instance. Success indication message is output to the Service Logs. The MDS may be configured to indicate the transfer status
Error	Data Set does not match SOP Class	A900 – A9FF	This is treated as a permanent Failure. Error indication message is output to the Service Logs. The MDS may be configured to indicate the transfer status
	Cannot Understand	C000 - CFFF	
Refused	Out of Resources	A700 – A7FF	Treated as error
Warning	Coercion of Data Elements	B000	Image transmission is considered successful. Warning indication message is output to the Service Logs. The MDS may be configured to indicate the transfer status
	Data Set does not match SOP Class	B007	
	Elements Discarded	B006	
	Attribute List Error	0107	
	Attribute Value Out of Range	0116	
*	*	Any other status code.	Treated as error

**Table 3-25: STORAGE-SCU AE C-STORE response status handling behavior**

All Status Codes indicating an error or refusal are treated as a permanent failure. The STORAGE-SCU AE never automatically resends images when an error Status Code is returned in a C-STORE Response.



Exception	Behavior
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout).	The Association is aborted using a DICOM A-ABORT. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).	The Association is aborted using a DICOM A-ABORT. Error indication message is output to the Service Logs. No message is posted to the User Interface.
Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error indication message is output to the Service Logs. No message is posted to the User Interface.

**Table 3-26: STORAGE-SCU AE communication failure behavior**

### 3.2.4 QUERY-RETRIEVE-SCU Application Entity Specification

#### 3.2.4.1 SOP Classes

The QUERY-RETRIEVE-SCU AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Study Root Q/R - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Q/R - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

**Table 3-27: SOP classes for QUERY-RETRIEVE-SCU AE**

#### 3.2.4.2 Association Policies

##### 3.2.4.2.1 General

The QUERY-RETRIEVE-SCU AE will form Associations only when triggered by the MDS. It cannot accept requests to open Associations from external Application Entities.

The DICOM standard Application Context Name for DICOM is always proposed:

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

**Table 3-28: DICOM application context for QUERY-RETRIEVE-SCU AE**

##### 3.2.4.2.2 Number of Associations

The maximum number of simultaneous Associations is one per MDS instance.

Maximum number of simultaneous Associations	1
---	---

**Table 3-29: Number of associations as a SCU for QUERY-RETRIEVE-SCU AE**

### 3.2.4.2.3 Asynchronous Nature

Asynchronous communication is not supported.

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

**Table 3-30: Asynchronous nature as a SCU for QUERY-RETRIEVE-SCU AE**

### 3.2.4.2.4 Implementation Identifying Information

Implementation Class UID	1.2.276.0.76.3.1.87.0.2.0.2
Implementation Version Name	MNDWS2.0.2

**Table 3-31: DICOM implementation class and version for QUERY-RETRIEVE-SCU AE**

Note that all DS AE’s use the same Implementation Version Name. This Version Name is updated with each new release of the product software, as the different AE versions are never released independently.

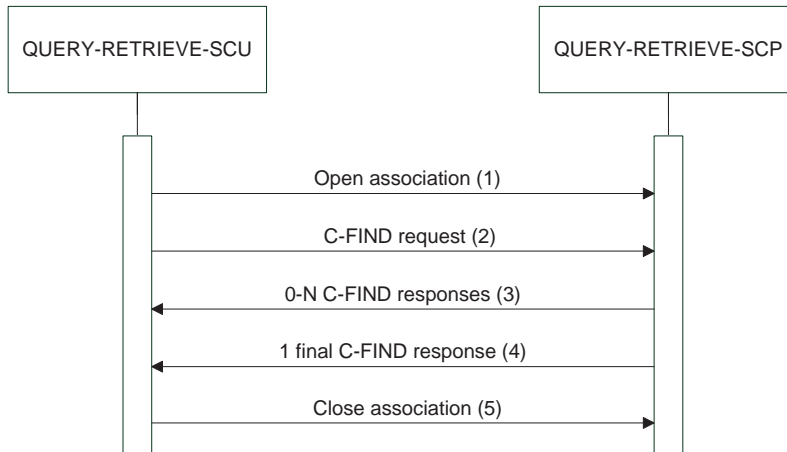
### 3.2.4.3 Association Acceptance Policy

The QUERY-RETRIEVE-SCU AE does not accept Associations.

### 3.2.4.4 Association Initiation Policy

#### 3.2.4.4.1 Activity - Send query request triggered by MDS

##### 3.2.4.4.1.1 Description and Sequencing of Activity



**Figure 3-6: Sequencing diagram for activity: Send query request triggered by MDS**

1. The figure above is a possible sequence of messages between the QUERY-RETRIEVE-SCU and a remote QUERY-RETRIEVE-SCP.

2. The QUERY-RETRIEVE-SCU opens an Association with the remote SCP for the purpose of querying a study list.

3. The QUERY-RETRIEVE-SCU send a C-FIND query request.
4. The remote SCP uses the attributes from the C-FIND Request and returns 0 to N C-FIND responses depending on matches returned from the database.
5. The remote SCP sends the final C-FIND response.
6. The QUERY-RETRIEVE-SCU closes the Association.

### 3.2.4.4.1.2 Proposed Presentation Contexts

QUERY-RETRIEVE-SCU AE will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

**Table 3-32: Proposed Presentation Contexts for activity “Send query request triggered by MDS”**

### 3.2.4.4.1.3 SOP Specific Conformance for Study Root Q/R – FIND

The QUERY-RETRIEVE-SCU AE will exhibit the following Behavior according to the Status Code value returned in a C-FIND Response from a destination QUERY-RETRIEVE-SCP:

Service Status	Further Meaning	Error Code	Reasons
Refused	Out of Resources	A7xx	Error indication message is output to the Service Log and User Interface. No results are displayed.
Failure	Dataset does not match SOP class	A9xx	
	Cannot understand	Cxxx	
Cancel	Matching terminated due to Cancel Request	FE00	Error indication message is output to the Service Log and User Interface. No results are displayed.
Pending	Pending	FF00	Message is output to the Service Log
Success	Success	0000	Matching is complete. No final identifier is supplied.
*	*	Any other status code	Handled like failure

**Table 3-33: C-FIND response status handling behavior**

Exception	Behavior
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout).	The Association is aborted using a DICOM A-ABORT. Error indication message is output to the Service Logs and the User

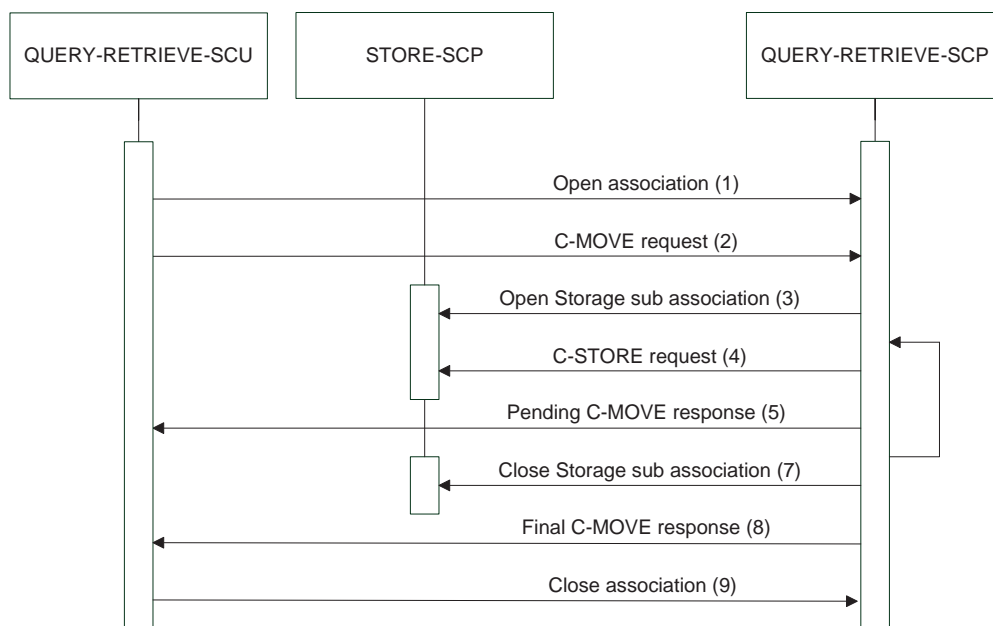
	Interface.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).	The Association is aborted using a DICOM A-ABORT. Error indication message is output to the Service Logs and the User Interface.
Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error indication message is output to the Service Logs and the User Interface.

**Table 3-34: C-FIND communication failure behavior**

**3.2.4.4.2 Activity - Send move request triggered by MDS**

**3.2.4.4.2.1 Description and Sequencing of Activities**

The figure below is a possible sequence of messages between the QUERY-RETRIEVE-SCU and a remote QUERY-RETRIEVE-SCP:



**Figure 3-7: Sequencing diagram for activity: Send move request triggered by MDS**

1. If triggered by the MDS the QUERY-RETRIEVE-SCU opens an Association to a remote QUERY-RETRIEVE-SCP.
2. QUERY-RETRIEVE-SCU sends a STUDY level C-MOVE request.
3. The remote QUERY-RETRIEVE-SCP opens an Association to a (local) DS STORE-SCP.
4. The remote QUERY-RETRIEVE-SCP sends a C-STORE command to the DS STORE-SCP.
5. The remote QUERY-RETRIEVE-SCP sends a C-MOVE response to the QUERY-RETRIEVE-SCU.
6. The remote QUERY-RETRIEVE-SCP continues with step three until all Objects are send.
7. The remote QUERY-RETRIEVE-SCP closes the Association to the DS STORE-SCP.
8. The remote QUERY-RETRIEVE-SCP sends one final C-MOVE response to the QUERY-RETRIEVE-SCU.
9. The QUERY-RETRIEVE-SCU closes the Association.

### 3.2.4.4.2.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/ Retrieve Model-MOVE	1.2.840.10008.5 .1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

**Table 3-35: Proposed Presentation Contexts for activity “Send move request triggered by MDS”**

### 3.2.4.4.2.3 SOP Specific Conformance for Study Root Q/R – MOVE

The QUERY-RETRIEVE-SCP AE will exhibit the following Behavior according to the Status Code value returned in a C-MOVE Response from a destination QUERY-RETRIEVE-SCP:

Service Status	Further Meaning	Error Code	Reasons
Refused	Out of Resources	A7xx	Error indication message is output to the Service Log. The user will be informed about the failure and may choose to retry retrieval
	Move destination unknown	A801	
Failure	Identifier does not match SOP Class	A900	
	Unable to process	Cxxx	
Cancel	Sub-operations terminated due to Cancel Request	FE00	Handled like Failure
Warning	Sub-operations complete – One or more Failures	B000	Some or all SOP instances could not be retrieved. The user will be informed about the failure and may choose to retry retrieval.
Pending	Pending	FF00	Message is output to the Service Log
Success	Sub-operations complete – no Failures	0000	All SOP instances be retrieved successfully.
*	*	Any other status code	Handled like Failure

**Table 3-36: C-MOVE response status handling behavior**

Exception	Behavior
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout).	The Association is aborted using a DICOM A-ABORT. Error indication message is output to the Service Logs and the User Interface.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).	The Association is aborted using a DICOM A-ABORT. Error indication message is output to the Service Logs and the User Interface.
Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	Error indication message is output to the Service Logs and the User Interface.

**Table 3-37: C-MOVE communication failure behavior**

### 3.2.5 MODALITY-WORKLIST-SCP Application Entity Specification

#### 3.2.5.1 SOP Classes

The MODALITY-WORKLIST-SCP AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	No	Yes
Modality Worklist	1.2.840.10008.5.1.4.31	No	Yes
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	No	Yes

**Table 3-38: SOP classes for MODALITY-WORKLIST-SCP AE**

#### 3.2.5.2 Association Policies

##### 3.2.5.2.1 General

The DICOM standard Application Context Name for DICOM is always proposed:

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

**Table 3-39: DICOM application context for MODALITY-WORKLIST-SCP AE**

##### 3.2.5.2.2 Number of Associations

DS will support as many simultaneous associations as SCP as are requested by Workflow SCUs up to a configurable maximum. DS limits the number of concurrent associations to a given Workflow SCU as described below.

Maximum number of simultaneous Associations	Configurable value.
---	---------------------

**Table 3-40: Number of associations as a SCP for MODALITY-WORKLIST-SCP AE**

### 3.2.5.2.3 Asynchronous Nature

Asynchronous communication is not supported.

Maximum number of outstanding asynchronous transactions	1 (Not Configurable)
---	----------------------

**Table 3-41: Asynchronous nature as a SCU for MODALITY-WORKLIST-SCP AE**

### 3.2.5.2.4 Implementation Identifying Information

Implementation Class UID	1.2.276.0.76.3.1.87.0.2.0.2
Implementation Version Name	MNDWS2.0.2

**Table 3-42: DICOM implementation class and version for MODALITY-WORKLIST-SCP AE**

Note that all DS AE's use the same Implementation Version Name. This Version Name is updated with each new release of the product software, as the different AE versions are never released independently.

### 3.2.5.3 Association Initiation Policy

The MODALITY-WORKLIST-SCP does not initiate Associations.

### 3.2.5.4 Association Acceptance Policy

The MODALITY-WORKLIST-SCP will accept associations for the MWL, MPPS and Verification SOP Classes as an SCP.

#### 3.2.5.4.1 Activity - Configured AE Requests MWL Query

##### 3.2.5.4.1.1 Description and Sequencing of Activity

When Modality Worklist SCUs query DS the queries run against the Scheduled Procedure Step Worklist (referred to hereafter as the 'SPS Worklist' or 'Worklist') in the MDS database. There is a configurable mapping between the Universal Service ID contained in the HL7 Order messages and one or more Requested Procedures within the DS database. A Requested Procedure may, in turn, map to 1 or more Scheduled Procedure Steps though the relation is usually 1-to-1. This mapping is also site-configurable. The relation between Accession Number (0008,0050) and Requested Procedure ID (0040,1001) is 1-to-1 within DS and these attributes have the same value in all MWL responses. Scheduled Procedure Step entries are added and removed from the Worklist as follows:

- Add Scheduled Procedure Step Entries Normal Pathway - As orders are received from the HIS via HL7 or entered using Ordering and Scheduling application, additions are made to the SPS Worklist in the MDS database per the mapping specified above.
- Add Scheduled Procedure Step Entries Exception Pathway – Users can interactively create additional Scheduled Procedure Step entries for a given Requested Procedure using the Procedure Update method in the MDS application. It may be necessary to create additional entries under certain conditions such as when it is discovered that a procedure must be redone after having previously been marked as completed. This does not apply to canceled procedures
- Remove Scheduled Procedure Step Entries Normal Pathway – An SPS entry is removed from the SPS Worklist under the following circumstances:  
As mentioned previously, DS supports to set the state of the procedure as it progresses from being ordered to being resulted and signed. Setting the procedure state may be initiated interactively via the

Procedure Update application (in MDS) or as a result of various events. An entry in the SPS Worklist is removed when the Requested Procedure that is the parent of the SPS is set to a configured status. This configuration is system-wide applying equally to all procedures. If configured to change the state of a Requested Procedure on receipt of an MPPS N-CREATE or N-SET referencing the procedure then the change in state may result in removal of SPS entries related to the procedure as described above.

- Remove Entries Exception Pathway – When a procedure is canceled all SPS entries related to that procedure are removed from the Worklist.
- Remove Entries Maintenance Pathway – SPS entries that are still in the Worklist can be removed manually or filtered out by date.

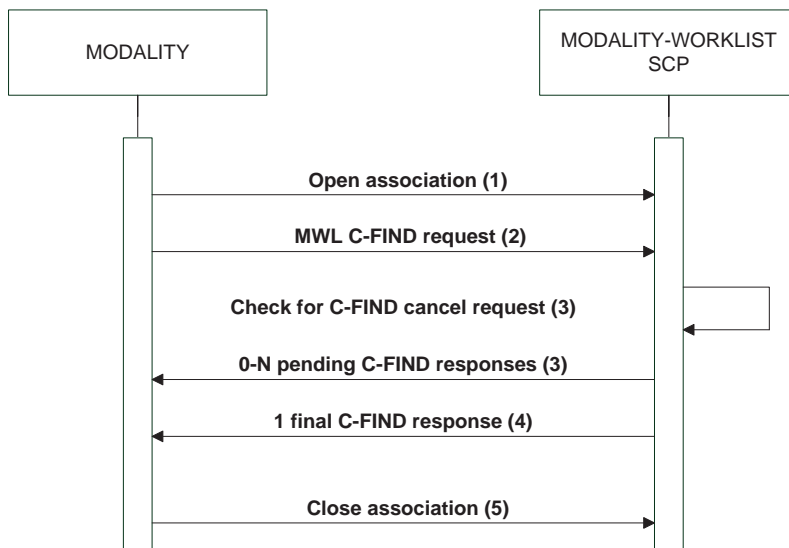
In the table below the following applies:

- To cause a given action to occur, MPPS messages must reference the parent Requested Procedure related to the SPS entry and applicable configuration must be in place.

Events	Scheduled Procedure Step Entry Actions
Order received from HIS	Add one or more Entries to Worklist
User adds SPS entry interactively	Add Entry to Worklist
MPPS message received that changes procedure state of parent procedure to status configured for removal of child SPS entry from Worklist	Remove Entry from Worklist
User removes SPS entry interactively	Remove Entry from Worklist
Parent procedure canceled	Remove one or more Entries from Worklist
Parent procedure set to a state that causes removal of child SPS entries from Worklist	Remove one or more Entries from Worklist

**Table 3-43: Scheduled procedure step entry actions table**

The following figure is a possible sequence of messages between a configured remote modality and the DS MWL-SCP:



**Figure 3-8: Sequencing diagram for activity: Configured AE requests MWL QUERY**



1. The modality opens an Association with DS for the purpose of querying for a Modality Worklist.
2. The Modality sends an MWL C-FIND query to DS.
3. DS queries its database using the attributes from the C-FIND Request and returns 0 to N C-FIND responses depending on matches returned from the database. DS checks for a C-FIND Cancel Request after a configured number of responses are sent. If a Cancel is received then no further Pending responses are sent.
4. DS sends the final C-FIND response.
5. The Modality closes the Association.

### 3.2.5.4.1.2 Accepted Presentation Contexts

MODALITY WORKLIST-SCP AE will accept Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

**Table 3-44: Acceptable Presentation Contexts for activity “Configured AE Requests MWL Query”**

### 3.2.5.4.1.3 SOP Specific Conformance for Modality Worklist SOP Class

MODALITY-WORKLIST-SCP supports the following matching key attributes:

Description/Module	Tag	Remark
<b>MWL Query by Patient</b>		
Patient's Name	(0010, 0010)	case insensitive
Patient ID	(0010, 0020)	single value matching
>Accession Number	(0008, 0050)	
>Requested Procedure ID	(0040, 1001)	
<b>Broad Worklist Query</b>		
Scheduled Procedure Step Start Date	(0040,0003)	date range accepted
Modality	(0008, 0060)	
Scheduled Performing Physician's Name	(0040, 0006)	case insensitive

**Table 3-45: Modality Worklist matching keys supported**

MODALITY-WORKLIST-SCP supports optional matching as described in the table below:

Description/Module	Tag	Remark
<b>Visit identification</b>		

Description/Module	Tag	Remark
Admission ID	(0038,0010)	

**Table 3-46: Modality Worklist optional matching keys supported**

MODALITY-WORKLIST-SCP supports optional return key attributes as described in the table below:

Description/Module	Tag	Remark
<b>Imaging Service Request</b>		
Placer Order Number / Imaging Service Request	(0040,2016)	
<b>Visit Admission</b>		
Referring Physician's Name	(0008,0090)	

**Table 3-47: Modality Worklist optional return keys supported**

Note that the corresponding fields must be present in the MDS database and values must either be provided by HIS via HL7 messages or entered interactively in the MDS.

MODALITY-WORKLIST-SCP returns C-FIND response statuses as specified below:

Service Status	Further Meaning	Error Code	Reasons
Success	Matching is complete	0000	The response status code and meaning are logged in the job log file.
Failure	Out of resources	A700	If the number of matches exceeds a configurable maximum this error code is returned. An error comment describing the error is also returned. The response status code and meaning are logged in the job log file.
	Identifier does not match SOP class	A900	This status is returned if the C-FIND request specifies query or Return keys that are not specified as part of the Modality Worklist Information Model – FIND SOP Class. The response status code and meaning are logged in the job log file.
	Unable to process	C001	This status is returned due to internal errors within DS such as a processing failure response on a query of the DS database. The response status code and meaning are logged in the job log file.
Canceled	Matching terminated due to cancel request	FE00	This status is returned if a Cancel Request is received from the SCU during the processing of a Modality Worklist request. The response status code and meaning are logged in the job log file.
Pending	Matching is continuing	FF00	The status is returned with each matching response. A message is logged for each pending response.
	Matching is continuing – Current match is supplied and any optional keys were supported in the same matter as required keys	FF01	The status is returned with each matching response if one or more optional matching or return keys are not supported for existence. A message is logged for each pending response.

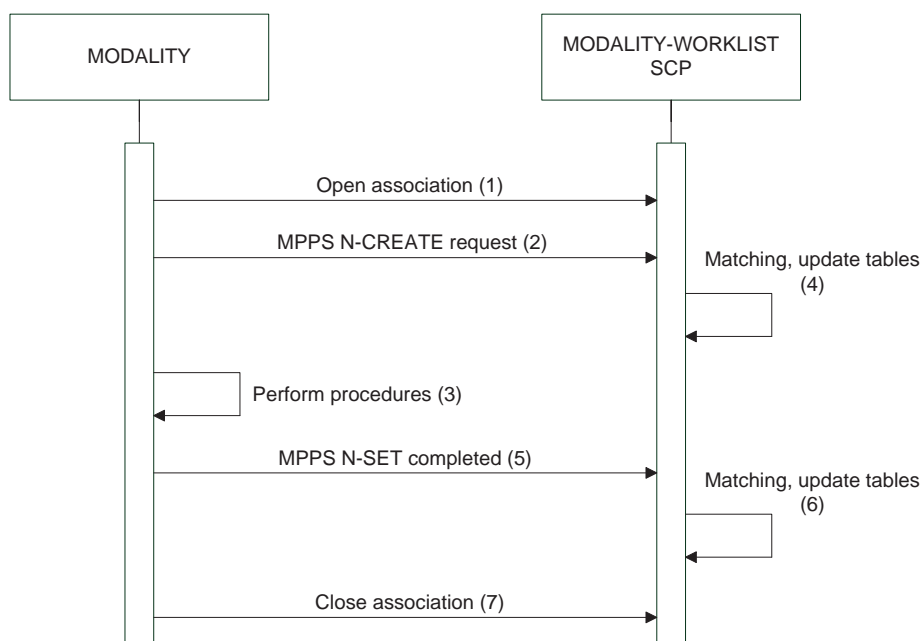
**Table 3-48: MWL C-FIND response status reasons**

### 3.2.5.4.2 Activity - Configured AE Makes Procedure Step Request

When a configured remote AE sends a conformant association request including one of the Modality Performed Procedure Step Presentation Contexts in the table below then DS will accept the Association.

#### 3.2.5.4.2.1 Description and Sequencing of Activities

The sequencing diagram below specifies a common flow of messages related to this activity. Prior to this sequence of messages it is necessary that orders have been received from the HIS interface or created via DS Ordering and Scheduling application. Attributes from the orders and created procedures, usually queried using MWL, will be included in the MPPS messages the Modality sends to DS. Key attributes in the MPPS N-CREATE and N-SET, specified below, are extracted and matched against values in the DS database. A match allows full update of all applicable DS database tables.



**Figure 3-9: Sequencing diagram for activity: Configured AE makes procedure step request**

The figure above is a possible sequence of messages and events for the Configured AE Makes Procedure Step Request activity.

1. The Modality opens an Association to update DS using MPPS.
2. The Modality sends an N-CREATE Request to indicate that it is performing one or more Requested Procedures.
3. The Modality performs all or part of the procedure(s).
4. DS stores the MPPS and executes the matching algorithm described in the conformance section below. If a successful match is found, then updates to various tables per the N-CREATE are performed. In the matching case, the procedure state of the procedure(s) referenced in the MPPS is updated if so configured.
5. The Modality sends an N-SET setting the status of the MPPS to COMPLETED.

6. DS stores the MPPS. If the N-CREATE for this step matched then updates are performed as specified in step 4.
7. The Modality closes the Association.

### 3.2.5.4.2.2 Accepted Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

**Table 3-49: Acceptable Presentation Contexts for activity “Configured AE Makes Procedure Step Request”**

### 3.2.5.4.2.3 SOP Specific Conformance for MPPS SOP Class

The table below lists all Modality Performed Procedure Step attributes, whether they may be created by N-CREATE and updated by N-SET and what parts of the MDS database they are used to update. The ‘Database Updates’ column considers updates separate from the storage of MPPS messages. If no value is present this indicates that there are is no update to the database associated with the given element.

Attribute Name	Tag	N-Create	N-Set	Database Updates
<b>SOP Common Module</b>				
<b>Performed Procedure Step Information</b>				
Performed Procedure Step Start Date	(0040,0244)	Y	N	Y
Performed Procedure Step Start Time	(0040,0245)	Y	N	Y
Performed Procedure Step End Date	(0040,0250)	Y	Y	Y
Performed Procedure Step End Time	(0040,0251)	Y	Y	Y

**Table 3-50: Supported N-SET/N-CREATE attributes for MPPS**

Note that this is the default setting. The mapping to the MDS database fields depends on the project-specific configuration. Different modalities may require other fields added or some fields removed from this list of supported return keys.

The list below details the behavior of DS on occurrence of certain MPPS events and with respect to the coercion of attributes and duration of storage of MPPS messages:

- Reception of a New MPPS Instance – The MPPS message is stored in the database. DS will then extract the StudyInstanceUID and Accession Numbers from the N-CREATE and try to match these values against the StudyInstanceUID and the Accession Numbers in the MDS database. If a non-matching N-CREATE is received, it and any following N-SETs will be ignored. Otherwise, DS will:
  - Update the MDS database with values contained in the N-CREATE per table above.
  - Update the state of each referenced procedure if so configured.

- Update of MPPS to 'DISCONTINUED' or 'COMPLETED' – The N-SET is stored in the database. If the preceding N-CREATE matched then the following is done:
  - The attribute values in the N-SET will be used to update the MDS database per table above.
  - Update the state of each referenced procedure if so configured.

Service Status	Further Meaning	Error Code	Reasons
Success	Successful completion of the N-SET or N-CREATE Request	0000	The response status code and meaning are logged in the job log file.
Failure	Processing Failure	0110	Internal error within DS. The response status code and meaning are logged in the job log file.
	Duplicate SOP Instance	0111	This status is returned when the SCU has attempted to N-CREATE a SOP Instance that has already been created. The response status code and meaning are logged in the job log file
	No such SOP Instance	0112	Status returned when the SCU is trying to SET a SOP instance which has not been created. The response status code and meaning are logged in the job log file
	Missing Attribute	0120	This status is returned if an attribute required to be sent in the N-CREATE or required to be sent before completion of the Procedure Step has not been sent. The response status code and meaning are logged in the job log file.

**Table 3-51: MPPS N-CREATE/N-SET response status reasons**

### 3.3 Network Interfaces

#### 3.3.1 Physical Network Interface

The DS DICOM applications are indifferent to the physical medium over which TCP/IP executes.

#### 3.3.2 Additional Protocols

DHCP support can be configured using the Windows Network Configuration. If DHCP is not configured a static IP address is assigned.

If DNS support exists on the local network, then DNS is used for address resolution (if configured so in Windows). The address of the DNS server is retrieved using DHCP if the DHCP option is enabled. If DNS is not supported then the hostnames and addresses are configured in the local hosts file.

### 3.4 Configuration

#### 3.4.1 AE Title/Presentation Address Mapping

##### 3.4.1.1 Local AE Titles

The mapping from AE Title to TCP/IP addresses and ports is configurable and set at the time of installation by Installation Personnel:

Application Entity	Role	Default AE Title	Default TCP/IP Port
MODALITY-WORKLIST-SCP	SCP	MNWLSCP	104
STORAGE-SCU	SCU	MNSTORESCU	None

Application Entity	Role	Default AE Title	Default TCP/IP Port
STORAGE-SCP	SCP	MNSTORESCP	111
QUERY-RETRIEVE-SCU	SCU	MNQRSCU	None

**Table 3-52: Default application entity characteristics**

#### 3.4.1.2 Remote AE Title/Presentation Address Mapping

The mapping of external AE Titles to TCP/IP addresses and ports is configurable and set at the time of installation by Installation Personnel. This mapping is necessary for resolving the IP address and port of Destination Application Entities addressed by the MDS and must be correctly configured for the STORAGE-SCP.

#### 3.4.2 Parameters

Parameter	Configurable	Default value
<b>General parameters</b>		
Maximum PDU size I can receive	Yes	1mb
Maximum PDU size I can send	Yes	128kbytes
ACSE timeout	Yes	30 s
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	No	60 s
DIMSE timeout	Yes	5 minutes

**Table 3-53: Configuration parameters**

#### **4 Media interchange**

DS does not support Media Storage.

## **5 Support of Extended Character Sets**

All DS DICOM applications support the following:

- ISO\_IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set)
- ISO\_IR 192 (UTF-8)

As well as supporting this Extended Character Set for DICOM messaging, the MDS database and user interface can support the expected display of this character set.



## **6 Security**

### **6.1 Security Profiles**

The DS does not conform to any security profile.

### **6.2 Association Level Security**

The STORAGE-SCP AE can be configured to check the following DICOM values when determining whether to accept Association Open Requests:

- Calling AE Title
- Application Context

The SCP AE can be configured to accept Association Requests from only a limited list of Calling AE Titles.

## 7 Annexes

### 7.1 IOD Contents

#### 7.1.1 Created SOP Instance(s)

Depending on the area of operations the DS may create the following IODs for SOP Instances:

IOD	Remarks
VL Endoscopic Image Storage	In conjunction with the OR1™ Communicator
Video Endoscopic Image Storage	In conjunction with the OR1™ Communicator
Secondary Capture Image Storage	In conjunction with the MDS “JPEG to DICOM” option or in conjunction with the OR1™ Communicator

The following tables specify the attributes used by the different IODs.

Abbreviations used to describe the presence of attributes / modules are:

- ALWAYS Always present
- ANAP Attribute not always present
- VNAP Value not always present (sent with zero length if no value is present)
- EMPTY Attribute is sent without a value
- NEVER Never present

Abbreviations used to describe the mapping / origins of attributes are:

- HL7 attribute value source is HL7 order management (ORM/SIU)
- MWL attribute value source is Modality Worklist
- USER attribute value is user input
- AUTO attribute value is generated automatically
- CONFIG attribute value is configurable parameter

#### 7.1.2 IOD Information entities

##### 7.1.2.1 VL Endoscopic Image IOD

IE	Module	Reference	Presence of Module
Patient	Patient		ALWAYS
	Clinical Trial Subject		NEVER
Study	General Study		ALWAYS
	Patient Study		NEVER
	Clinical Trial Study		NEVER
Series	General Series		ALWAYS
	Clinical Trial Series		NEVER
Equipment	General Equipment		ALWAYS
Image	General Image		ALWAYS
	Image Pixel		ALWAYS
	SOP Common		ALWAYS

IE	Module	Reference	Presence of Module
	Acquisition Context		ALWAYS
	VL Image		ALWAYS
	Overlay Plane		NEVER
	VOI LUT		ALWAYS

**Table 7-1: VL Endoscopic Image IOD**

**7.1.2.2 VIDEO Endoscopic Image IOD**

IE	Module	Reference	Presence of Module
Patient	Patient		ALWAYS
	Clinical Trial Subject		NEVER
Study	General Study		ALWAYS
	Patient Study		NEVER
	Clinical Trial Study		NEVER
Series	General Series		ALWAYS
	Clinical Trial Series		NEVER
Equipment	General Equipment		ALWAYS
Image	General Image		ALWAYS
	Image Pixel		ALWAYS
	SOP Common		ALWAYS
	Acquisition Context		ALWAYS
	VL Image		ALWAYS
	Overlay Plane		NEVER
	Cine		ALWAYS
	Multi-frame		ALWAYS
	VOI LUT		ALWAYS

**Table 7-2: Video Endoscopic Image IOD**

### 7.1.2.3 Secondary Capture Image IOD

IE	Module	Reference	Presence of Module
Patient	Patient		ALWAYS
	Clinical Trial Subject		NEVER
Study	General Study		ALWAYS
	Patient Study		NEVER
	Clinical Trial Study		NEVER
Series	General Series		ALWAYS
	Clinical Trial Series		NEVER
Equipment	General Equipment		NEVER
	SC Equipment		ALWAYS
Image	General Image		ALWAYS
	Image Pixel		ALWAYS
	SOP Common		ALWAYS
	SC Image		ALWAYS
	Overlay Plane		NEVER
	VOI LUT		ALWAYS

Table 7-3: Secondary Capture Image IOD

## 7.1.3 Common Modules

### 7.1.3.1 Secondary Capture Image IOD

#### 7.1.3.1.1 Patient Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Patient's Name	(0010,0010)	PN		ALWAYS	HL7/USER
Patient ID	(0010,0020)	LO		ALWAYS	HL7/USER
Patient's Birth Date	(0010,0030)	DA		VNAP	HL7/USER
Patient's Sex	(0010,0040)	CS		ALWAYS	HL7/USER

#### 7.1.3.1.2 General Study Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Study Date	(0008,0020)	DA		ALWAYS	HL7/USER
Study Time	(0008,0030)	TM		VNAP	HL7/USER
Accession Number	(0008,0050)	SH		ALWAYS	HL7/AUTO
Referring Physician's Name	(0008,0090)	PN		VNAP	HL7/USER
Study Description	(0008,1030)	LO		ALWAYS	HL7/USER
Study Instance UID	(0020,000D)	UI		ALWAYS	AUTO
Study ID	(0020,0010)	SH		ALWAYS	AUTO
Admission ID	(0038,0010)	LO		VNAP	HL7

### 7.1.3.1.3 General Series Modules of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Series Date	(0008,0021)	DA		ALWAYS	HL7/USER
Series Time	(0008,0031)	TM		VNAP	HL7/USER
Series Description	(0008,103E)	LO		ALWAYS	HL7/USER
Performing Physician's Name	(0008,1050)	PN		VNAP	HL7/USER
Body Part Examined	(0018,0015)	CS		NEVER	
Series Instance UID	(0020,000E)	UI		ALWAYS	AUTO
Series Number	(0020,0011)	IS		ALWAYS	AUTO

### 7.1.3.1.4 General Equipment Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Manufacturer	(0008,0070)	LO	KARL STORZ	ALWAYS	
Manufacturer's Model Name	(0008,1090)	LO		VNAP	
Software Versions	(0018,1020)	LO		VNAP	
Station Name	(0008,1010)	SH		VNAP	
Institution Name	(0008,0080)	LO		VNAP	CONFIG
Institution Address	(0008,0081)	ST		VNAP	CONFIG
Institutional Department Name	(0008,1040)	LO		VNAP	CONFIG

### 7.1.3.1.5 General Image Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Image Type	(0008,0008)	CS			
Content Date	(0008,0022)	DA		NEVER	
Content Time	(0008,0033)	TM		NEVER	
Instance Number	(0020,0013)	IS		ALWAYS	AUTO
Image Comment	(0020,4000)	LT		NEVER	
Lossy Image Compression	(0028,2110)	CS	1	ALWAYS	AUTO

### 7.1.3.1.6 Image Pixel Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Samples per Pixel	(0028,0002)	US			
Photometric Interpretation	(0028,0004)	CS			
Planar configuration	(0028,0006)	US			
Number of Frames	(0028,0008)	US			
Rows	(0028,0010)	US			
Columns	(0028,0011)	US			
Pixel Aspect Ratio	(0028,0034)	IS			
Bits Allocated	(0028,0100)	US			
Bits Stored	(0028,0101)	US			

Attribute Name	Tag	VR	Value	Presence	Source
High Bit	(0028,0102)	US			
Pixel Representation	(0028,0103)	US			

### 7.1.3.1.7 SOP Common Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Spec. character Set	(0008,0005)	CS			
SOP Class UID	(0008,0016)	UI			
SOP Instance UID	(0008,0018)	UI			

### 7.1.3.2 VL Endoscopic Image IOD / Video Endoscopic Image IOD

#### 7.1.3.2.1 Patient Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Patient's Name	(0010,0010)	PN		ALWAYS	MWL/USER
Patient ID	(0010,0020)	LO		ALWAYS	MWL/USER
Patient's Birth Date	(0010,0030)	DA		VNAP	MWL/USER
Patient's Sex	(0010,0040)	CS		ALWAYS	MWL/USER

#### 7.1.3.2.2 General Study Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Study Date	(0008,0020)	DA		ALWAYS	MWL/AUTO
Study Time	(0008,0030)	TM		VNAP	MWL/AUTO
Accession Number	(0008,0050)	SH		ALWAYS	MWL/USER
Referring Physician's Name	(0008,0090)	PN		VNAP	MWL/USER
Study Description	(0008,1030)	LO		ALWAYS	MWL/USER
Study Instance UID	(0020,000D)	UI		ALWAYS	MWL/AUTO
Study ID	(0020,0010)	SH		VNAP	MWL
Admission ID	(0038,0010)	LO		VNAP	MWL/USER

#### 7.1.3.2.3 General Series Modules of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Series Date	(0008,0021)	DA		ALWAYS	AUTO
Series Time	(0008,0031)	TM		ALWAYS	AUTO
Series Description	(0008,103E)	LO		VNAP	MWL/USER
Performing Physician's Name	(0008,1050)	PN		VNAP	MWL/USER
Operator's Name	(0008,1070)	PN		VNAP	USER
Body Part Examined	(0018,0015)	CS		VNAP	USER
Series Instance UID	(0020,000E)	UI		ALWAYS	AUTO
Series Number	(0020,0011)	IS		ALWAYS	AUTO
Performed Proc. Step Start Date	(0040,0244)	DA		ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence	Source
Performed Proc. Step Start Time	(0040,0245)	TM		ALWAYS	AUTO
Performed Proc. Step ID	(0040,0253)	LO		VNAP	AUTO
Performed Proc. Step Description	(0040,0254)	LO		VNAP	MWL/USER
Comments on the Perf. Proc. Step	(0040,0280)	ST		VNAP	USER

#### 7.1.3.2.4 General Equipment Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Manufacturer	(0008,0070)	LO	KARLSTORZ	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	Application dependent	ALWAYS	AUTO
Software Versions	(0018,1020)	LO		ALWAYS	AUTO
Station Name	(0008,1010)	SH		VNAP	CONFIG
Institution Name	(0008,0080)	LO		VNAP	CONFIG
Institution Address	(0008,0081)	ST		VNAP	CONFIG
Institutional Department Name	(0008,1040)	LO		NEVER	

#### 7.1.3.2.5 General Image Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Image Type	(0008,0008)	CS		ALWAYS	AUTO
Content Date	(0008,0022)	DA		ALWAYS	AUTO
Content Time	(0008,0033)	TM		ALWAYS	AUTO
Instance Number	(0020,0013)	IS		ALWAYS	AUTO
Image Comment	(0020,4000)	LT		VNAP	USER
Lossy Image Compression	(0028,2110)	CS	1	ALWAYS	AUTO

#### 7.1.3.2.6 Image Pixel Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Samples per Pixel	(0028,0002)	US		ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS		ALWAYS	AUTO
Planar configuration	(0028,0006)	US		ALWAYS	AUTO
Number of Frames	(0028,0008)	US		ALWAYS	AUTO
Rows	(0028,0010)	US		ALWAYS	AUTO
Columns	(0028,0011)	US		ALWAYS	AUTO
Pixel Aspect Ratio	(0028,0034)	IS		VNAP	AUTO
Bits Allocated	(0028,0100)	US		ALWAYS	AUTO
Bits Stored	(0028,0101)	US		ALWAYS	AUTO
High Bit	(0028,0102)	US		ALWAYS	AUTO
Pixel Representation	(0028,0103)	US		ALWAYS	AUTO

### 7.1.3.2.7 SOP Common Module of created SOP Instances

Attribute Name	Tag	VR	Value	Presence	Source
Spec. character Set	(0008,0005)	CS	ISO_IR 100 or ISO_IR 192	ALWAYS	CONFIG
SOP Class UID	(0008,0016)	UI		ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI		ALWAYS	AUTO

### 7.1.4 Usage of Attributes from Received IOD's

Fields from MPPS such as technique and supplies and how they are used:

Attribute Name	Tag	Database Updates
<b>SOP Common Module</b>		
<b>Performed Procedure Step Relationship Module</b>		
Scheduled Step Attribute Sequence	(0040,0270)	
>Accession Number	(0008,0050)	These attributes need to match values in the MDS database so other data contained in MPPS messages e.g. Dose and Materials data, can update the database and be displayed by the MDS application as described below
>StudyInstanceUID	(0020,000D)	
<b>Radiation Dose</b>		
Total Time of Fluoroscopy	(0040,0300)	Values are needed for these attributes so that dose exposure data can be displayed by the MDS application
Total Number of Exposures	(0040,0301)	
Distance Source to Detector	(0018,1110)	
Distance Source to Entrance	(0040,0306)	
Entrance Dose	(0040,0302)	
Exposed Area	(0040,0303)	
Image Area Dose Product	(0018,115E)	

**Table 7-4: Attributes in MPPS IOD used by DS/MDS applications**

❗ By altering the configuration it is possible to support additional or fewer Attributes.

### 7.1.5 MWL HL7 Attribute Mapping

The mapping between attributes received via HL7 from the HIS and those supplied in Modality Worklist is configurable.

The default mapping is contained in the table below. The information is sent as received in the respective HL7-fields by HIS:

DICOM Attribute	DICOM Tag	HL7 Attribute Name	HL7 Segment	Editable / Creatable in MDS
<b>Scheduled Procedure Step</b>				
Scheduled Procedure Step Sequence	(0040,0100)			
> Scheduled Station AET	(0040,0002)			YES
> Scheduled Procedure Step Start Date	(0040,0003)	Quantity/Timing	ORM OBR:27	YES
> Scheduled Procedure Step Start	(0040,0006)	Quantity/Timing	ORM OBR:27	YES



DICOM Attribute	DICOM Tag	HL7 Attribute Name	HL7 Segment	Editable / Creatable in MDS
Time				
> Modality	(0008,0060)			YES
> Scheduled Performing Physician's Name	(0040,0006)	Technician	ORM OBR:34	YES
> Scheduled Procedure Step Description	(0040,0007)	Universal Service Identifier	ORC OBR:4	YES
>Scheduled Station Name	(0040,0010)			YES
>Scheduled Protocol Code Sequence	(0040, 0008)			
>>Code Value	(0008, 0100)	Universal Service Identifier	ORC OBR:4	YES
>>Coding Scheme Designator	(0008, 0102)	Universal Service Identifier	ORC OBR:4	YES
>>Code Meaning	(0008, 0104)	Universal Service Identifier	ORC OBR:4	YES
> Scheduled Procedure Step ID	(0040,0009)	Placer Order Number	ORM OBR:2	YES
<b>Requested Procedure</b>				
Requested Procedure ID	(0040,1001)			YES
Requested Procedure Description	(0032,1060)	Universal Service Identifier	ORC OBR:4	YES
Study Instance UID	(0020,000D)			YES
<b>Imaging Service Request</b>				
Accession Number	(0008,0050)	Placer Order Number	ORM OBR:2	YES
Referring Physician's Name	(0008,0090)	Referring doctor	ORM PV1:8	YES
<b>Visit Identification</b>				
Admission ID	(0038,0010)		ADT PV1:19	
<b>Patient Identification</b>				
Patient's Name	(0010,0010)		ADT PID:5	YES
Patient ID	(0010,0020)		ADT PID:3	YES
<b>Patient Demographics</b>				
Patients Birth Date	(0010,0030)		ADT PID:7	
Patient's Sex	(0010,0040)		ADT PID:8	
Patient's Weight	(0010,1030)		ADT OBX:5	

**Table 7-5: HL7/Modality Worklist attribute mapping**

**i** For a more detailed description please refer to our HL7 Interface Statement available as a separate document.

### 7.1.6 Storage-SCP AE Element Use

The following Elements of Composite SOP Instances received by the STORAGE-SCP AE are of particular importance in the received images:

Module	Attribute Name	Tag ID	Type	Significance
Patient	Patient Name	(0010,0010)	Opt	Value is saved to database as separate first and last names. Only first and last names are entered in the DS database. Both first and last names can be a maximum of 30 characters each. Names will be parsed correctly if they are in the format of 'lname^fname'. If space separation is used (i.e. 'lname fname') then the entire name will be treated as the last name.
	Patient ID	(0010,0020)	Opt	Value is saved to database
	Patient's Birth Date	(0010,0030)	Opt	Value is saved to database
	Patient's Sex	(0010,0040)	Opt	Value is saved to database
General Study	Study Instance UID	(0020,000D)	Mand	If matched value(s) in the MDS exam list database, Composite SOP instance will be assigned to existing exam
	Study Date	(0008,0020)	Opt	Value is saved to database
	Accession Number	(0008,0050)	Opt	If matched value(s) in the MDS exam list database, Composite SOP instance may be assigned to existing exam (configurable)
	Study Description	(0008,1030)	Opt	Value is saved to database

General Series	Series Instance UID	(0020,000E)	Mand	Value is saved to database
SOP Common	SOP Instance UID	(0008,0018)	Mand	If a duplicate SOP Instance UID is received the system preserves the original object but does not report any error

**Table 7-6: Significant elements in received composite SOP instances**

SOP Instances conforming to the following Composite Image SOP Classes are fully supported for display on the system workstations:

Display support
US Image Storage (Retired)
US Image Storage
US Multi-frame Storage (Retired)
US Multi-frame Storage
Computed Radiography Image Storage
CT Image Storage
MR Image Storage
Secondary Capture Image Storage
VL Endoscopic Image Storage
Video Endoscopic Image Storage

Display support
BasicText SR Storage
Enhanced SR Storage
Comprehensive SR Storage

**Table 7-7: Supported composite image SOP classes for display**

- ① Note that only overlay information will be ignored for display purposes. Such information will still be stored and forwarded however.

### 7.1.7 Storage-SCU AE Element Modification

The following table contains a list of all Elements that can have a value modified by the STORAGE-SCU at the time of export using the Storage Service depending on the capabilities of the receiver:

Module	Attribute Name	Tag ID	Type	Significance
Patient	Patient Name	(0010,0010)	Opt	May be updated in case of patient reconciliation in the MDS
	Patient ID	(0010,0020)	Opt	May be updated in case of patient reconciliation in the MDS
	Patients Sex	(0010,0040)	Opt	May be updated in case of patient reconciliation in the MDS
	Patients Birth Date	(0010,0030)	Opt	May be updated in case of patient reconciliation in the MDS
Visit Identification	AdmissionID	(0038,0010)	Opt	May be updated in case of patient reconciliation in the MDS
Imaging Service Request	PlacerOrder NumberImaging ServiceRequest	(0040,2016)	Opt	May be updated in case of patient reconciliation in the MDS
General Study	Accession Number	(0008,0050)	Opt	May be updated in case of patient reconciliation in the MDS
	Study Description	(0008,1030)	Opt	May be updated in case of patient reconciliation in the MDS

**Table 7-8: STORAGE-SCU AE Element Modification**

### 7.2 Data Dictionary of Private Attributes

Private attributes may be added by the STORE-SCU into image IOD's in case of performed patient reconciliation in the MDS in order to store original attribute values:

Attribute Name	Tag ID	VR	Value
DS Private Creator	(0023,0010)	LO	
DS Private Changed Attributes	(0023,1000)	LO	List of changed Attributes and original content

**Table 7-9: Data dictionary of private attributes**

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