



# ***Kodak DICOM Adapter Service*** **DICOM Conformance Statement**

Kodak Mammography CAD System & Kodak Mammography Digitizing System

DAS Version 1.3.30

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## I. Conformance Statement Overview

The Kodak "DICOM adapter service" is software that implements a set of interfaces between the Kodak "CAD server" and digital sources and destinations. In particular it supports the Kodak "Mammography CAD System" by receiving and temporarily storing mammography cases and subsequently exporting the CAD reports corresponding to those cases. Specifically the DICOM adapter service provides storage for images in a digital mammography X-ray series that are pushed to it, and it pushes generated reports out to a configured storage provider.

The server also support the Kodak "Mammography Digitizing System" as an image source that sends cases to a configured DICOM destination - where the cases are comprise of images that have been digitized from films.

The following table summarizes the DICOM services that are implemented by this system:

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
<b>Transfer</b>		
Digital Mammography X-Ray Image Storage - For Presentation	yes	yes
Digital Mammography X-Ray Image Storage - For Processing	yes	yes
Secondary Capture Image Storage	yes	no
Mammography CAD SR Storage	yes	no
Grayscale Softcopy Presentation State Storage	yes	no
Stand-alone Overlay Storage	yes	no
<b>Workflow Management</b>		
Storage Commitment Push Model SOP Class	yes	yes
Modality Worklist Information Model FIND	yes	no

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## 3. Introduction

### 3.1. Revision History

The following table summarizes the history of this document:

Rev	CO	Description	Date	Author
0.1		first draft	04/18/05	pbh
0.2		Added DcmArchive (DICOM export of images)	10/17/05	pbh
1.0		Approved for Kansas release	11/15/05	pbh
1.1		Updates for MWLread and DcmOutput-OVL	04/04/06	pbh
2.0		Approved for Garuda release	9/11/06	pbh
2.1		Update to add storage commitment provider support	03/21/07	Jackie Meng
3.0	820	Approved for Digitized Priors Phase 2 Release	06/12/07	Craig Lambrecht
3.1		Update for supporting more aspect and view modifiers, and patient orientation mapping	07/16/07	Jackie Meng
4.0	826	Approved for DAS V1.3.22	07/31/07	Jackie Meng
4.1		Updates that apply to DAS V1.3.23 and DAS V1.3.24	10/23/07	Craig Lambrecht
5.0	835	Approved for Release	10/26/07	Craig Lambrecht
5.1		Updated according to Craig's comments	02/26/08	Jackie Meng
5.2		Add new added properties to DcmStore	02/29/08	Jackie Meng
5.3		Change logo to Carestream and update some content according to Craig's comments.	03/06/08	Jackie Meng
6.0	839	Approved for DAS 1.3.30	03/10/08	Jackie Meng

### 3.2. Audience

This document is intended for health system administrators, hospital staff, health system integrators, software designers and implementers. It is assumed that the reader has a working understanding of DICOM.

### 3.3. Remarks

This DICOM Conformance Statement by itself is not sufficient to guarantee successful connectivity between the Kodak Mammography System and equipment from other vendors. The following issues should be considered:

- The integration of equipment from different vendors (including Carestream Health) goes beyond the scope of the DICOM 3.0 standard and the DICOM Conformance Statements from Carestream Health and other vendors. It is the responsibility of the user (or user's agent) to assess the application requirements and to design a solution that integrates Carestream Health equipment with equipment from other vendors.
- When the comparison of this DICOM Conformance Statement with a DICOM Conformance Statement from another vendor indicates that connectivity should be possible, it is the responsibility of the user (or user's agent) to verify this by carrying out validation tests and to check whether all required functionality (such as correct display of CAD markers) is met.
- With regard to the future evolution of the DICOM 3.0 standard Carestream Health reserves the right to make changes to the Kodak Mammography System architecture described in this document. The user (or user's agent) should ensure that any equipment connected via DICOM to Carestream Health equipment also follows the future evolution of the DICOM 3.0 standard. Failure to do so may result in (partial) loss of connectivity.

### 3.4. Definitions, Terms and Abbreviations

The following acronyms and abbreviations are used in this document:

AE	Application Entity
CAD	Computer Aided Detection
DAS	DICOM Adapter Service
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
MG	Mammography
MWL	Modality Work List
PDU	Protocol Data Unit
SCU	Service Class User
SCP	Service Class Provider
SOP	Service-Object Pair
SR	Structured Report
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier

### 3.5. References

This conformance statement follows the template specified in:

- Digital Imaging and Communications in Medicine (DICOM) PS 3-2006.

## 4. Networking

### 4.1. Implementation Model

The Kodak DICOM Adapter Service is implemented as a Windows service, and this service hosts a number of adapters. Each adapter utilizes one or more DICOM services in order to implement some real world activity. DAS can host any number of types (here referred to as "classes") of adapter, and each class can be present multiple times (e.g., each can use a different communication port and a different AE title). This release of DAS includes five adapter classes:

- DcmArchive - a class which can be triggered to read cases digitized from films, and to export those to a configured destination.
- DcmStore - a class which acts as a Storage SCP in order to receive and temporarily store mammography x-ray cases for subsequent CAD processing,
- DcmOutput-SR - a class which converts CAD reports, and sends them out to a configured destination as Mammography CAD SR.
- DcmOutput-OVL - a class which converts CAD reports and sends them out to a configured destination as GSPS or stand-alone overlay objects.
- MWLread - a class which queries a Modality Work List provider to obtain meta-data for a case that is to be exported (via DcmArchive).

#### 4.1.1. Application Data Flow

The following diagram illustrates the application data flow:

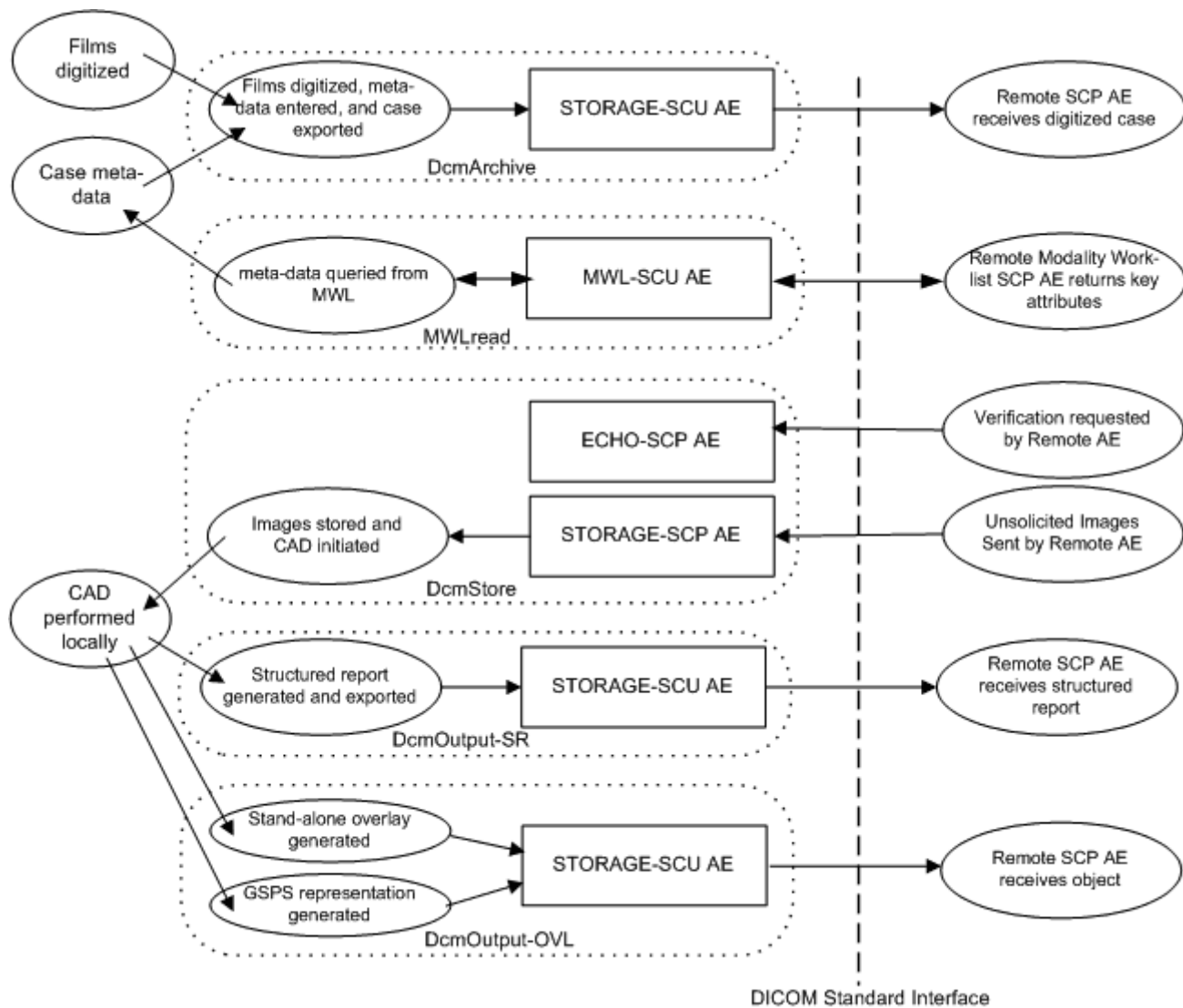


Figure 4.1 - Implementation Model

where the left side of the DICOM interface is the functionality implemented locally within DAS. This diagram shows six application entities - one a storage SCP, and three storage SCU. The required echo SCP is also implemented (in the same class that implements the Storage SCP). The sixth application entity is a modality work-list SCU.

The dotted borders surround the functionality implemented in the five adapters - "DcmArchive", "MWLread", "DcmStore", "DcmOutput-SR" and "DcmOutput-OVL". A default configuration of DAS has one instance each of these five classes - but there can be any number of instances of each in a single DAS. Each instance of one of these adapters thus includes the corresponding DICOM AE, and each of those has its own AE title.

As can be seen from the diagram, the ECHO-SCP and STORAGE-SCP are part of the same adapter, and so they share a single AE title. The implemented application entities are:

- ECHO-SCP - this corresponds to the real world activity "Verification requested by Remote AE". This activity is initiated by the Remote SCU AE to verify communications with a configured DcmStore AE destination.
- STORAGE-SCP - this corresponds to the real world activity "Unsolicited Images Sent by Remote AE". This AE supports the reception of the composite SOP classes discussed below in section 4.2.1.1. It responds as a Service

Class Provider to C-STORE requests from a Remote SCU AE.

- MWL-SCU - this corresponds to the real-world activity "Meta-data queries from Modality Work-list". This AE queries a remote work-list SCP for information on a particular case. The returned information is then used to populate the information needed for subsequent export the case.
- STORAGE-SCU - this corresponds to the real world activity "Films digitized, meta-data entered, and case exported". This AE sends digitized film images and associated meta-data to a configured Remote SCP AE (for storage and subsequent processing or display).
- STORAGE-SCU - this corresponds to the real world activity "Structured report generated and exported". This AE sends the generated structured reports to a configured Remote SCP AE (for storage and subsequent display).
- STORAGE-SCU - this corresponds to the real world activities "GSPS representation generated" and "Stand-alone overlay generated" and exported. This AE sends the generated overlay objects (encoded as either GSPS or stand-alone overlay objects) to a configured Remote SCP AE (for storage and subsequent display).

The diagram covers two usages, each with its own set of basic interactions:

- export of a case that has been digitized from film, which has the following basic interactions:
  - the user operates the Case Input Station (an accessory to the Kodak Mammography CAD System) to digitize films for a case.
  - the user enters a case identifier (string) that is associated with the digitized images that are stored to disk in separate files.
  - the information about each case, including where its images are stored, is recorded in a centralized database (known as the "procedure log").
  - optionally, a user (not necessarily the same user) operates another tool that enters ancillary information about the case - i.e., the meta-data required to complete the information needed for a DICOM export of the images comprising that case. This information is also stored in the procedure log.
  - an export of the case can be triggered by either of the users described in the preceding steps.
  - this results in a trigger message being sent to the DICOM Adapter Service.
  - the DICOM Adapter service receives the export request, and uses its configuration to determine which output adapter to utilize.
  - if there is not yet any meta-data associated with that case (e.g., it was just digitized from film, but there was no manual entry of meta-data), then an instance of the MWLread adapter is utilized to retrieve the meta-data for that case.
  - if there is meta-data associated with the case (either from manual entry, or the preceding step using an MWLread instance), the adapter service then forwards the export request to another output adapter (an instance of the DcmArchive adapter).
  - a DcmArchive instance then:
    - retrieves the case information from the procedure log,
    - opens a connection with the configured STORAGE-SCP,
    - reads the images for this case from disk and formats them as DICOM images with the appropriate meta data,
    - sends those images to the STORAGE-SCP,
    - closes the connection used to send the image to the STORAGE-SCP.
  - at the completion of the export, the status of the export (success or failure) is recorded with the action performed in the procedure log.
- reception of a case pushed to the system, with CAD performed, and the resultant report exported, which has the following basic interactions:
  - a remote AE (typically a digital mammography acquisition device) opens an association with DAS (with a configured DcmStore instance, using a known port and AE title). It may use the echo service at this time to verify connectivity.
  - the local AE (the connected DcmStore instance) accepts (or rejects, depending on the configuration) the requested association, and waits for images to be sent.

- the remote AE sends a number of images from a series that comprise a case for which CAD processing is desired.
- the local AE (the DcmStore instance) receives those images, and stores them temporarily on the local disk.
- the remote AE indicates that the case is completely sent by implementing (perhaps implicitly) one of the following:
  - closing the association (if DcmStore is configured to use this as a "case end" mechanism),
  - sending a different case on the same association (where "different" depends configurably on whether the case identification is to be considered as the study or series instance UID), or
  - not sending another image for the case (either on the same of a different association, if so configured) for longer than a configured period of time.
- the local AE (DcmStore instance) acts on the association closure to submit the case for CAD processing.
- the local CAD processing engine processes the case, and subsequently reports back to DAS that it has completed.
- one or more configured local instances of the DcmOutput-SR and/or DcmOutput-OVL classes are notified on completion of the CAD processing, and each such instance then retrieves the CAD reports and ancillary information, generating a corresponding DICOM object - a mammography CAD structured report object in the case of each DcmOutput-SR instance, and configurably either a GSPS or stand-alone overlay object in the case of each DcmOutput-OVL instance.
- the DcmOutput-SR and/or DcmOutput-OVL instance opens an association to a configured remote AE that implements a STORAGE-SCP.
- the generated DICOM object which encoded the CAD report is sent over the association.
- if storage commitment is configured for this adapter instance, storage commitment is used to indicate the completion of the transfer.
- the association is closed, and any temporary information related to the case is discarded.

The system does not have fixed limits on the number of input or output connections, nor on the number of simultaneous connections or pending jobs that can be handled. Naturally the system is still constrained by physical resources (memory, network bandwidth, disk space).

#### **4.1.2. Functional Definition of AEs**

The DICOM Adapter Service allocates a thread for the execution of each adapter instance, and each instance may utilize additional threads for simultaneous connections to that AE. However within the limits of system resources, it is appropriate to consider each service in isolation. The following subsections contain a functional definition for each individual local Application Entity.

##### **4.1.2.1. ECHO-SCP**

The ECHO-SCP (which is available in each DcmStore instance) listens for connections on the configured port for that instance. It accepts associations with Presentation Contexts for SOP Class of the Verification Service Class, and responds successfully to echo requests.

##### **4.1.2.2. STORAGE-SCP**

The STORAGE-SCP (which is available in each DcmStore instance) listens for connections on the configured port for that instance. It accepts associations with Presentation Contexts for SOP Classes of the Storage Service Class (see 4.2.1.1 below for the accepted SOP Classes), and stores the received images to the local file store from where they are subsequently retrieved for CAD processing, and later automatically deleted when the processing is completed.

#### 4.1.2.3. STORAGE-SCU

A STORAGE-SCU is implemented in each DcmArchive instance. On receipt of a request to export a film digitized case, DAS passes the case information to each output instance (configured by routing rules). Each such output instance then formats the images and associated case meta-data as images to be stored using a configurable SOP Class - by default "MG For Processing", but the export can also be as "MG For Presentation" or "Secondary Capture". This AE then opens an association with its configured remote Storage SCP, and sends the image instances to that AE.

A second STORAGE-SCU is implemented in each DcmOutput-SR instance. On completion of CAD processing, DAS passes the generated CAD report to each output instance (configured by routing rules), and then any output instance of the class DcmOutput-SR formats the report as a Mammography CAD SR. This AE then opens an association with a configured remote Storage SCP, and sends the SR instance to that AE.

A third STORAGE-SCU is implemented in each DcmOutput-OVL instance. On completion of CAD processing, DAS passes the generated CAD report to each output instance (configured by routing rules), and then any output instance of the class DcmOutput-OVL formats the report configurably as either a stand-alone overlay object or a grayscale softcopy presentation state object. This AE then opens an association with a configured remote Storage SCP, and sends the generated instance to that AE.

Each of these storage SCU entities also supports storage commitment as a user. This is a configurable option for each, but if configured, at the completion of the sending of the DICOM objects, a STORAGE-SCU instance issues an N-ACTION request to the SCP, which indicates the intent to transfer ownership of the objects to the SCP. The SCU then waits for the subsequent N-EVENT-REPORT request from the SCP, which indicates agreement to transfer the ownership of the requested instances.

#### 4.1.2.4. MWL-SCU

A MWL-SCU instance is implemented in each MWLread instance. This instance is triggered upon a request to export a case for which there is no meta-data. This results in the MWL-SCU instance issuing a request to the configured MWL SCP for the meta-data that corresponds to that case. The query passes one matching key, which is configurably mapped from the case identifying string. That mapping can be to the "patient ID", "study ID", or the "accession number". If the data can successfully be retrieved, then that meta-data is added to the local store of information for that case, and it can subsequently be exported (using an instance of DcmArchive).

### 4.1.3. Sequencing of Real World Activities

The following diagram (4.2) summarizes the real-world interactions that occur when a digitized film case is requested for export. In this example, the case meta-data is manually entered prior to digitization, but the order can also be reversed (digitization and then meta-data entry):

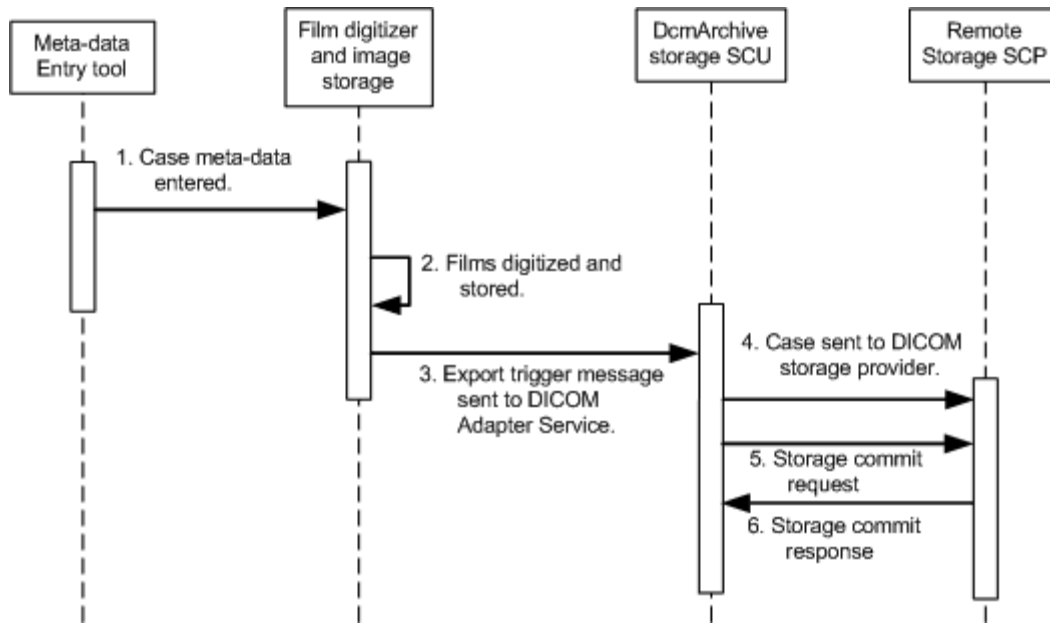


Figure 4.2 - Sequencing of real-world activities for a digitized film case being exported after manual entry of the case meta-data.

The following diagram (4.3) shows the same scenario, except that there is no manual entry of the case meta-data - in this case DAS is configured to utilize an instance of the MWLread instance to retrieve the meta-data, prior to export of the case:

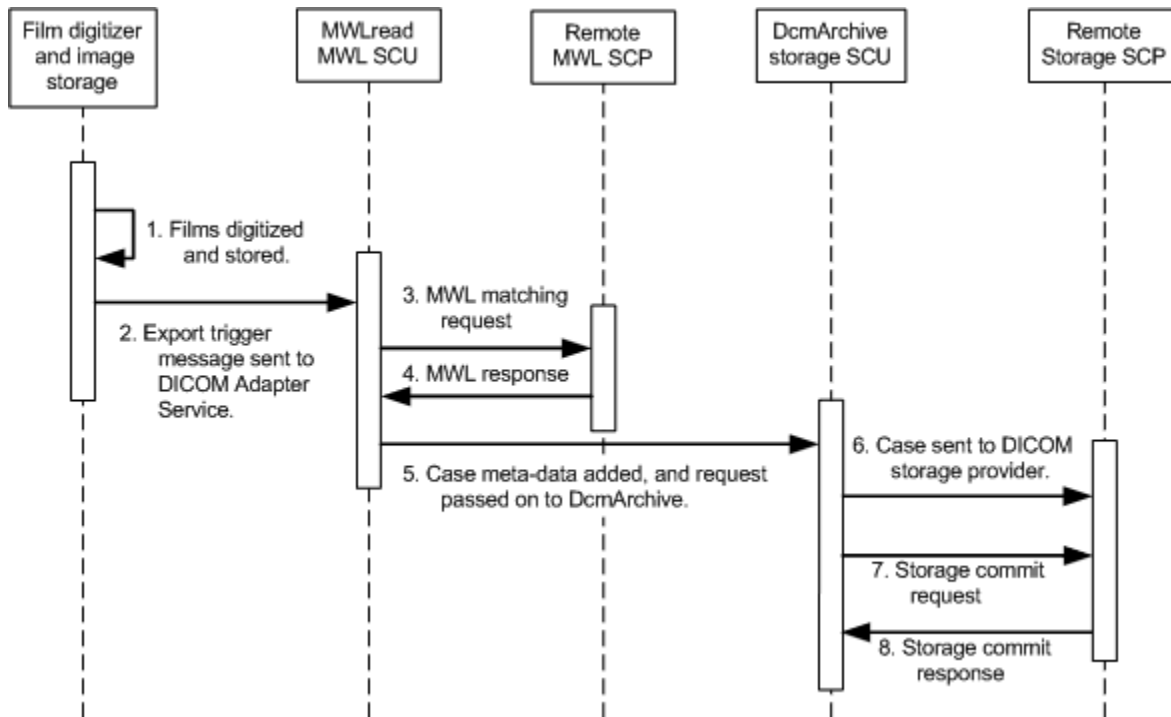


Figure 4.3 - Sequencing of real-world activities for a digitized film case being exported using MWL for meta-data retrieval.

The following diagram (4.4) summarizes the real-world interactions between two remote application entities, and the corresponding DAS agents.

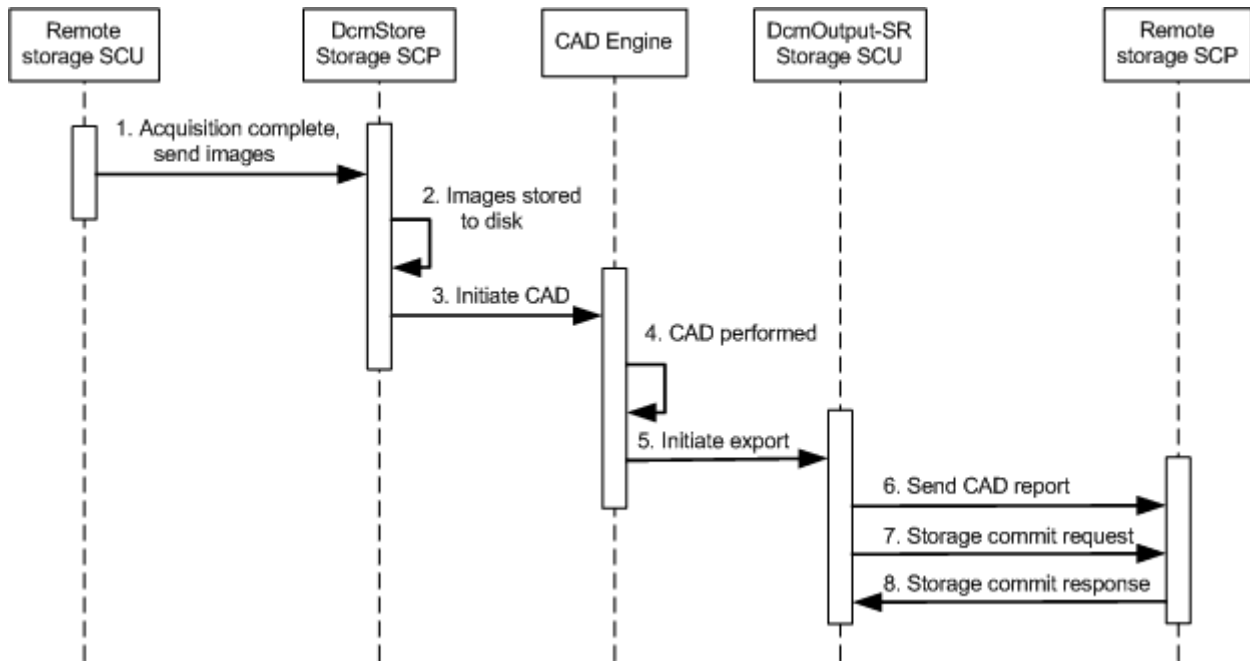


Figure 4.4 - Sequencing of real-world activities for a case pushed through the system for CAD processing.

The remote entities (the sender of the images and the receiver of the reports) may be implemented in the same or different systems. This sequence of activities can overlap asynchronously with any number of cycles of the same activities - i.e., there can be multiple of these work-flows active at any time - with the same or different remote entities, and with one or more instances of the local DcmStore and DcmOutput-SR adapters. When DcmOutput-OVL is used, it fills the same role in the above sequence as DcmOutput-SR.

## 4.2. AE Specifications

The following sub-sections specify the implemented application entities.

### 4.2.1. DcmArchive Application Entity Specification

This subsection specifies the DcmArchive application entity.

#### 4.2.1.1. SOP Classes

An instance of the DcmArchive Application Entity provides Standard Conformance to the following SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Digital Mammography X-Ray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	yes	no
Digital Mammography X-Ray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	yes	no
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	yes	no
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	yes	yes

#### 4.2.1.2. Association Policies

The following sub-sections describe the Association Establishment and Acceptance policies of an instance of DcmArchive.

##### 4.2.1.2.1. General

A DcmArchive AE initiates associations to a remote AE. It uses a PDU size of 256K Bytes.

The DICOM standard application context name for DICOM version 3.0 is proposed:

Application Context Name	I.2.840.10008.3.1.1.1
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##### 4.2.1.2.2. Number of Associations.

Each instance of DcmArchive supports a single association at one time, but there can be multiple DcmArchive instances in a single DAS deployment (each instance has a unique AE title and destination AE title and network port).

Maximum number of simultaneous associations per instance	1
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##### 4.2.1.2.3. Asynchronous Nature

Each association from an instance of DcmArchive performs a maximum of one transaction at any time - each association is implicitly tied to the transfer of a single "case".

Maximum number of outstanding asynchronous transactions on each association	1
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##### 4.2.1.2.4. Implementation Identifying Information

DcmArchive uses the following for Implementation Class UID and implementation version:

Implementation Class UID	I.2.840.113564.12.1.2
Implementation version name	DcmArchive **

where the version string is formed as the name of this adapter ("DcmArchive") with the major.minor version information of the release appended.

##### 4.2.1.3. Association Initiation Policy

Internally to the DICOM Adapter Service, requests to export digitized cases are queued and dispatched sequentially to the identified output adapters. The routing of such requests to specific output adapters is configurable, using an internal rules database. The net result is that any instance of the DcmArchive adapter class is passed a single output request at a time, and no others until that is completed. There can be several instances of DcmArchive, each with different configuration parameters, but from the viewpoint of a single instance (a single configuration), output processing is sequential.

Once an instance of DcmArchive receives a request from the DICOM Adapter Service to perform an export, it initiates

an association with the configured destination (Storage SCP). Note that DcmArchive may re-initiate an association as part of its error recovery procedure (see 4.2.1.3.1.3 below).

#### 4.2.1.3.1. Case generated and exported

A DcmArchive instance sends a DICOM image using a configured SOP Class to a configured remote SCP AE. The supported SOP Classes are as listed above- "MG For Processing" and "MG For Presentation", and "Secondary Capture".

##### 4.2.1.3.1.1. Description and Sequencing of Activities

A DcmArchive instance initiates a DICOM association using a command field of C-STORE and a SOP class of a composite image SOP. The assumed role of a DcmArchive is a STORAGE-SCU server and a storage commitment service user, as shown below in figure 4.5.

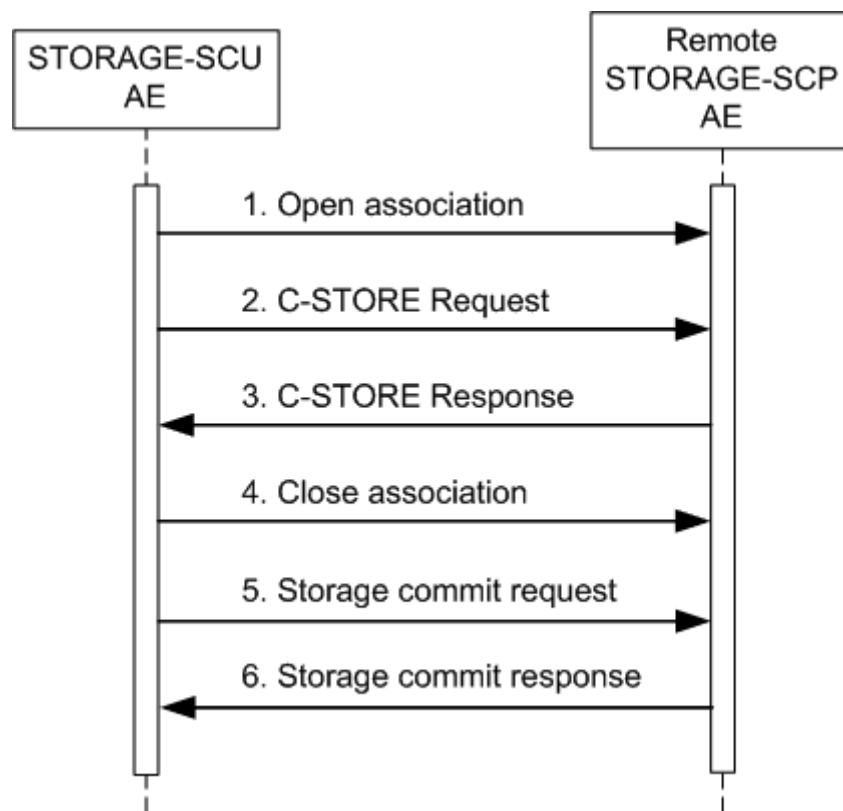


Figure 4.5 - Sequencing of activity: Case sent to a remote AE

The following sequencing interactions are performed by the STORAGE-SCU server when issuing exporting a case:

1. The STORAGE-SCU server opens an association with the remote STORAGE-SCP server
2. The STORAGE-SCU server sends a C-STORE-RQ message to the STORAGE-SCP server
3. The STORAGE-SCP server returns a C-STORE-RSP message to the STORAGE-SCU server
4. The STORAGE-SCU server closes the storage association.
5. The STORAGE-SCU opens an association with the storage commitment SCP, and sends an N-ACTION request to the SCP.
6. The STORAGE SCP sends an N-EVENT-REPORT request to the SCU, indicating that the ownership of the stored objects can be transferred to it.

4.2.1.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, DcmArchive (as a STORAGE-SCU) proposes the following Presentation Contexts:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Digital Mammography X-Ray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	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		
		JPEG Lossless Non Hierarchical First Order Prediction	1.2.840.10008.1.2.4.70		
Digital Mammography X-Ray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		JPEG Lossless Non Hierarchical First Order Prediction	1.2.840.10008.1.2.4.70		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ImplicitVRLittleEndian	1.2.840.10008.1.2		
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1		
		ExplicitVRBigEndian	1.2.840.10008.1.2.2		
		JPEG Lossless Non Hierarchical First Order Prediction	1.2.840.10008.1.2.4.70		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	ImplicitVRLittleEndian	1.2.840.10008.1.2		
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1		
		ExplicitVRBigEndian	1.2.840.10008.1.2.2		

4.2.1.3.1.3. SOP Specific Conformance for SOP Class(es)

DcmArchive handles DICOM error status during export as described in the following table:

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The storage of the case to the SCP is considered to have been successful. This association can now be closed by the SCU.
Refused	Out of Resources	A700-A7FF	The storage of the case to the SCP is considered to have been unsuccessful, due to a temporary lack of resources. The send will be retried. *
Error	Data Set does not match SOP Class	A900-A9FF	The storage of the case to the SCP is considered to have been unsuccessful, and it will not be resent to this destination. This association can now be closed by the SCU.
	Can not understand	C000-CFFF	
Warning	Coercion of Data Elements	B000	The storage of the case is considered to have been successful. This association can now be closed by the SCU.
	Data Set does not match SOP Class	B007	The storage of the case to the SCP is considered to be complete (whether successful or not cannot be determined by the SCU). This association can now be closed by the SCU.
	Elements Discarded	B006	The storage of the case to the SCP is considered to have been successful. This association can now be closed by the SCU.

DcmArchive handles DICOM error status during storage commitment as described in the following table:

Service Status	Further Meaning	Error Code	Behavior
			The storage commitment request is considered

Success	Success	0000	successful, and the association can be closed by the SCU.
Resource limitation	Out of Resources	0213	The storage commitment request is considered unsuccessful, the case will be re-sent to the SCP, and a storage commitment request will be re-issued if the case is stored successful by the SCP.
Others	Others	others	The storage commitment request is considered unsuccessful, the association will be closed, and the case will not be re-sent and storage commitment request will not be re-tried later.

and low-level failures:

Error condition	Behavior
Timeout expires for an expected DICOM PDU or TCP/IP packet.	An error message is output to the DAS trace log. *
Association A-REJECTed by the SCP.	
Association A-ABORTed by the SCP.	
Network layer indicates communication loss (i.e., low-level TCP/IP socket closure).	

where: \* means that the following retry model is followed:

The adapter retries the export a configured number of times ("RetryTimes" - see 4.4.1.2.2 below), pausing a configured number of seconds ("RetryInterval" - see 4.4.1.2.2 below) between retries.

In general, the behavior of DcmArchive following a communication failure is to try to re-initiate an association with the remote SCP. The number of retry attempts is configurable.

In addition, DcmArchive outputs status and error information into a trace log file that can be used to monitor and diagnose any problems that may arise. If any errors occur during DICOM communication, then appropriate messages are added to the trace log. The logged information can also be viewed on the user interface of the service tool (see [4.4](#) below).

#### 4.2.1.4. Association Acceptance Policy

For the storage commitment service, the DcmArchive can work in synchronize mode and asynchronous mode. If works in synchronize mode, the DcmArchive will not accept any association request. If work in asynchronous mode, the DcmArchive will listen on configured port number for association request about DICOM N-EVENT-REPORT. Each instance of DcmArchive waits and listens for incoming connection requests (on a configured port). When a connection request is accepted, a storage commitment provider service (a separate thread within DcmStore) is started by the listener, and DcmArchive continues to listen for additional incoming connection requests. The storage commitment provider within DcmArchive negotiates the association using the list of supported presentation contexts. If the association is accepted, then the DcmArchive instance start to process the subsequent N-EVENT-REPORT requests.

A DcmArchive instance will reject an association attempt if the called AE title does not match the title of this instance. Similarly, the association will be rejected if the calling AE title does not match a configured calling AE title for this instance.

The following chapters assume that the DcmArchive works in asynchronous mode.

##### 4.2.1.4.1. Activity - Verification requested by remote AE

The following sub-sections describe how the real world activity Verification requested by remote AE is handled by a DcmArchive instance.

**4.2.1.4.1.1. Description and sequencing of Activities**

A DcmArchive instance responds to C-ECHO requests to verify communication from a Remote SCU AE. This capability can be used as a diagnostic service tool for trouble shooting network communication issues.

If the incoming association contains a command field with a C-ECHO and an SOP Class of Verification SOP Class, the assumed role of the DcmArchive instance will become that of an ECHO-SCP.

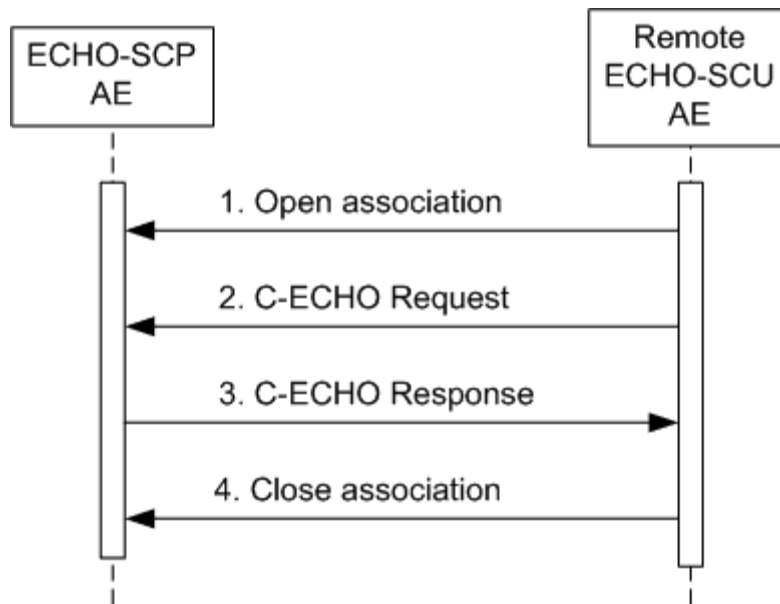


Figure 4.6 - Sequencing of activity: Verification requested by remote AE

The following sequencing interactions apply to the ECHO-SCP server when handling C-ECHO Requests:

1. The ECHO-SCP server accepts an association from a remote ECHO-SCU entity.
2. The remote ECHO-SCU entity sends a C-ECHO-RQ Message.
3. The ECHO-SCP server returns a C-ECHO-RSP Message to the remote ECHO-SCU entity.
4. The ECHO-SCP server closes the association.

**4.2.1.4.1.2. Accepted Presentation Contexts**

The ECHO-SCP server accepts the Presentation Contexts shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

**4.2.1.4.1.3. SOP Specific Conformance for SOP Class**

The ECHO-SCP server provides standard conformance as an SCP to the DICOM C-ECHO Operation Service defined in Part 7 and the Verification Service Class defined in Part 4 of the DICOM Standard.

The ECHO-SCP server returns the status codes shown in the next table:

Service Status	Further Meaning	Error Code	Reason
Success	Success	0	The echo request is considered to have been successfully handled, and the association can now be released.

**4.2.1.4.2. Activity - Unsolicited N-EVENT-REPORT-REQUEST sent by remote AE**

The following sub-sections describe how the real world activity Unsolicited N-EVENT-REPORT-REQUEST sent by remote AE is handled by a DcmArchive instance.

**4.2.1.4.2.1. Description and sequencing of Activities**

A DcmArchive instance accepts DICOM N-EVENT-REPORT-REQUEST sent to it from a Remote SCU AE.

If the incoming association contains a command field with a N-EVENT-REPORT-REQUEST and a list of referenced SOP class UID and SOP instance UID, the assumed role of the DcmArchive instance will become that of a N-EVENT-REPORT SCP server, as shown below in figure 4.7.

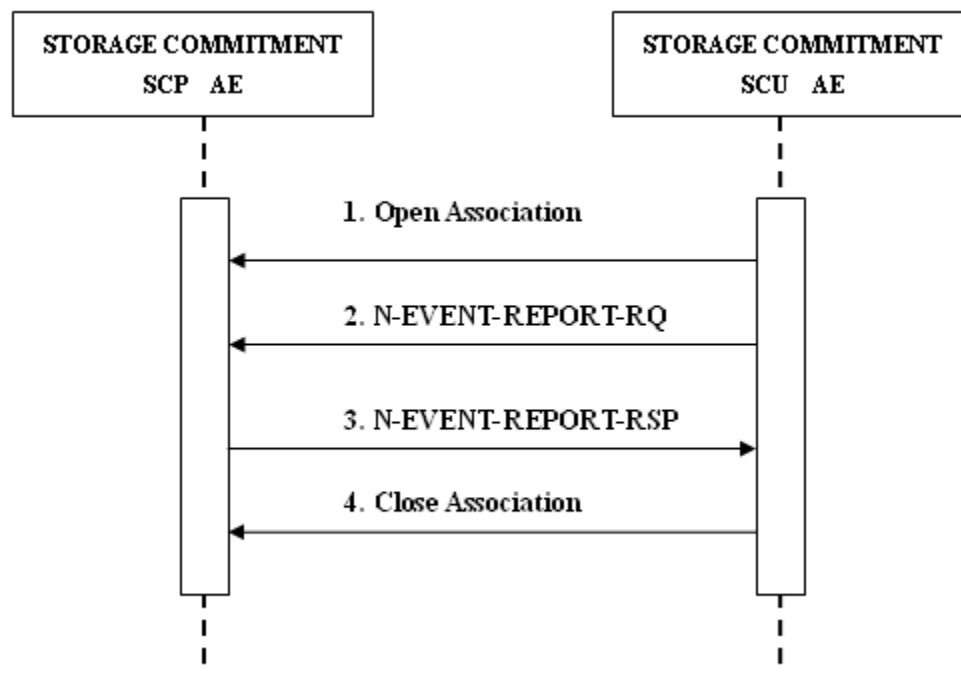


Figure 4.7 - Sequencing of activity: N-EVENT-REPORT-REQUEST sent by remote AE

The following sequencing interactions apply to the N-EVENT-REPORT server for handling N-EVENT-REPORT Requests.

1. The N-EVENT-REPORT-SCP server accepts an association from the remote N-EVENT-REPORT SCU entity.
2. The remote N-EVENT-REPORT-SCU entity sends a N-EVENT-REPORT-RQ message containing a list of success SOP Instances and failed SOP Instances if there are some.
3. The N-EVENT-REPORT-SCP server returns a N-EVENT-REPORT-RSP message to the N-EVENT-REPORT-SCU entity.
4. The N-EVENT-REPORT-SCU entity closes the association.

#### 4.2.1.4.2.2. Accepted Presentation Contexts

When works as a storage commitment service provider, the DcmArchive accepts the Presentation Contexts shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	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		

#### 4.2.1.4.2.3. SOP Specific Conformance for SOP Class

The N-EVENT-REPORT-SCP server provides standard conformance as a SCP to the DICOM N-EVENT-REPORT Operation Service defined in Part 7.

The associated activity handled by the N-EVENT-REPORT-SCP server is verifying the ownership of the images sent previously by the DcmArchive (as a storage SCU) has already be transferred to the remote storage SCP.

The N-EVENT-REPORT-SCP has no limit on the number of associations it can accept.

The N-EVENT-REPORT-SCP server returns the status codes shown in the following table when sending a N-EVENT-REPORT response.

Service Status	Further Meaning	Error Code	Reason
Success	Success	0	The status of image ownership transfer has been received successfully

## 4.2.2. DcmStore Application Entity Specification

This subsection specifies the DcmStore application entity.

### 4.2.2.1. SOP Classes

An instance of the DcmStore Application Entity provides Standard Conformance to the following SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Digital Mammography X-Ray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	no	yes
Digital Mammography X-Ray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	no	yes

### 4.2.2.2. Association Policies

The following sub-sections describe the Association Establishment and Acceptance policies of an instance of DcmStore.

#### 4.2.2.2.1. General

A DcmStore AE accepts associations that are initiated by a remote AE. It accepts any PDU size offered by the calling SCU, up a maximum of 256K Bytes.

The DICOM standard application context name for DICOM version 3.0 is accepted:

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

#### 4.2.2.2.2. Number of Associations.

Each instance of DcmStore can support any number if associations (subject to memory constraints), and there can be multiple DcmStore instances in a single DAS deployment (each instance has a unique AE title and port). There are no explicit rules governing number or simultaneity of associations.

Maximum number of simultaneous associations	Not Limited
---	-------------

#### 4.2.2.2.3. Asynchronous Nature

Each association with an instance of DcmStore can perform a maximum of one transaction - each association is implicitly tied to the transfer of a single "case".

Maximum number of outstanding asynchronous transactions on each association	1
---	---

#### 4.2.2.2.4. Implementation Identifying Information

DcmStore uses the following for Implementation Class UID and implementation version:

Implementation Class UID	1.2.840.113564.12.1.1
Implementation version name	DcmStore **

where the version string is formed as the name of this adapter ("DcmStore") with the major.minor version information of the release appended.

#### 4.2.2.3. Association Initiation Policy

An instance of DcmStore never initiates an association.

#### 4.2.2.4. Association Acceptance Policy

Each instance of DcmStore waits and listens for incoming connection requests (on a configured port). When a connection request is accepted, a storage provider service (a separate thread within DcmStore) is started by the listener, and DcmStore continues to listen for additional incoming connection requests. The storage provider within DcmStore negotiates the association using the list of supported presentation contexts. If the association is accepted, then the DcmStore instance proceeds to process the subsequent image storage requests.

A DcmStore instance will reject an association attempt if the called AE title does not match the title of this instance, and the instance is not set to match any called AE title. Similarly, the association will be rejected if the calling AE title does not match a configured calling AE title for this instance, and the instance is not set to allow connections from any calling AE.

The following two sub-sections describe the acceptance policies for the echo and storage activities implemented by DcmStore.

#### 4.2.2.4.1. Activity - Verification requested by remote AE

The following sub-sections describe how the real world activity Verification requested by remote AE is handled by a DcmStore instance.

##### 4.2.2.4.1.1. Description and sequencing of Activities

A DcmStore instance responds to C-ECHO requests to verify communication from a Remote SCU AE. This capability can be used as a diagnostic service tool for trouble shooting network communication issues.

If the incoming association contains a command field with a C-ECHO and an SOP Class of Verification SOP Class, the assumed role of the DcmStore instance will become that of an ECHO-SCP.

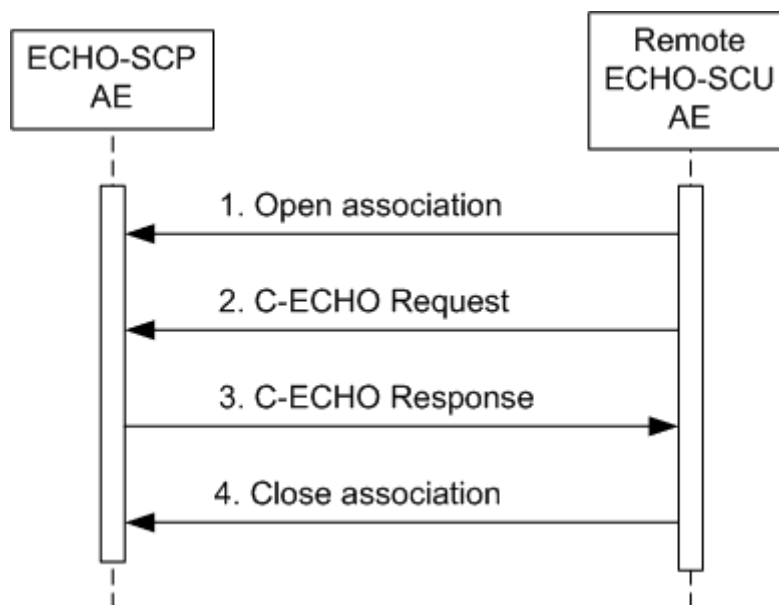


Figure 4.8 - Sequencing of activity: Verification requested by remote AE

The following sequencing interactions apply to the ECHO-SCP server when handling C-ECHO Requests:

1. The ECHO-SCP server accepts an association from a remote ECHO-SCU entity.
2. The remote ECHO-SCU entity sends a C-ECHO-RQ Message.
3. The ECHO-SCP server returns a C-ECHO-RSP Message to the remote ECHO-SCU entity.
4. The ECHO-SCP server closes the association.

##### 4.2.2.4.1.2. Accepted Presentation Contexts

The ECHO-SCP server accepts the Presentation Contexts shown in the following table:

Presentation Context Table						
Abstract Syntax			Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID			
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None	

**4.2.2.4.1.3. SOP Specific Conformance for SOP Class**

The ECHO-SCP server provides standard conformance as an SCP to the DICOM C-ECHO Operation Service defined in Part 7 and the Verification Service Class defined in Part 4 of the DICOM Standard.

The ECHO-SCP server returns the status codes shown in the next table:

Service Status	Further Meaning	Error Code	Reason
Success	Success	0	The echo request is considered to have been successfully handled, and the association can now be released.

**4.2.2.4.2. Activity - Unsolicited images sent by remote AE**

The following sub-sections describe how the real world activity Unsolicited images sent by remote AE is handled by a DcmStore instance.

**4.2.2.4.2.1. Description and sequencing of Activities**

A DcmStore instance accepts DICOM images sent to it from a Remote SCU AE.

If the incoming association contains a command field with a C-STORE and a SOP Class of a Composite Image SOP, the assumed role of the DcmStore instance will become that of a STORAGE-SCP server.

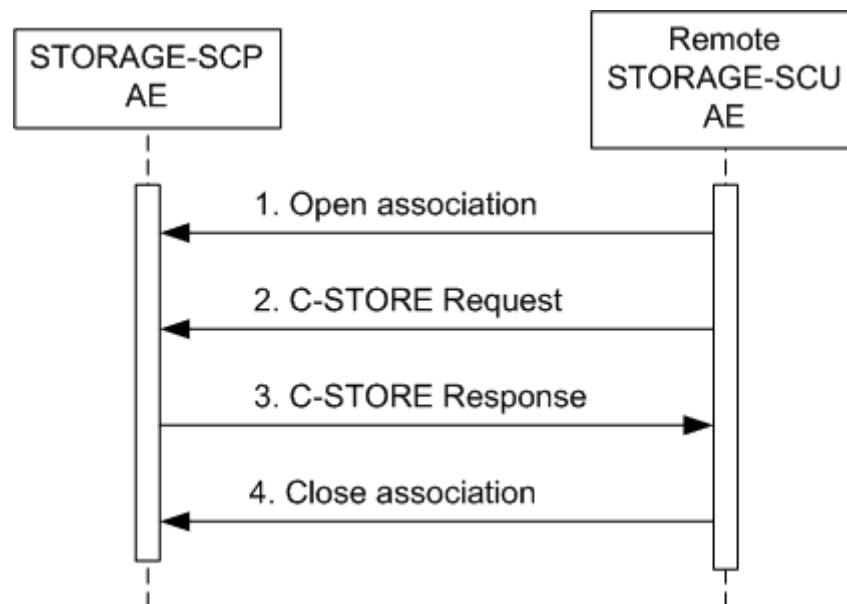


Figure 4.9 - Sequencing of activity: Unsolicited images sent by remote AE

The following sequencing interactions apply to the STORAGE-SCP server for handling C-STORE Requests. Steps 2 and 3 can be repeated for each composite SOP instance.

1. The STORAGE-SCP server accepts an association from the remote STORAGE SCU entity.
2. The remote STORAGE-SCU entity sends a C-STORE-RQ message containing a Composite SOP Instance.
3. The STORAGE-SCP server returns a C-STORE-RSP message to the STORAGE-SCU entity.
4. The STORAGE-SCU entity closes the association.

As shown above (see section 4.1.1) closure of the association is one (configurable) way to indicate completion of the case, and this in turn triggers the start of CAD processing for that case. However the STORAGE-SCP server can also determine case complete when the case identity changes (which is configurably interpreted as a change in the series or study instance UID, and the constraint is at one time only one image source send cases to DAS), or when there is no activity for this case for more than a configured period of time (see section 4.4.2 below for details on the configurable settings of DcmStore).

#### 4.2.2.4.2.2. Accepted Presentation Contexts

The STORAGE-SCP server accepts the Presentation Contexts shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Digital Mammography X-Ray Image Storage For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	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		
		JPEG Lossless Non Hierarchical First Order Prediction	1.2.840.10008.1.2.4.70		
Digital Mammography X-Ray Image Storage For Presentation	1.2.840.10008.5.1.4.1.1.1.2	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		
		JPEG Lossless Non Hierarchical First Order Prediction	1.2.840.10008.1.2.4.70		

#### 4.2.2.4.2.3. SOP Specific Conformance for SOP Class

The STORAGE-SCP server provides standard conformance as a SCP to the DICOM C-STORE Operation Service defined in Part 7 and the Storage Service Class defined in Part 4 of the DICOM Standard.

The associated activity handled by the STORAGE-SCP server is the storage of the image data received over the network to the local hard disk. The STORAGE-SCP server returns a failure status if it is unable to perform this task.

The STORAGE-SCP has no limit on the number of associations it can accept. However all images transferred over a single association (from open to close) are considered to be part of one case for CAD processing.

The STORAGE-SCP server is Level 0 (local) conformant as a Storage SCP. A subset of the elements are stored in a local database (called the "procedure log") to support subsequent export of the generated CAD report. Refer to the Annex 8.2 for the list of elements that are stored in the procedure log when a composite SOP instance is received.

The behavior for handling a duplicate SOP Instance if it conflicts with an existing SOP Instance UID is to process the new SOP again - as a case is completely received, CAD is processed on it. Thus if the same SOP arrives twice, then

likewise, there will be two CAD reports exported.

The average throughput performance has been determined to be approximately 2.5 MBytes per second on a 100-Megabit Ethernet network. Actual performance depends greatly on the performance of the local disk, the number of simultaneous active associations, and the underlying network performance.

The STORAGE-SCP server returns the status codes shown in the following table when sending a C-STORE response.

Service Status	Further Meaning	Error Code	Reason
Success	Success	0	Images received and stored OK
Error	Out of resources	0xA700	Saving of one or more images failed.

### 4.2.3. DcmOutput-SR Application Entity Specification

This subsection specifies the DcmOutput-SR application entity.

#### 4.2.3.1. SOP Classes

An instance of the DcmOutput-SR Application Entity provides Standard Conformance to the following SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	yes	no
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	yes	yes

#### 4.2.3.2. Association Policies

The following sub-sections describe the Association Establishment and Acceptance policies of an instance of DcmOutput-SR.

##### 4.2.3.2.1. General

A DcmOutput-SR AE initiates associations to a remote AE. It uses a PDU size of 256K Bytes.

The DICOM standard application context name for DICOM version 3.0 is proposed:

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

##### 4.2.3.2.2. Number of Associations.

Each instance of DcmOutput-SR supports a single association at one time, but there can be multiple DcmOutput-SR instances in a single DAS deployment (each instance has a unique AE title and destination AE title and network port).

Maximum number of simultaneous associations per instance	1
--	---

##### 4.2.3.2.3. Asynchronous Nature

Each association from an instance of DcmOutput-SR performs a maximum of one transaction at any time - each association is implicitly tied to the transfer of a single "case".

Maximum number of outstanding asynchronous transactions on each association	1
---	---

#### 4.2.3.2.4. Implementation Identifying Information

DcmOutput-SR uses the following for Implementation Class UID and implementation version:

Implementation Class UID	1.2.840.113564.12.1.3
Implementation version name	DcmOutput-SR *.*

where the version string is formed as the name of this adapter ("DcmOutput-SR") with the major.minor version information of the release appended.

#### 4.2.3.3. Association Initiation Policy

Internally to the DICOM Adapter Service, requests to export CAD reports are queued and dispatched sequentially to the identified output adapters. The routing of CAD reports to specific output adapters is configurable, using an internal rules database. The net result is that any instance of the DcmOutput-SR adapter class is passed a single output request at a time, and no others until that is completed. There can be several instances of DcmOutput-SR, each with different configuration parameters, but from the viewpoint of a single instance (a single configuration), output processing is sequential.

Once an instance of DcmOutput-SR receives a request from the DICOM Adapter Service to perform an export, it initiates an association with the configured destination (Storage SCP). Note that DcmOutput-SR may re-initiate an association as part of its error recovery procedure (see 4.2.3.3.1.3 below).

##### 4.2.3.3.1. Structured Report generated and exported

A DcmOutput-SR instance sends a DICOM CAD Mammography Structured Report to a configured remote SCP AE.

##### 4.2.3.3.1.1. Description and Sequencing of Activities

A DcmOutput-SR instance initiates a DICOM association using a command field of C-STORE and a SOP class of a Mammography CAD SR SOP. The assumed role of a DcmOutput-SR is a STORAGE-SCU server and a storage commitment service user, as shown below in figure 4.10.

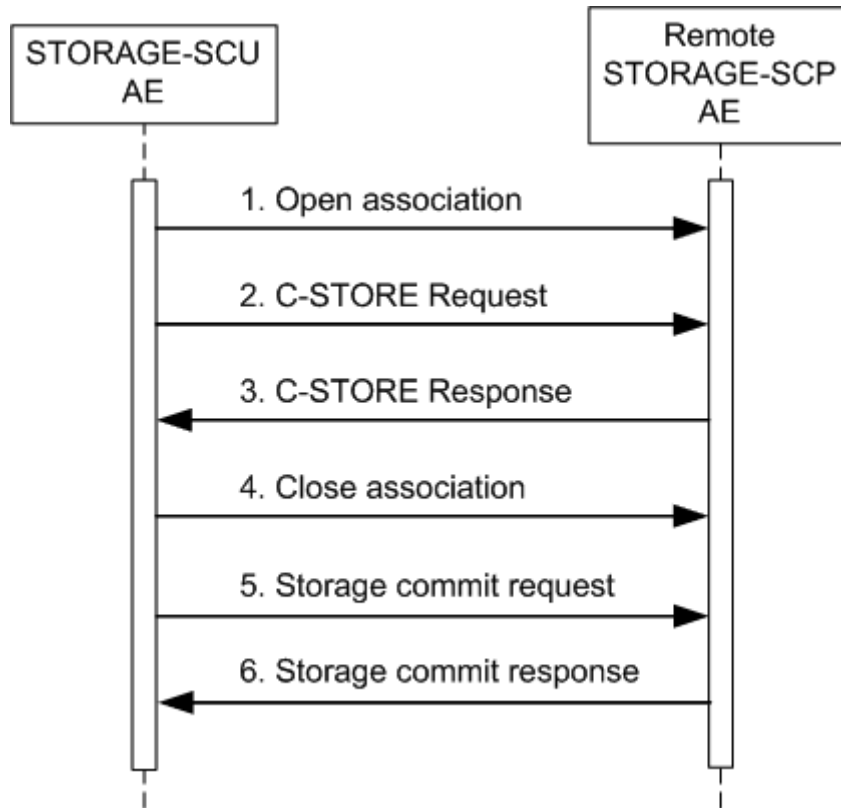


Figure 4.10 - Sequencing of activity: Report sent to a remote AE

The following sequencing interactions are performed by the STORAGE-SCU server when exporting a report:

1. The STORAGE-SCU server opens an association with the remote STORAGE-SCP server
2. The STORAGE-SCU server sends a C-STORE-RQ message to the STORAGE-SCP server
3. The STORAGE-SCP server returns a C-STORE-RSP message to the STORAGE-SCU server
4. The STORAGE-SCU server closes the association.
5. The STORAGE-SCU opens an association with the storage commitment SCP, and sends an N-ACTION request to the SCP.
6. The STORAGE SCP sends an N-EVENT-REPORT request to the SCU, indicating that the ownership of the stored objects can be transferred to it.

**4.2.3.3.1.2. Proposed Presentation Contexts**

Each time an association is initiated, DcmOutput-SR (as a STORAGE-SCU) proposes the following Presentation Contexts:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	ImplicitVRLittleEndian	1.2.840.10008.1.2	SCU	None
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1		
		ExplicitVRBigEndian	1.2.840.10008.1.2.2		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	ImplicitVRLittleEndian	1.2.840.10008.1.2		
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1		
		ExplicitVRBigEndian	1.2.840.10008.1.2.2		

4.2.3.3.1.3. SOP Specific Conformance for SOP Class(es)

DcmOutput-SR handles DICOM error status during export as described in the following table:

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The storage of the structured report to the SCP is considered to have been successful. This association can now be closed by the SCU.
Refused	Out of Resources	A700-A7FF	The storage of the structured report to the SCP is considered to have been unsuccessful, due to a temporary lack of resources. The send will be retried. *
Error	Data Set does not match SOP Class	A900-A9FF	The storage of the structured report to the SCP is considered to have been unsuccessful, and it will not be resent to this destination. This association can now be closed by the SCU.
	Can not understand	C000-CFFF	
Warning	Coercion of Data Elements	B000	The storage of the structured report is considered to have been successful. This association can now be closed by the SCU.
	Data Set does not match SOP Class	B007	The storage of the structured report to the SCP is considered to be complete (whether successful or not cannot be determined by the SCU). This association can now be closed by the SCU.
	Elements Discarded	B006	The storage of the structured report to the SCP is considered to have been successful. This association can now be closed by the SCU.

DcmOutput-SR handles DICOM error status during storage commitment as described in the following table:

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The storage commitment request is considered successful, and the association can be closed by the SCU.
Resource limitation	Out of Resources	0213	The storage commitment request is considered unsuccessful, the SR will be re-sent to the SCP, and a storage commitment request will be re-issued if the SR is stored successful by the SCP.
Others	Others	others	The storage commitment request is considered unsuccessful, the association will be closed, and the SR will not be re-sent and storage commitment request will not be re-tried later.

and low-level failures:

Error condition	Behavior
Timeout expires for an expected DICOM PDU or TCP/IP packet.	An error message is output to the DAS trace log. *
Association A-REJECTed by the SCP.	
Association A-ABORTed by the SCP.	
Network layer indicates communication loss (i.e., low-level TCP/IP socket closure).	

where: \* means that the following retry model is followed:

The adapter retries the export a configured number of times ("RetryTimes" - see 4.4.2 below), pausing a configured number of seconds ("RetryInterval" - see 4.4.2 below) between retries.

In general, the behavior of DcmOutput-SR following a communication failure is to try to re-initiate an association with the remote SCP. The number of retry attempts is configurable.

In addition, DcmOutput-SR outputs status and error information into a trace log file that can be used to monitor and diagnose any problems that may arise. If any errors occur during DICOM communication, then appropriate messages are added to the trace log. The logged information can also be viewed on the user interface of the service tool (see [4.4](#) below).

#### **4.2.3.4. Association Acceptance Policy**

For the storage commitment service, the DcmOutput-SR can work in synchronize mode and asynchronous mode. If works in synchronize mode, the DcmOutput-SR will not accept any association request. If work in asynchronous mode, the DcmOutput-SR will listen on configured port number for association request about DICOM N-EVENT-REPORT. Each instance of DcmOutput-SR waits and listens for incoming connection requests (on a configured port). When a connection request is accepted, a storage commitment provider service (a separate thread within DcmOutput-SR) is started by the listener, and DcmOutput-SR continues to listen for additional incoming connection requests. The storage commitment provider within DcmOutput-SR negotiates the association using the list of supported presentation contexts. If the association is accepted, then the DcmOutput-SR instance start to process the subsequent N-EVENT-REPORT requests.

A DcmOutput-SR instance will reject an association attempt if the called AE title does not match the title of this instance. Similarly, the association will be rejected if the calling AE title does not match a configured calling AE title for this instance.

The following chapters assume that the DcmOutput-SR works in asynchronous mode.

##### **4.2.3.4.1. Activity - Verification requested by remote AE**

The following sub-sections describe how the real world activity Verification requested by remote AE is handled by a DcmOutput-SR instance.

###### **4.2.3.4.1.1. Description and sequencing of Activities**

A DcmOutput-SR instance responds to C-ECHO requests to verify communication from a Remote SCU AE. This capability can be used as a diagnostic service tool for trouble shooting network communication issues.

If the incoming association contains a command field with a C-ECHO and an SOP Class of Verification SOP Class, the assumed role of the DcmOutput-SR instance will become that of an ECHO-SCP.

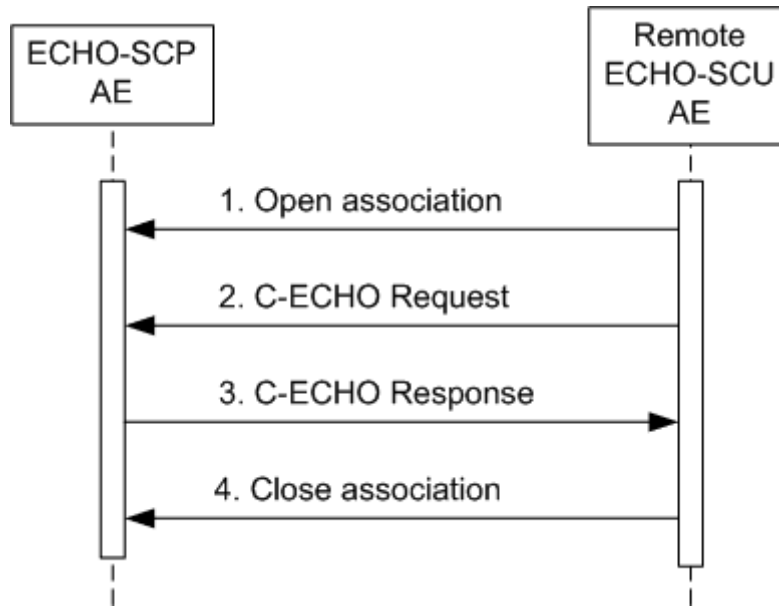


Figure 4.11 - Sequencing of activity: Verification requested by remote AE

The following sequencing interactions apply to the ECHO-SCP server when handling C-ECHO Requests:

1. The ECHO-SCP server accepts an association from a remote ECHO-SCU entity.
2. The remote ECHO-SCU entity sends a C-ECHO-RQ Message.
3. The ECHO-SCP server returns a C-ECHO-RSP Message to the remote ECHO-SCU entity.
4. The ECHO-SCP server closes the association.

**4.2.3.4.1.2. Accepted Presentation Contexts**

The ECHO-SCP server accepts the Presentation Contexts shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

**4.2.3.4.1.3. SOP Specific Conformance for SOP Class**

The ECHO-SCP server provides standard conformance as an SCP to the DICOM C-ECHO Operation Service defined in Part 7 and the Verification Service Class defined in Part 4 of the DICOM Standard.

The ECHO-SCP server returns the status codes shown in the next table:

Service Status	Further Meaning	Error Code	Reason
Success	Success	0	The echo request is considered to have been successfully handled, and the association can now be released.

**4.2.3.4.2. Activity - Unsolicited N-EVENT-REPORT-REQUEST sent by remote AE**

The following sub-sections describe how the real world activity Unsolicited N-EVENT-REPORT-REQUEST sent by remote AE is handled by a DcmOutput-SR instance.

#### 4.2.3.4.2.1. Description and sequencing of Activities

A DcmOutput-SR instance accepts DICOM N-EVENT-REPORT-REQUEST sent to it from a Remote SCU AE.

If the incoming association contains a command field with a N-EVENT-REPORT-REQUEST and a list of referenced SOP class UID and SOP instance UID, the assumed role of the DcmOutput-SR instance will become that of a N-EVENT-REPORT SCP server.

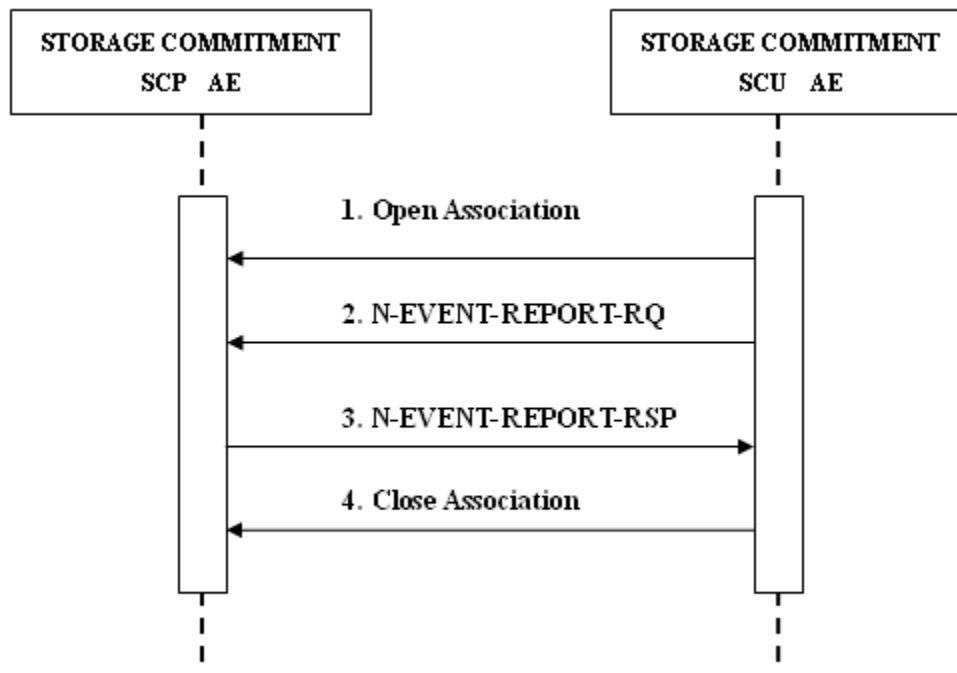


Figure 4.12 - Sequencing of activity: N-EVENT-REPORT-REQUEST sent by remote AE

The following sequencing interactions apply to the N-EVENT-REPORT server for handling N-EVENT-REPORT Requests.

1. The N-EVENT-REPORT-SCP server accepts an association from the remote N-EVENT-REPORT SCU entity.
2. The remote N-EVENT-REPORT-SCU entity sends a N-EVENT-REPORT-RQ message containing a list of success SOP Instances and failed SOP Instances if there are some.
3. The N-EVENT-REPORT-SCP server returns a N-EVENT-REPORT-RSP message to the N-EVENT-REPORT-SCU entity.
4. The N-EVENT-REPORT-SCU entity closes the association.

#### 4.2.3.4.2.2. Accepted Presentation Contexts

The N-EVENT-REPORT-SCP server accepts the Presentation Contexts shown in the following table:

---

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	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		

#### 4.2.3.4.2.3. SOP Specific Conformance for SOP Class

The N-EVENT-REPORT-SCP server provides standard conformance as a SCP to the DICOM N-EVENT-REPORT Operation Service defined in Part 7.

The associated activity handled by the N-EVENT-REPORT-SCP server is verifying the ownership of the images sent previously by the DcmOutput-SR (as a storage SCU) has already be transferred to the remote storage SCP.

The N-EVENT-REPORT-SCP has no limit on the number of associations it can accept.

The N-EVENT-REPORT-SCP server returns the status codes shown in the following table when sending a N-EVENT-REPORT response.

Service Status	Further Meaning	Error Code	Reason
Success	Success	0	The status of image ownership transfer has been received successfully

#### 4.2.4. DcmOutput-OVL Application Entity Specification

This subsection specifies the DcmOutput-OVL application entity.

##### 4.2.4.1. SOP Classes

An instance of the DcmOutput-OVL Application Entity provides Standard Conformance to the following SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Greyscale Softcopy Presentation State	1.2.840.10008.5.1.4.1.1.1.1.1	yes	no
Stand alone Overlay	1.2.840.10008.5.1.4.1.1.8	yes	no
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	yes	yes

##### 4.2.4.2. Association Policies

The following sub-sections describe the Association Establishment and Acceptance policies of an instance of DcmOutput-OVL.

###### 4.2.4.2.1. General

A DcmOutput-OVL AE initiates associations to a remote AE. It uses a PDU size of 256K Bytes.

The DICOM standard application context name for DICOM version 3.0 is proposed:

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

**4.2.4.2.2. Number of Associations.**

Each instance of DcmOutput-OVL supports a single association at one time, but there can be multiple DcmOutput-OVL instances in a single DAS deployment (each instance has a unique AE title and destination AE title and network port).

Maximum number of simultaneous associations per instance	1
--	---

**4.2.4.2.3. Asynchronous Nature**

Each association from an instance of DcmOutput-OVL performs a maximum of one transaction at any time - each association is implicitly tied to the transfer of the converted report for a single "case".

Maximum number of outstanding asynchronous transactions on each association	1
---	---

**4.2.4.2.4. Implementation Identifying Information**

DcmOutput-OVL uses the following for Implementation Class UID and implementation version:

Implementation Class UID	1.2.840.113564.12.1.5
Implementation version name	DcmOutput-OVL **

where the version string is formed as the name of this adapter ("DcmOutput-OVL") with the major.minor version information of the release appended.

**4.2.4.3. Association Initiation Policy**

Internally to the DICOM Adapter Service, requests to export CAD reports are queued and dispatched sequentially to the identified output adapters. The routing of CAD reports to specific output adapters is configurable, using an internal rules database. The net result is that any instance of the DcmOutput-OVL adapter class is passed a single output request at a time, and no others until that is completed. There can be several instances of DcmOutput-OVL, each with different configuration parameters, but from the viewpoint of a single instance (a single configuration), output processing is sequential.

Once an instance of DcmOutput-OVL receives a request from the DICOM Adapter Service to perform an export, it initiates an association with the configured destination (Storage SCP). Note that DcmOutput-OVL may re-initiate an association as part of its error recovery procedure (see 4.2.4.3.1.3 below).

**4.2.4.3.1. Stand-alone Overlay generated and exported**

A DcmOutput-OVL instance sends a DICOM stand-alone overlay objects to a configured remote SCP AE.

**4.2.4.3.1.1. Description and Sequencing of Activities**

A DcmOutput-OVL instance initiates a DICOM association using a command field of C-STORE and a SOP class of a Grayscale Presentation State or stand-alone Overlay SOP (configurable). The assumed role of a DcmOutput-OVL is a STORAGE-SCU server and a storage commitment service user, as shown below in figure 4.13.

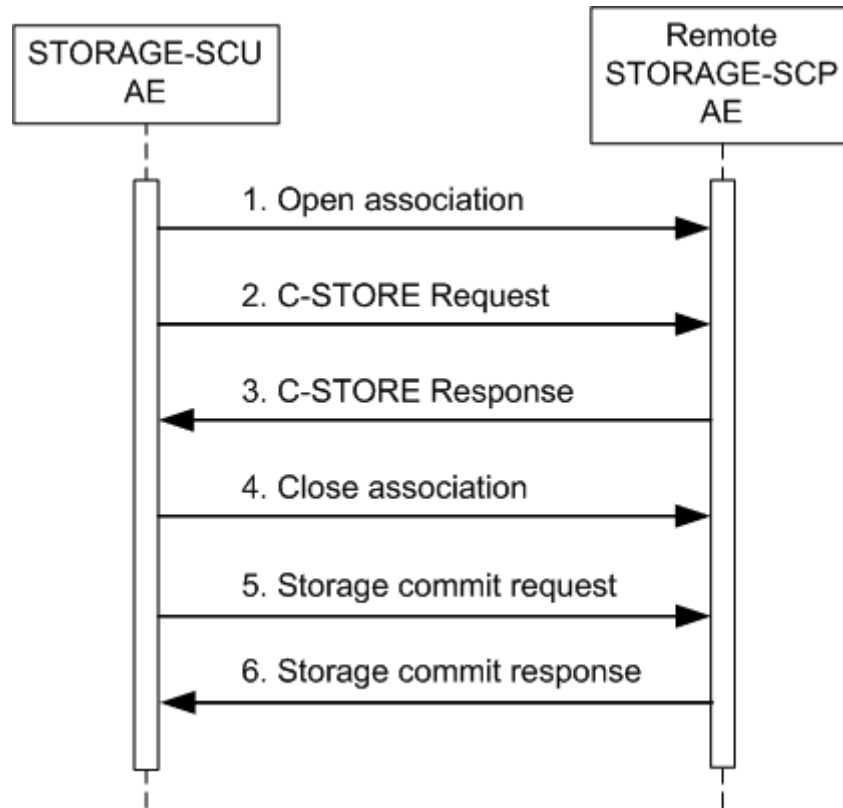


Figure 4.13 - Sequencing of activity: Report sent to a remote AE

The following sequencing interactions are performed by the STORAGE-SCU server when exporting a report:

1. The STORAGE-SCU server opens an association with the remote STORAGE-SCP server
2. The STORAGE-SCU server sends a C-STORE-RQ message to the STORAGE-SCP server
3. The STORAGE-SCP server returns a C-STORE-RSP message to the STORAGE-SCU server
4. The STORAGE-SCU server closes the association.
5. The STORAGE-SCU opens an association with the storage commitment SCP, and sends an N-ACTION request to the SCP.
6. The STORAGE SCP sends an N-EVENT-REPORT request to the SCU, indicating that the ownership of the stored objects can be transferred to it.

**4.2.4.3.1.2. Proposed Presentation Contexts**

Each time an association is initiated, DcmOutput-OVL (as a STORAGE-SCU) proposes the following Presentation Contexts:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Stand-alone overlay object	1.2.840.10008.5.1.4.1.1.8	ImplicitVRLittleEndian	1.2.840.10008.1.2	SCU	None
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1		
		ExplicitVRBigEndian	1.2.840.10008.1.2.2		
Grayscale Softcopy Presentation State	1.2.840.10008.5.1.4.1.1.1.1	ImplicitVRLittleEndian	1.2.840.10008.1.2		
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1		
		ExplicitVRBigEndian	1.2.840.10008.1.2.2		

Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	ImplicitVRLittleEndian	1.2.840.10008.1.2		
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1		
		ExplicitVRBigEndian	1.2.840.10008.1.2.2		

4.2.4.3.1.3. SOP Specific Conformance for SOP Class(es)

DcmOutput-OVL handles DICOM error status during export as described in the following table:

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The storage of the GSPS or stand-alone overlay object to the SCP is considered to have been successful. This association can now be closed by the SCU.
Refused	Out of Resources	A700-A7FF	The storage of the GSPS or stand-alone overlay object to the SCP is considered to have been unsuccessful, due to a temporary lack of resources. The send will be retried.*
Error	Data Set does not match SOP Class	A900-A9FF	The storage of the GSPS or stand-alone overlay object to the SCP is considered to have been unsuccessful, and it will not be resent to this destination. This association can now be closed by the SCU.
	Can not understand	C000-CFFF	
Warning	Coercion of Data Elements	B000	The storage of the GSPS or stand-alone overlay object is considered to have been successful. This association can now be closed by the SCU.
	Data Set does not match SOP Class	B007	The storage of the GSPS or stand-alone overlay object to the SCP is considered to be complete (whether successful or not cannot be determined by the SCU). This association can now be closed by the SCU.
	Elements Discarded	B006	The storage of the GSPS or stand-alone overlay object to the SCP is considered to have been successful. This association can now be closed by the SCU.

DcmOutput-OVL handles DICOM error status during storage commitment as described in the following table:

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The storage commitment request is considered successful, and the association can be closed by the SCU.
Resource limitation	Out of Resources	0213	The storage commitment request is considered unsuccessful, the GSPS or stand-alone overlay object will be re-sent to the SCP, and a storage commitment request will be re-issued if the object is stored successful by the SCP.
Others	Others	others	The storage commitment request is considered unsuccessful, the association will be closed, and the GSPS or stand-alone overlay object will not be re-sent and storage commitment request will not be re-tried later.

and low-level failures:

Error condition	Behavior
Timeout expires for an expected DICOM PDU or TCP/IP packet.	An error message is output to the DAS trace log.*
Association A-REJECTed by the SCP.	
Association A-ABORTed by the SCP.	
Network layer indicates communication loss (i.e., low-level TCP/IP socket closure).	

where: \* means that the following retry model is followed:

The adapter retries the export a configured number of times ("RetryTimes" - see 4.4.2 below), pausing a configured number of seconds ("RetryInterval" - see 4.4.2 below) between retries.

In general, the behavior of DcmOutput-OVL following a communication failure is to try to re-initiate an association with the remote SCP. The number of retry attempts is configurable.

In addition, DcmOutput-OVL outputs status and error information into a trace log file that can be used to monitor and diagnose any problems that may arise. If any errors occur during DICOM communication, then appropriate messages are added to the trace log. The logged information can also be viewed on the user interface of the service tool (see [4.4](#) below).

#### **4.2.4.4 Association Acceptance Policy**

For the storage commitment service, the DcmOutput-OVL can work in synchronize mode and asynchronous mode. If works in synchronize mode, the DcmOutput-OVL will not accept any association request. If work in asynchronous mode, the DcmOutput-OVL will listen on configured port number for association request about DICOM N-EVENT-REPORT. Each instance of DcmOutput-OVL waits and listens for incoming connection requests (on a configured port). When a connection request is accepted, a storage commitment provider service (a separate thread within DcmOutput-OVL ) is started by the listener, and DcmOutput-OVL continues to listen for additional incoming connection requests. The storage commitment provider within DcmOutput-OVL negotiates the association using the list of supported presentation contexts. If the association is accepted, then the DcmOutput-OVL instance start to process the subsequent N-EVENT-REPORT requests.

A DcmOutput-OVL instance will reject an association attempt if the called AE title does not match the title of this instance. Similarly, the association will be rejected if the calling AE title does not match a configured calling AE title for this instance.

The following chapters assume that the DcmOutput-OVL works in asynchronous mode.

##### **4.2.4.4.1. Activity - Verification requested by remote AE**

The following sub-sections describe how the real world activity Verification requested by remote AE is handled by a DcmOutput-OVL instance.

###### **4.2.4.4.1.1. Description and sequencing of Activities**

A DcmOutput-OVL instance responds to C-ECHO requests to verify communication from a Remote SCU AE. This capability can be used as a diagnostic service tool for trouble shooting network communication issues.

If the incoming association contains a command field with a C-ECHO and an SOP Class of Verification SOP Class, the assumed role of the DcmOutput-OVL instance will become that of an ECHO-SCP.

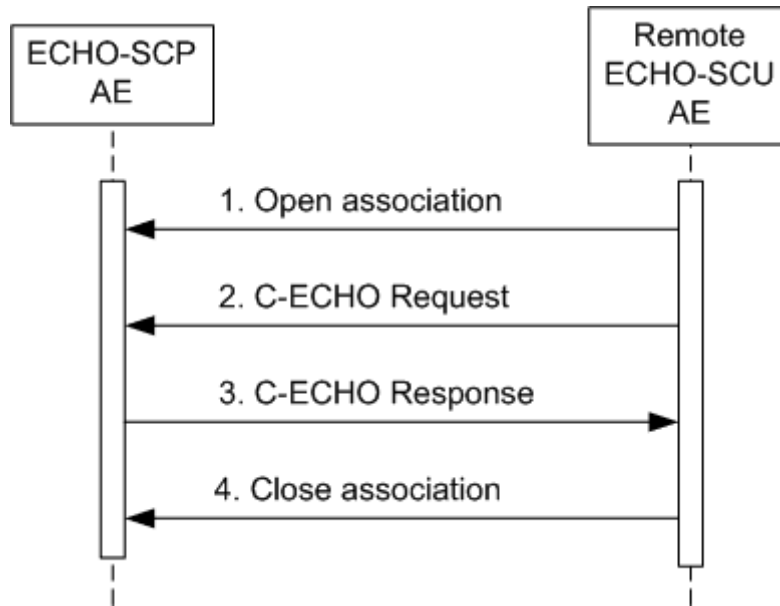


Figure 4.14 - Sequencing of activity: Verification requested by remote AE

The following sequencing interactions apply to the ECHO-SCP server when handling C-ECHO Requests:

1. The ECHO-SCP server accepts an association from a remote ECHO-SCU entity.
2. The remote ECHO-SCU entity sends a C-ECHO-RQ Message.
3. The ECHO-SCP server returns a C-ECHO-RSP Message to the remote ECHO-SCU entity.
4. The ECHO-SCP server closes the association.

**4.2.4.4.1.2. Accepted Presentation Contexts**

The ECHO-SCP server accepts the Presentation Contexts shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

**4.2.4.4.1.3. SOP Specific Conformance for SOP Class**

The ECHO-SCP server provides standard conformance as an SCP to the DICOM C-ECHO Operation Service defined in Part 7 and the Verification Service Class defined in Part 4 of the DICOM Standard.

The ECHO-SCP server returns the status codes shown in the next table:

Service Status	Further Meaning	Error Code	Reason
Success	Success	0	The echo request is considered to have been successfully handled, and the association can now be released.

**4.2.4.4.2. Activity - Unsolicited N-EVENT-REPORT-REQUEST sent by remote AE**

The following sub-sections describe how the real world activity Unsolicited N-EVENT-REPORT-REQUEST sent by remote AE is handled by a DcmOutput-OVL instance.

#### 4.2.4.4.2.1. Description and sequencing of Activities

A DcmOutput-OVL instance accepts DICOM N-EVENT-REPORT-REQUEST sent to it from a Remote SCU AE.

If the incoming association contains a command field with a N-EVENT-REPORT-REQUEST and a list of referenced SOP class UID and SOP instance UID, the assumed role of the DcmOutput-OVL instance will become that of a N-EVENT-REPORT SCP server.

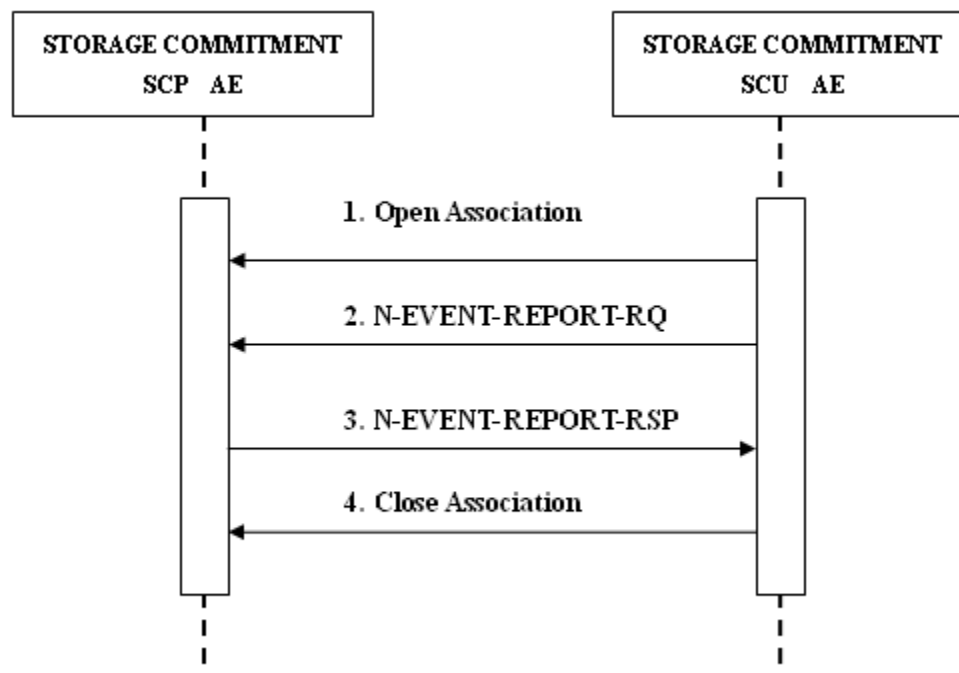


Figure 4.15 - Sequencing of activity: N-EVENT-REPORT-REQUEST sent by remote AE

The following sequencing interactions apply to the N-EVENT-REPORT server for handling N-EVENT-REPORT Requests.

1. The N-EVENT-REPORT-SCP server accepts an association from the remote N-EVENT-REPORT SCU entity.
2. The remote N-EVENT-REPORT-SCU entity sends a N-EVENT-REPORT-RQ message containing a list of success SOP Instances and failed SOP Instances if there are some.
3. The N-EVENT-REPORT-SCP server returns a N-EVENT-REPORT-RSP message to the N-EVENT-REPORT-SCU entity.
4. The N-EVENT-REPORT-SCU entity closes the association.

#### 4.2.4.4.2.2. Accepted Presentation Contexts

The N-EVENT-REPORT-SCP server accepts the Presentation Contexts shown in the following table:

---

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	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		

#### 4.2.4.4.2.3. SOP Specific Conformance for SOP Class

The N-EVENT-REPORT-SCP server provides standard conformance as a SCP to the DICOM N-EVENT-REPORT Operation Service defined in Part 7.

The associated activity handled by the N-EVENT-REPORT-SCP server is verifying the ownership of the images sent previously by the DcmOutput-OVL (as a storage SCU) has already be transferred to the remote storage SCP.

The N-EVENT-REPORT-SCP has no limit on the number of associations it can accept.

The N-EVENT-REPORT-SCP server returns the status codes shown in the following table when sending a N-EVENT-REPORT response.

Service Status	Further Meaning	Error Code	Reason
Success	Success	0	The status of image ownership transfer has been received successfully

### 4.2.5. MWLread Application Entity Specification

This subsection specifies the MWLread application entity.

#### 4.2.5.1. SOP Classes

An instance of the MWLread Application Entity provides Standard Conformance to the following SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model FIND	1.2.840.10008.5.1.4.3.1	yes	no

#### 4.2.5.2. Association Policies

The following sub-sections describe the Association Establishment and Acceptance policies of an instance of MWLread.

##### 4.2.5.2.1. General

A MWLread AE initiates associations to a remote AE. It uses a PDU size of 256K Bytes.

The DICOM standard application context name for DICOM version 3.0 is proposed:

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

##### 4.2.5.2.2. Number of Associations.

Each instance of MWLread supports a single association at one time, but there can be multiple MWLread instances in a single DAS deployment (each instance has a unique AE title and destination AE title and network port).

Maximum number of simultaneous associations per instance	1
--	---

#### 4.2.5.2.3. Asynchronous Nature

Each association from an instance of MWLread performs a maximum of one transaction at any time - each association is used only for a single query and its responses.

Maximum number of outstanding asynchronous transactions on each association	1
---	---

#### 4.2.5.2.4. Implementation Identifying Information

MWLread uses the following for Implementation Class UID and implementation version:

Implementation Class UID	1.2.840.113564.12.1.4
Implementation version name	MWLread *.*

where the version string is formed as the name of this adapter ("MWLread") with the major.minor version information of the release appended.

#### 4.2.5.3. Association Initiation Policy

Internally to the DICOM Adapter Service, requests to export images from film digitized cases are queued and dispatched sequentially to the identified output adapters. The routing of these requests to specific output adapters is configurable, using an internal rules database. The rules are typically set so that cases with no meta-data are first dispatched to an instance of MWLread, which then contacts a remote MWL provider, and with the query response, populates the case meta data. That case can then be exported (using the rules, it can for example, be dispatched to an instance of the DcmArchive adapter). The implemented design ensures that any instance of the MWLread adapter class is passed a single output request at a time, and no others until that is completed. There can be several instances of MWLread, each with different configuration parameters, but from the viewpoint of a single instance (a single configuration), output processing is sequential.

Once an instance of MWLread receives a request from the DICOM Adapter Service to perform a query, it initiates an association with the configured destination (MWL SCP). Note that MWLread may re-initiate an association as part of its error recovery procedure (see 4.2.5.3.1.3 below).

##### 4.2.5.3.1. MWL query and response

A MWLread instance sends a DICOM C-FIND message to a configured remote SCP AE.

##### 4.2.5.3.1.1. Description and Sequencing of Activities

A MWLread instance initiates a DICOM association using a command field of C-FIND. The assumed role of a MWLread is a MWL-SCU server, as shown below in figure 4.16.

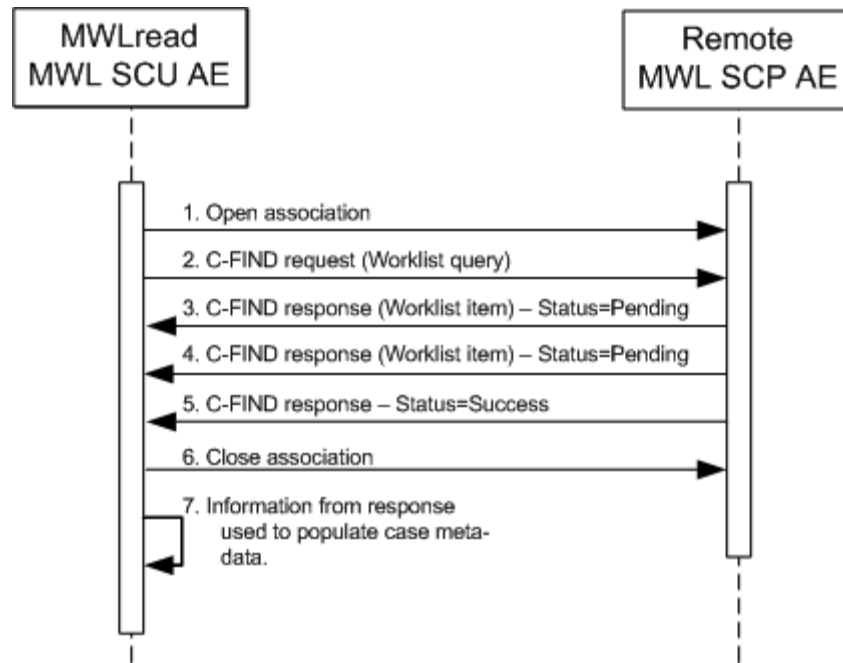


Figure 4.16 - Sequencing of activity: MWL query and response

The following sequencing interactions are performed by the MWL-SCU server when querying for the meta-data for a case:

1. The MWL-SCU server opens an association with the remote MWL-SCP server
2. The MWL-SCU server sends a C-FIND message to the MWL-SCP server. This query has only one matching key - and configurably it is one of the Patient ID, Study ID, or Accession number (with a value corresponding to the case identifier). The query requests the return of the keys:
  - Patient ID
  - Patient Name
  - Patient Birth Date
  - Patient Age
  - Patient Sex
  - Study ID
  - Study Date
  - Study Instance UID
  - Accession Number
  - Referring Physician

More information on the use of these keys can be found below in section 8.1.2.

3. The MWL-SCP server sends a C-FIND response message with a status of pending
4. There may be several of response messages with pending status
5. Finally a C-FIND response with status of Success is received, and this indicates the completion of the response to the query.
6. The MWL-SCU server closes the association.
7. The query response(s) are analyzed, and if the response provides the desired information, this is stored locally with that case as the meta-data than can later be used for export of the case (e.g., using DcmArchive).

#### 4.2.5.3.1.2. Proposed Presentation Contexts

Each time an association is initiated, MWLread (as a MWL-SCU) proposes the following Presentation Contexts:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.3.1	ImplicitVRLittleEndian	1.2.840.10008.1.2	SCU	None
		ExplicitVRLittleEndian	1.2.840.10008.1.2.1		
		ExplicitVRBigEndian	1.2.840.10008.1.2.2		

#### 4.2.5.3.1.3. SOP Specific Conformance for SOP Class(es)

MWLread handles DICOM error status during query as described in the following table:

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the matches. The SCU can close the association, and proceed to use the returned information.
Pending	Matches are continuing	FF00	The returned information is retained until a Success is returned.
Pending	Matches are continuing - warning that one or more optional keys were not supported.	FF01	
Refused	Out of Resources	A700-A7FF	The SCU can close the association, and consider that the request has not succeeded.
Error	Data Set does not match SOP Class	A900-A9FF	
	Can not understand	C000-CFFF	
Warning	Coercion of Data Elements	B000	
	Data Set does not match SOP Class	B007	
	Elements Discarded	B006	

and low-level failures:

Error condition	Behavior
Timeout expires for an expected DICOM PDU or TCP/IP packet.	An error message is output to the DAS trace log. *
Association A-REJECTed by the SCP.	
Association A-ABORTed by the SCP.	
Network layer indicates communication loss (i.e., low-level TCP/IP socket closure).	

where: \* means that the following retry model is followed:

The adapter retries the query a configured number of times ("RetryTimes" - see 4.4.2 below), pausing a configured number of seconds ("RetryInterval" - see 4.4.2 below) between retries.

In general, the behavior of MWLread following a communication failure is to try to re-initiate an association with the remote SCP. The number of retry attempts is configurable.

In addition, MWLread outputs status and error information into a trace log file that can be used to monitor and diagnose any problems that may arise. If any errors occur during DICOM communication, then appropriate messages are added to the trace log. The logged information can also be viewed on the user interface of the service tool (see [4.4](#) below).

#### 4.2.5.4. Association Acceptance Policy

An instance of MWLread never accepts an association.

## **4.3. Network Interfaces**

### **4.3.1. Physical Network Interface**

The AE hosted within the DICOM Adapter service provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

The AE inherit their TCP/IP stacks from the computer operating system upon which they execute (the currently supported operating systems are Windows XP SP-2 and Windows Server 2003 SP-1).

### **4.3.2. Additional Protocols**

The AE hosted within the DICOM Adapter Service do not directly utilize support any additional protocols such as DHCP, DNS, NTP or LDAP for communication with other entities. However the system itself may well use these protocols - e.g., the network IP address, domain name, and name lookup are typically configured by default to utilize DHCP and DNS. Similarly, time synchronization may be performed at the operating system level using active directory, or NTP. User authentication (for the service user) may be local to the machine, or resolved using Active Directory. The use of these mechanisms is orthogonal to setup and configuration of the DICOM Adapter Service - those mechanisms are considered to operate at the operating system level, and can be changed independently of the DAS configuration.

Internally, the DICOM Adapter Service uses additional protocols for communication with other Kodak entities. In particular, http is used to communicate with the "procedure log" (which is a local database mechanism that is typically installed on the same machine as DAS), and the Microsoft Message Queue is used for communication with other Kodak Mammography CAD systems.

## **4.4. Configuration**

The configuration of DAS is implemented using a file stored locally within the installed files. The basic configuration is set as part of the install (the installation wizards allow some parameters to be tailored). After installation, a service tool (user interface) is available for changing the configuration. The use of the configuration tool requires login permission for the system, and this is reserved for use only by qualified service personnel.

### **4.4.1. AE Title/Presentation Address Mapping**

Configuration information related to the DAS application entities is viewed and changed using the "Adapters" tab of the service UI. For digital CAD system, 4 classes of adapter are included: DcmStore, DcmOutput-SR and DcmOutput-OVL, for digitized priors system, 2 classes of adapter are included: MWLRead and DcmArchive. A typical product specific installation will have a minimum of one instance of each of those classes, and may have any number of each. Each such instance can have its own unique properties (AE Title, etc).

Each class defines a set of configurable properties, and their default values. A single instance of one such class by default has the same properties, and hence values, as the class. However each instance can specialize - have its own unique values for any property (in fact the reason for having multiple instances is so that some can have different properties). The following sub-sections list the default properties for each adapter class - which are also used by a default (single) instance of each.

#### 4.4.2. Configurable Parameters

The following table lists the key parameters of this implementation:

Parameter	Configurable (Yes/No)	Default Value
<b>DcmArchive Specific Parameters</b>		
AE Title of the DcmArchive instance	yes [AETitle]	DcmArchive
AE Title for destination storage	yes [AEDest]	STORAGE
IP address/host name for destination storage	yes [Host]	localhost
port used to connect to destination	yes [Port]	104
Processing applied to scanned film data	yes [PixelFormat]	PValue
SOP class to send (supported values are "SC Image", "MG Processing", and "MG Presentation")	yes [SOPClass]	MG Presentation
Time-out waiting for acceptance or rejection Response to an association Open Request (application level timeout).	yes [AssociationTimeOut]	10 seconds
General DIMSE level time-out values	yes [StorageTimeOut]	300 seconds
Maximum time to wait for a response to a release request.	yes [ReleaseTimeOut]	10 seconds
Time between re-connection attempts when there is a communication error.	yes [RetryInterval]	5 seconds
Number of times to retry the send on a communication error.	yes [RetryTimes]	3
Use lossless compression as the transfer syntax ("yes" or "no").	yes [UseJPEGLossless]	no
Send to storage device using DICOM storage commitment ("yes" or "no")	yes [UseStorageCommitment]	no
If synchronous storage commitment or asynchronous storage commitment will be used	yes [SyncCommitment]	no
AE Title of the DcmArchive instance when it performs storage commitment	yes [CommitmentAETitle]	DcmArchive
AE Title for destination storage commitment service	yes [CommitmentAEDest]	STORAGE
IP address/host name for storage commitment service	yes [CommitmentHost]	localhost
port used to connect to storage commitment service	yes [CommitmentPort]	2104
Time-out used when waiting for the N-ACTION response from the storage commitment SCP.	yes [CommitActionTimeOut]	10
Time-out used when waiting for the N-EVENT-REPORT request from the storage commitment SCP.	yes [CommitReportTimeOut]	30
Port number that the adapter used to listen for N-EVENT-REPORT request from storage commitment SCU	yes [CommitmentSCPPort]	104
AE title of the adapter when it serves as a storage commitment service provider	yes [CommitmentSCPAETitle]	DcmArchive
AE title of the remote storage commitment service user	yes [CommitmentSCPAEDest]	STORAGE
If the exported images within a case belongs to the same series or different series	yes [SingleSeries]	yes
<b>DcmStore Specific Parameters</b>		
AE Title of the DcmStore instance	yes [AETitle]	DcmStore
Listening port	yes [Port]	104
AE Title for accepted source	yes [AESource]	*
The default behavior is to use the Series or Study UID (depending on "CaseEndChange") as the case identifier. However it is configurable to have the case identification string instead be the "PatientID", "StudyID", or "AccessionNumber" from that case.	yes [MapCaseID]	no
The number of seconds to wait after an image is received. If this time expires with no new data received, the case is considered to be complete.	Yes [IdleTimeOut]	60 seconds
The name of a configured set of rules to be used to check case tags against (if they do not match, the this association will be rejected).	yes [RuleSet]	all
Consider case to be complete when "Series" or "Study" instance UID changes	yes [CaseEndChange]	Series
Consider case to be complete when the association closes	yes [CaseEndWhenAssociationDown]	yes
When duplicate view images are received, if the old one will be kept or replaced	yes [ReplaceDuplicateImage]	yes
For Kodak CR, if some of the wrong tag values be corrected	yes [DoTagChanges]	no
When the 4 standard view (LCC, LMLO, RCC, RMLO) images are received completely, whether the case will be submit for CAD immediately, or wait for the next image or idle time out	yes [CRAcceleration]	yes

<b>DcmOutput-SR Specific Parameters</b>		
AE Title of the DcmOutput-SR instance	yes [AETitle]	DcmOutput-SR
AE Title for destination storage	yes [AEDest]	STORAGE
IP address/host name destination storage	yes [Host]	localhost
port used to connect to destination	yes [Port]	104
If the location of the found lesions should be rotated by 180 degree in the creation of the structured report	yes [DoRotate]	no
Time-out waiting for acceptance or rejection Response to an association Open Request (application level timeout)	yes [AssociationTimeOut]	10 seconds
General DIMSE level time-out values	yes [StorageTimeOut]	10 seconds
Maximum time to wait for a response to a release request.	yes [ReleaseTimeOut]	10 seconds
Time between re-connection attempts when there is a communication error.	yes [RetryInterval]	5 seconds
Number of times to retry the send on a communication error.	yes [RetryTimes]	3
Send to storage device using DICOM storage commitment ("yes" or "no")	yes [UseStorageCommitment]	yes
If synchronous storage commitment or asynchronous storage commitment will be used	yes [SyncCommitment]	no
AE Title of the DcmOutput-SR instance when it performs storage commitment	yes [CommitmentAETitle]	DcmOutput-SR
AE Title for destination storage commitment service	yes [CommitmentAEDest]	STORAGE
IP address/host name for storage commitment service	yes [CommitmentHost]	localhost
port used to connect to storage commitment service	yes [CommitmentPort]	2104
Time-out used when waiting for the N-ACTION response from the storage commitment SCP.	yes [CommitActionTimeOut]	10
Time-out used when waiting for the N-EVENT-REPORT request from the storage commitment SCP.	yes [CommitReportTimeOut]	30
Port number that the adapter used to listen for N-EVENT-REPORT request from storage commitment SCU	yes [CommitmentSCPPort]	104
AE title of the adapter when it serves as a storage commitment service provider	yes [CommitmentSCPAETitle]	DcmOutput-SR
AE title of the remote storage commitment service user	yes [CommitmentSCPAEDest]	STORAGE
<b>DcmOutput-OVL Specific Parameters</b>		
AE Title of the DcmOutput-OVL instance	yes [AETitle]	DcmOutput-OVL
AE Title for destination storage	yes [AEDest]	STORAGE
IP address/host name destination storage	yes [Host]	localhost
port used to connect to destination	yes [Port]	2104
Time-out waiting for acceptance or rejection Response to an association Open Request (application level timeout).	yes [AssociationTimeOut]	10 seconds
Maximum time to wait for a response to a release request.	yes [ReleaseTimeOut]	10 seconds
Time between re-connection attempts when there is a communication error.	yes [RetryInterval]	5 seconds
Number of times to retry the send on a communication error.	yes [RetryTimes]	3
SOP class to convert the report to (accepted values are "StandaloneOVL" or "GSPS")	yes [SopClass]	GSPS
Specify the contents of the converted report - it can include the "mass" marks, the "MCC" marks, and an outline of the breast "mask". These settings can be in any combination, and are separated by commas.	yes [ExportFindings]	MCC,mass,mask
The height of the drawn marker shape bounding box as a percentage of the image height.	yes [ShapeHeight]	3.0
Shape of the marker to draw for each Mass finding - can be one of "Circle", "Ellipse", "Point", "Rectangle", "Star" or "Triangle",	yes [ShapeMass]	Star
Shape of the marker to draw for each MCC finding - can be one of "Circle", "Ellipse", "Point", "Rectangle", "Star" or "Triangle",	yes [ShapeMcc]	Triangle
The thickness of the pen, as a percentage of the image width, with which to draw the marker shape lines.	yes [ShapePenWidth]	0.5
The width of the drawn marker shape bounding box as a percentage of the image width.	yes [ShapeWidth]	3.0
Which operating point from the CAD report to convert to the overlay representation. Note that this currently has no effect.	yes [OperatingPoint]	0
Send to storage device using DICOM storage commitment ("yes" or "no")	yes [UseStorageCommitment]	no
If synchronous storage commitment or asynchronous storage commitment will be used	yes [SyncCommitment]	no
If the location of the found lesions should be rotated by 180 degree in the creation of the overlay or GSPS	yes [DoRotate]	no
AE Title of the DcmOutput-OVL instance when it performs storage		

commitment	yes [CommitmentAETitle]	DcmOutput-OVL
AE Title for destination storage commitment service	yes [CommitmentAEDest]	STORAGE
IP address/host name for storage commitment service	yes [CommitmentHost]	localhost
port used to connect to storage commitment service	yes [CommitmentPort]	2104
Time-out used when waiting for the N-ACTION response from the storage commitment SCP.	yes [CommitActionTimeOut]	10
Time-out used when waiting for the N-EVENT-REPORT request from the storage commitment SCP.	yes [CommitReportTimeOut]	30
Port number that the adapter used to listen for N-EVENT-REPORT request from storage commitment SCU	yes [CommitmentSCPPort]	104
AE title of the adapter when it serves as a storage commitment service provider	yes [CommitmentSCPAETitle]	DcmOutput-OVL
AE title of the remote storage commitment service user	yes [CommitmentSCPAEDest]	STORAGE
<b>MWLread Specific Parameters</b>		
AE Title of the MWLread instance	yes [AETitle]	MWLread
AE Title for destination storage	yes [AEDest]	STORAGE
IP address/host name destination storage	yes [Host]	localhost
port used to connect to destination	yes [Port]	104
Map the case ID to one of "PatientID", "StudyID", or "AccessionNumber" as the matching attribute.	yes[CaseIDMapsTo]	PatientID
Maximum time to wait for an acceptance or rejection response to an association Open Request (application level timeout).	yes [AssociationTimeOut]	10 seconds
Maximum time to wait for a response to a query.	yes [QueryTimeOut]	10 seconds
Maximum time to wait for a response to a release request.	yes [ReleaseTimeOut]	10 seconds
Time between re-connection attempts when there is a communication error.	yes [RetryInterval]	5 seconds
Number of times to retry the send on a communication error.	yes [RetryTimes]	3
If the MWLread will be used in the Digitized Priors product	yes [ForDPIS]	no

where the names in brackets "[]" are the names of the configuration parameters (which appear on the user interface of the DAS service tool, where they can be changed).

## 5. Media Interchange

The DICOM Adapter Service does not support media interchange. Internally the DcmStore adapter temporarily stores received images as DICOM part-10 files, but no claim is made as to whether they are DICOM compliant.

## 6. Support of Character Sets

For cases exported using DcmArchive (Storage SCU), the character set is specified as "ISO\_IR 100".

For cases received using DcmStore (Storage SCP), no character processing is performed, and so the received character set is irrelevant.

On output of a CAD structured report using DcmOutput-SR (which is a Storage SCU) the character set is specified as "ISO\_IR 100".

On output of a standalone overlay and GSPS using DcmOutput-OVL (which is a Storage SCU) the character set is specified as "ISO\_IR 100".

## 7. Security

### 7.1. Security Profiles

The DICOM Adapter Service does not implement any of the "Secure Use Profiles" defined in PS 3.15 (section 6.1 and Annex A).

The DICOM Adapter Service does not implement any of the "Secure Transport Connection Profiles" as defined in PS 3.15 (section 6.2 and Annex B).

The DICOM Adapter Service does not implement the "Digital Signature Profile" as defined in PS 3.15 (section 6.3 and Annex C).

The "Media Storage Security Profiles" as defined in PS 3.15 (section 6.4 and Annex D) are not applicable to the DICOM Adapter Service.

### 7.2. Association Level Security

Each DcmStore instance can be configured to accept association requests from any calling AE, or only a specifically configured source AE.

The remote AE that is the destination for the storage of a CAD report (via DcmOutput-SR or DcmOutput-OVL) or a digitized film case (via DcmArchive) must be configured with an AE Title, port and host name (or IP address).

### 7.3. Application Level Security

The DICOM Adapter Service does not directly provide or support any specific security measures related to DICOM communication. However it is assumed that this service is installed on a secured system within a secured environment. Such an environment minimally includes:

1. Firewall or router protections to ensure that only approved external hosts have network access to the local system.
2. Firewall or router protections to ensure that the local system only has network access to approved external hosts and services.
3. Any communication with external hosts and services outside the locally secured environment uses appropriate secure network channels (in particular, Kodak's secure remote monitoring service infrastructure should be used for this purpose).

Other network security procedures such as anti-virus protection, or automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

## 8. Annexes

### 8.1. IOD Contents

#### 8.1.1. Created SOP Instance

The DcmArchive, DcmOutput-SR and DcmOutput-OVL adapters are capable of generating IOD instances. The following three subsections details the contents of those IOD instances.

Abbreviations used in the tables include:

VNAP

Value Not Always Present (attribute sent zero length if no value is present)

ANAP

Attribute Not Always Present

ALWAYS

Always Present with a value

EMPTY

Attribute is sent without a value

OPT

indicates that the module is provided if the image data contains those DICOM tags.

Abbreviations used for the source of the data values in the tables are:

AUTO

the attribute is generated automatically by the DICOM Adapter Service.

IMAGES

the attribute value comes from the received case.

RAW

the attribute value comes from the film digitized files.

IS

the attribute comes from an information system (this is the local procedure log, which in turn is populated either manually or indirectly using a Modality Worklist query).

CONFIG

the attribute value source is a configurable parameter

##### 8.1.1.1. DcmArchive

The DcmArchive adapter generates IOD that conform to either (configurably) the Digital Mammography X-Ray Image Class., or the Secondary Capture Image Class. Those objects are exported to the configured remote storage class providers. The following subsections specify the attributes that are contained in these objects.

The following table summarizes the modules that are present in a created Digital Mammography X-Ray Image IOD:

IE	Module	Reference	Presence of Module
Patient	Patient	<a href="#">8.1.1.1.1</a>	ALWAYS
Study	General Study	<a href="#">8.1.1.1.2</a>	ALWAYS

	Patient Study	8.1.1.1.3	ANAP
Series	General Series	8.1.1.1.4	ALWAYS
	DX Series	8.1.1.1.5	ALWAYS
	Mammography Series	8.1.1.1.6	ALWAYS
Equipment	General Equipment	8.1.1.1.7	ALWAYS
Image	General Image	8.1.1.1.9	ALWAYS
	Image Pixel	8.1.1.1.10	ALWAYS
	DX Anatomy Imaged	8.1.1.1.11	ALWAYS
	DX Image	8.1.1.1.12	ALWAYS
	DX Detector	8.1.1.1.13	ALWAYS
	Mammography Image	8.1.1.1.14	ALWAYS
	Acquisition Context	8.1.1.1.15	ALWAYS
	SOP Common	8.1.1.1.17	ALWAYS

The following table summarizes the modules that are present in a created Secondary Capture Image IOD:

IE	Module	Reference	Presence of Module
Patient	Patient	8.1.1.1.1	ALWAYS
Study	General Study	8.1.1.1.2	ALWAYS
	Patient Study	8.1.1.1.3	ANAP
Series	General Series	8.1.1.1.4	ALWAYS
Equipment	General Equipment	8.1.1.1.7	ALWAYS
	SC Equipment	8.1.1.1.8	ALWAYS
Image	General Image	8.1.1.1.9	ALWAYS
	Image Pixel	8.1.1.1.10	ALWAYS
	SC Image	8.1.1.1.16	ALWAYS
	DX Detector	8.1.1.1.13	ALWAYS
	Mammography Image	8.1.1.1.14	ALWAYS
	SOP Common	8.1.1.1.17	ALWAYS

8.1.1.1.1. Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	All information can be retrieved from an information system which is a local procedure log, that is manually maintained by the customer, or queried from a remote RIS system.	ALWAYS	IS
Patient ID	(0010,0020)	LO		ALWAYS	IS
Patient's Birth Date	(0010,0030)	DA		VNAP	IS
Patient's Sex	(0010,0040)	CS		ALWAYS	IS

8.1.1.1.2. General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	A new UID created for this study instance if it is the first time the study is exported (if the export of the study is repeated, then the same UID is used).	ALWAYS	AUTO
Study Date	(0008,0020)	DA	All information can be entered by the operator, or queried from a remote RIS system.	VNAP	IS
Study Time	(0008,0030)	TM		VNAP	IS
Study ID	(0020,0010)	SH		ALWAYS	IS
Accession number	(0008,0050)	SH		VNAP	IS
Referring physician's name	(0008,0090)	PN		VNAP	IS
Study description	(0008,1030)	LO	The description extracted from the source TIF image.	ALWAYS	RAW

8.1.1.1.3. Patient Study

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Age	(0010,1010)	AS	This information is retrieved from an information system. If the age is not present, then this module is not created.	ANAP	IS

#### 8.1.1.1.4. General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"MG"	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	The whole case can be assigned a new created UID, or each image within the case can be assigned a new created UID, which mechanism will be used is configurable.	ALWAYS	AUTO
Series Number	(0020,0011)	IS	The system will create sequential number for the series number	ALWAYS	AUTO

#### 8.1.1.1.5. DX Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"MG"	ALWAYS	AUTO
Presentation Intent Type	(0008,0068)	CS	"FOR PRESENTATION" or "FOR PROCESSING"	ALWAYS	CONFIG

#### 8.1.1.1.6. Mammography Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"MG"	ALWAYS	AUTO

#### 8.1.1.1.7. General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	"Eastman Kodak Company"	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	The software version and manufacturer model from the source TIF image.	ALWAYS	RAW
Software version	(0018,1020)	LO	"DAS x.y" - the version of DAS that processed this case.	ALWAYS	AUTO

#### 8.1.1.1.8. SC Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Conversion Type	(0008,0064)	CS	"DF"	ALWAYS	AUTO

#### 8.1.1.1.9. General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS		ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS	The patient orientation value is set according to <a href="#">8.1.1.1.18</a>	ALWAYS	RAW

Content Date	(0008,0023)	DA		ALWAYS	AUTO
Content Time	(0008,0033)	TM		ALWAYS	AUTO
Image Type	(0008,0008)	CS	"ORIGINAL" for MG images, and "SECONDARY" for SC images	ALWAYS	AUTO

## 8.1.1.1.10. Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	typically 1	ALWAYS	RAW
Photometric Interpretation	(0028,0004)	CS	"MONOCHROME1" or "MONOCHROME2" based on the TIFF file's "PhotoMetric" tag. Typically it is "MONOCHROME2" - minimum sample value is displayed black	ALWAYS	RAW
Rows	(0028,0010)	US		ALWAYS	RAW
Columns	(0028,0011)	US		ALWAYS	RAW
Bits Allocated	(0028,0100)	US	typically 16	ALWAYS	RAW
Bits Stored	(0028,0101)	US	typically 16	ALWAYS	RAW
High Bit	(0028,0102)	US	typically 15	ALWAYS	RAW
Pixel Representation	(0028,0103)	US	0000H (unsigned integer)	ALWAYS	AUTO
Pixel Data	(7fe0,0010)	OW	Typically the pixel data is 16 bit. If the "bits allocated" is 8, then the VR is OB, but this is not expected to occur in practice.	ALWAYS	RAW

## 8.1.1.1.11. DX Anatomy Imaged Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Laterality	(0020,0062)	CS	"L" or "R"	ALWAYS	RAW
Anatomic Region Sequence	(0008,2218)	SQ	(T-04000, SNM3, Breast)	ALWAYS	AUTO

## 8.1.1.1.12. DX Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	"ORIGINAL" for MG images, and "SECONDARY" for SC images	ALWAYS	AUTO
Acquisition Device Processing Description	(0018,1400)	LO	The scan parameters from the source TIF image.	ALWAYS	RAW
Samples per Pixel	(0028,0002)	US	typically 1	ALWAYS	RAW
Photometric Interpretation	(0028,0004)	CS	"MONOCHROME1" or "MONOCHROME2" based on the TIFF file's "PhotoMetric" tag. Typically it is "MONOCHROME2" - minimum sample value is displayed black	ALWAYS	RAW
Bits Allocated	(0028,0100)	US	typically 16	ALWAYS	RAW
Bits Stored	(0028,0101)	US	typically 16	ALWAYS	RAW
High Bit	(0028,0102)	US	typically 15	ALWAYS	RAW
Pixel Representation	(0028,0103)	US	0000H (unsigned integer)	ALWAYS	AUTO
Pixel Intensity Relationship	(0028,1040)	CS	"LOG"	ALWAYS	AUTO
Pixel Intensity Relationship Sign	(0028,1041)	SS	"-1"	ALWAYS	AUTO
Rescale Intercept	(0028,1052)	DS	"0"	ALWAYS	AUTO
Rescale Slope	(0028,1053)	DS	"1"	ALWAYS	AUTO
Rescale Type	(0028,1054)	LO	"US"	ALWAYS	AUTO

Presentation LUT Shape	(2050,0020)	CS	"IDENTITY" if (0028,0004) is MONOCHROME2, or "INVERSE" if (0028,0004) is MONOCHROME1	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	"00" no lossy compression	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS	The patient orientation value is set according to <a href="#">8.1.1.1.18</a>	ALWAYS	RAW
Burned In Annotation	(0028,0301)	CS	"YES" or "NO"	ALWAYS	RAW
Window Center	(0028,1050)	DS		ALWAYS	AUTO
Window Width	(0028,1051)	DS		ALWAYS	AUTO

#### 8.1.1.1.13. DX Detector Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Configuration	(0018,7005)	CS	"SLOT"	ALWAYS	AUTO
Imager Pixel Spacing	(0018,1164)	DS		ALWAYS	RAW

#### 8.1.1.1.14. Mammography Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Positioner Type	(0018,1508)	CS	"MAMMOGRAPHIC"	ALWAYS	AUTO
Image Laterality	(0020,0062)	CS		ALWAYS	RAW
Organ Exposed	(0040,0318)	CS	"BREAST"	ALWAYS	AUTO
Anatomic Region Sequence	(0008,2218)	SQ	(T-04000, SNM3, "Breast")	ALWAYS	AUTO
View Code Sequence	(0054,0220)	SQ	the view code sequence value is set according to <a href="#">8.1.1.1.19</a>	ALWAYS	RAW
View Modifier Code Sequence	(0054, 0222)	SQ	the view modifier code sequence value is set according to <a href="#">8.1.1.1.20</a>	ALWAYS	RAW

#### 8.1.1.1.15. Acquisition Context Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Acquisition Context Sequence	(0040,0555)	SQ		EMPTY	AUTO

#### 8.1.1.1.16. SC Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Date of Secondary Capture	(0018,1012)	DA		ALWAYS	IS
Time of Secondary Capture	(0018,1014)	TM		ALWAYS	IS

#### 8.1.1.1.17. SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UID	Configured to be one of the MG classes, or SC. The possible values are thus: "1.2.840.10008.5.1.4.1.1.1.2.1" (MG for processing)	ALWAYS	CONFIG

			"1.2.840.10008.5.1.4.1.1.1.2" (MG for presentation) "1.2.840.10008.5.1.4.1.1.1.7" (SC)		
SOP Instance UID	(0008,0018)	UID	< a new UID created for this instance >	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	"ISO_IR 100"	ALWAYS	AUTO

**8.1.1.1.18 Patient Orientation**

Patient orientation is set according to the clinical view, as in the following table:

Clinical View	Patient Orientation (Row Orientation / Column Orientation)
RCC, RXCCM, RXCCL, RXCC	P/L
CV, LCC, LXCCM, LXCCL, LXCC	A/R
RMLO	P/FL
RFB	P/R
LFB	A/L
LMLO	A/FR
RML, LLM	P/F
LLMO	P/FR
RLMO	A/FL
LML, RLM	A/F

**8.1.1.1.19 View Code Sequence**

View code sequence is in the following table:

Coding scheme designator	Code Value	Code Meaning	ACR MQCM 1999 Equivalent
SNM3	R-10224	medio-lateral	ML
SNM3	R-10226	medio-lateral oblique	MLO
SNM3	R-10228	latero-medial	LM
SNM3	R-10230	latero-medial oblique	LMO
SNM3	R-10242	cranio-caudal	CC
SNM3	R-10244	caudo-cranial (from below)	FB
SNM3	R-102D0	superolateral to inferomedial oblique	SIO
SNM3	R-102CF	exaggerated cranio-caudal	XCC
SRT	R-1024A	cranio-caudal exaggerated laterally	XCCL
SRT	R-1024B	crani-caudal exaggerated medially	XCCM

**8.1.1.1.20 View modifier code sequence**

View modifier code sequence is in the following table:

			<b>Applies only when View</b>	
--	--	--	-------------------------------	--

Coding scheme designator	Code Value	Code Meaning	ACR MQCM 1999 Equivalent (CIS 4014) is:	ACR MQCM 1999 Equivalent
SNM3	R-102D2	Cleavage	CC or FB	CV
SNM3	R-102D1	Axillary Tail	MLO	AT
SNM3	R-102D3	Rolled Lateral	any	...RL
SNM3	R-102D4	Rolled Medial	any	...RM
SRT	R-102CA	Rolled Inferior	any	...RI
SRT	R-102C9	Rolled Superior	any	...RS
SNM3	R-102D5	Implant Displaced	any	...ID
SNM3	R-102D6	Magnification	any	M...
SNM3	R-102D7	Spot Compression	any	S...
SNM3	R-102C2	Tangential	any	TAN

#### 8.1.1.2. DcmOutput-SR

The DcmOutput-SR adapter generates IOD that conform to the Mammography CAD SR SOP Class. Those objects are exported to the configured remote storage class providers. The following subsections specify the attributes that are contained in these objects.

The following table summarizes the modules that are present in the created IOD.

IE	Module	Reference	Presence of Module
Patient	Patient	<a href="#">8.1.1.2.1</a>	ALWAYS
	Specimen Identification	<a href="#">8.1.1.2.2</a>	ANAP
	Clinical Trial Subject	<a href="#">8.1.1.2.3</a>	ANAP
Study	General Study	<a href="#">8.1.1.2.4</a>	ALWAYS
	Patient Study	<a href="#">8.1.1.2.5</a>	ALWAYS
	Clinical Trial Study	<a href="#">8.1.1.2.6</a>	ANAP
Series	SR Document Series	<a href="#">8.1.1.2.7</a>	ALWAYS
	Clinical Trial Series	<a href="#">8.1.1.2.8</a>	ANAP
Equipment	General Equipment	<a href="#">8.1.1.2.9</a>	ALWAYS
Document	SR Document General	<a href="#">8.1.1.2.10</a>	ALWAYS
	SR Document Content	<a href="#">8.1.1.2.11</a>	ALWAYS
	SOP Common	<a href="#">8.1.1.2.12</a>	ALWAYS

#### 8.1.1.2.1. Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	Passed to output without interpretation from the received value.	VNAP	IMAGES
Patient ID	(0010,0020)	LO		VNAP	IMAGES
Patient's Birth Date	(0010,0030)	DA		VNAP	IMAGES
Patient's Sex	(0010,0040)	CS		VNAP	IMAGES

#### 8.1.1.2.2. Specimen Identification

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specimen Accession Number	(0040,050A)	LO	Passed to output without interpretation from the received value.	ANAP	IMAGES

#### 8.1.1.2.3. Clinical Trial Subject

Attribute Name	Tag	VR	Value	Presence of Value	Source
Clinical Trial Sponsor Name	(0012,0010)	LO	Passed to output without interpretation from the received value.	ANAP	IMAGES
Clinical Trial Protocol ID	(0012,0020)	LO		ANAP	IMAGES

#### 8.1.1.2.4. General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	Passed to output without interpretation from the received value.	ALWAYS	IMAGES
Study Date	(0008,0020)	DA		VNAP	IMAGES
Study Time	(0008,0030)	TM		VNAP	IMAGES
Study ID	(0020,0010)	SH		VNAP	IMAGES
Accession number	(0008,0050)	SH	Passed on if present in the source images.	VNAP	IMAGES
Referring physician's name	(0008,0090)	PN		VNAP	IMAGES
Referring Physician Identification Sequence	(0008,0096)	SQ		ANAP	IMAGES

#### 8.1.1.2.5. Patient Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Admitting Diagnoses Description	(0008,1080)	LO	Passed on if present in the source images.	ANAP	IMAGES
Admitting Diagnoses Code Sequence	(0008,1084)	SQ		ANAP	IMAGES

#### 8.1.1.2.6. Clinical Trial Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Clinical Trial Time Point ID	(0012,0050)	LO	Passed on if present in the source images.	ANAP	IMAGES

#### 8.1.1.2.7. SR Document Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	Passed to output without interpretation from the received value.	ALWAYS	IMAGES
Series Instance UID	(0020,000E)	UI		ALWAYS	IMAGES

#### 8.1.1.2.8. Clinical Trial Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Clinical Trial Coordinating Center Name	(0012,0060)	LO	Passed on if present in the source images.	ANAP	IMAGES

#### 8.1.1.2.9. General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	"Eastman Kodak Company"	ALWAYS	AUTO
Software version	(0018,1020)	LO	"DAS x.y"	ALWAYS	AUTO

#### 8.1.1.2.10. SR Document General Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	1	ALWAYS	AUTO
Completion Flag	(0040,A491)	CS	"PARTIAL"	ALWAYS	AUTO
Verification Flag	(0040,A493)	CS	"UNVERIFIED"	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date and time at which the CAD report is generated	ALWAYS	AUTO
Content Time	(0008,0033)	TM		ALWAYS	AUTO
Performed Procedure Code Sequence	(0040,A372)	SQ	Currently no value set.	EMPTY	AUTO
Current Requested Procedure Evidence Sequence	(0040,A375)	SQ	Full set of Composite SOP Instances created to satisfy the current Requested Procedure(s) for which this SR Document is generated.	ALWAYS	AUTO
>Referenced Series Sequence	(0008,1115)	SQ	Contains references to all images processed by DAS	ALWAYS	AUTO
>> Study Instance UID	(0020,000D)	UI	Unique identify for the study of the images and the SR	ALWAYS	IMAGES
>>> Referenced SOP Sequence	(0008,1199)	SQ	Sequence of Repeating Items where each Item includes the Attributes of a Series containing referenced Composite Object(s).	ALWAYS	AUTO
>>> Referenced SOP Class UID	(0008,1150)	UI	UID of the referenced Digital Mammography X-ray Storage class: 1.2.840.10008.5.1.4.1.1.1.2 or 1.2.840.10008.5.1.4.1.1.1.2.1	ALWAYS	IMAGES
>>> Referenced SOP Instance UID	(0008,1155)	UI	SOP Instance UID of the referenced Digital Mammography Image instance	ALWAYS	IMAGES
>> Series Instance UID	(0020,000E)	UI	UID of the series to which the referenced image belongs	ALWAYS	IMAGES

#### 8.1.1.2.11. SR Document Content Module

The DcmOutput-SR adapter of the Kodak DICOM Adaptor Service (DAS) implements the Mammography CAD SR IOD using Template ID 4000 (DICOM Part 16). The Image Library references all MG images processed for a single case. Single image findings are reported, including Calcification Clusters, Densities, and Breast Geometry outlines. Detections and Analyses are not included in this report.

Attribute Name	Tag	VR	Value	Presence of Value	Source
Value Type	(0040,A040)	CS	"CONTAINER"	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ	(111036, DCM, Mammography CAD Report	ALWAYS	AUTO
Continuity of Content	(0040,A050)	CS	"SEPARATE"	ALWAYS	AUTO
Content Template			Template that describes the content of this		

Sequence	(0040,A504)	SQ	Content Item.	ALWAYS	AUTO
>Mapping Resource	(0008,0105)	CS	"DCMR"	ALWAYS	AUTO
>Template Identifier	(0040,DB00)	CS	"TID 4000"	ALWAYS	AUTO
Content Sequence	(0040,A730)	SQ	Contains the details of the SR information	ALWAYS	AUTO
>Relationship Type	(0040, A010)	CS	HAS CONCEPT MOD	ALWAYS	AUTO
> Value Type	(0040, A040)	CS	CODE	ALWAYS	AUTO
> Concept Name Code Sequence	(0040,A043)	SQ	(121049, DCM, Language of Content Item and Descendants	ALWAYS	AUTO
> Concept Code Sequence	(0040,A168)	SQ	(eng, RFC3066, English)	ALWAYS	AUTO
>Relationship Type	(0040,A010)	CS	CONTAINS	ALWAYS	AUTO
> Value Type	(0040,A040)	CS	CONTAINER	ALWAYS	AUTO
>> Concept Name Code Sequence	(0040,A043)	SQ	(111028, DCM, Image Library	ALWAYS	AUTO
<i>Details from Template ID 4020</i>					
>Relationship Type	(0040,A010)	CS	CONTAINS	ALWAYS	AUTO
> Value Type	(0040,A040)	CS	CODE	ALWAYS	AUTO
>> Concept Name Code Sequence	(0040,A043)	SQ	(111017, DCM, CAD Processing and Findings Summary	ALWAYS	AUTO
<i>Details of Template IDs 4002 and 4003</i>					
>Relationship Type	(0040,A010)	CS	CONTAINS	ALWAYS	AUTO
> Value Type	(0040,A040)	CS	CODE	ALWAYS	AUTO
>> Concept Name Code Sequence	(0040,A043)	SQ	(111064, DCM, Summary of Detections	ALWAYS	AUTO
>> Concept Code Sequence	(0040,A168)	SQ	(111222, DCM, Succeeded or (111224, DCM, "Failed")	ALWAYS	AUTO
>Relationship Type	(0040,A010)	CS	CONTAINS	ALWAYS	AUTO
> Value Type	(0040,A040)	CS	CODE	ALWAYS	AUTO
>> Concept Name Code Sequence	(0040,A043)	SQ	(111065, DCM, Summary of Analyses)	ALWAYS	AUTO
>> Concept Code Sequence	(0040,A168)	SQ	(111225, DCM, Not Attempted)	ALWAYS	AUTO

Note that this follows Mammography CAD Report root template TID 4000. The following templates from DICOM Part 16 are implemented:

- 4000,
- 4001,
- 4003,
- 4006,
- 4008,
- 4015,
- 4017,
- 4019,
- 4020, and
- 4021

#### 8.1.1.2.12. SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UID	1.2.840.10008.5.1.4.1.1.88.50	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UID	< a new UID created for this instance >	ALWAYS	AUTO

Specific Character Set	(0008,0005)	CS	"ISO_IR 100"	ALWAYS	AUTO
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### 8.1.1.3. DcmOutput-OVL

The DcmOutput-OVL adapter generates IOD that conform to either the GSPS or the stand-alone Overlay SOP Class. Those objects are exported to the configured remote storage class providers. The following subsections specify the attributes that are contained in these objects.

The following table summarizes the modules that are present in a created GSPS IOD:

IE	Module	Reference	Presence of Module
Patient	Patient	8.1.1.3.1	ALWAYS
	Clinical Trial Subject	8.1.1.3.2	ANAP
Study	General Study	8.1.1.3.3	ALWAYS
	Patient Study	8.1.1.3.4	ANAP
	Clinical Trial Study	8.1.1.3.5	ANAP
Series	General Series	8.1.1.3.6	ALWAYS
	Clinical Trial Series	8.1.1.3.7	ANAP
	Presentation Series	8.1.1.3.8	ALWAYS
Equipment	General Equipment	8.1.1.3.9	ALWAYS
Presentation state	Presentation State Identification	8.1.1.3.10	ALWAYS
	Displayed Area	8.1.1.3.11	ALWAYS
	Graphic Annotation	8.1.1.3.12	ALWAYS
	Graphic Layer	8.1.1.3.13	ALWAYS
	Softcopy Presentation LUT	8.1.1.3.14	ALWAYS
	SOP Common	8.1.1.3.15	ALWAYS

The following table summarizes the modules that are present in a created stand-alone overlay IOD.

IE	Module	Reference	Presence of Module
Patient	Patient	8.1.1.3.1	ALWAYS
	Clinical Trial Subject	8.1.1.3.2	ANAP
Study	General Study	8.1.1.3.3	ALWAYS
	Patient Study	8.1.1.3.4	ANAP
	Clinical Trial Study	8.1.1.3.5	ANAP
	General Series	8.1.1.3.6	ALWAYS
Series	Clinical Trial Series	8.1.1.3.7	ANAP
Equipment	General Equipment	8.1.1.3.9	ALWAYS
Overlay	Overlay Identification	8.1.1.3.16	ALWAYS
	Overlay Plane	8.1.1.3.17	ALWAYS
	SOP Common	8.1.1.3.18	ALWAYS

#### 8.1.1.3.1. Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	Passed to output without interpretation from the received value.	VNAP	IMAGES
Patient ID	(0010,0020)	LO		VNAP	IMAGES
Patient's Birth Date	(0010,0030)	DA		VNAP	IMAGES
Patient's Sex	(0010,0040)	CS		VNAP	IMAGES

#### 8.1.1.3.2. Clinical Trial Subject Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Clinical Trial Sponsor Name	(0012,0010)	LO	Passed to output without interpretation from the received value.	ANAP	IMAGES
Clinical Trial Protocol ID	(0012,0020)	LO		ANAP	IMAGES

#### 8.1.1.3.3. General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	Passed to output without interpretation from the received value.	ALWAYS	IMAGES
Study Date	(0008,0020)	DA		VNAP	IMAGES
Study Time	(0008,0030)	TM		VNAP	IMAGES
Study ID	(0020,0010)	SH		VNAP	IMAGES
Accession number	(0008,0050)	SH	Passed on if present in the source images.	VNAP	IMAGES
Referring physician's name	(0008,0090)	PN		VNAP	IMAGES
Referring Physician Identification Sequence	(0008,0096)	SQ		ANAP	IMAGES

#### 8.1.1.3.4. Patient Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Admitting Diagnoses Description	(0008,1080)	LO	Passed on if present in the source images.	ANAP	IMAGES
Admitting Diagnoses Code Sequence	(0008,1084)	SQ		ANAP	IMAGES

#### 8.1.1.3.5. Clinical Trial Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Clinical Trial Time Point ID	(0012,0050)	LO	Passed on if present in the source images.	ANAP	IMAGES

#### 8.1.1.3.6. General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"PR"	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	series instance UID of the generated gsps objects	ALWAYS	AUTO
SeriesNumber	(0020,0011)	IS	A number that identifies this Series.	ANAP	AUTO

#### 8.1.1.3.7. Clinical Trial Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Clinical Trial Coordinating Center Name	(0012,0060)	LO	Passed on if present in the source images.	ANAP	IMAGES

## 8.1.1.3.8. Presentation Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	PR (Presentation State)	ALWAYS	AUTO

## 8.1.1.3.9. General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	"Eastman Kodak Company"	ALWAYS	AUTO

## 8.1.1.3.10. Presentation State Identification Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	new created	ALWAYS	AUTO
Content Label	(0070,0080)	CS	a string abbreviation of image side and aspect, like "RCC",	ALWAYS	AUTO
Content Description	(0070,0081)	LO	from the CAD report - typically "Kodak Mammography Algorithms x.y.z"	ALWAYS	AUTO
Presentation Creation Date	(0070,0082)	DA	date when GSPS object was created.	ALWAYS	AUTO
Presentation Creation Time	(0070,0083)	TM	time when GSPS object was created.	ALWAYS	AUTO
Content Creator's Name	(0070,0084)	PN	from the CAD report - typically "Kodak Mammography Algorithms x.y.z"	ALWAYS	AUTO
Referenced Series Sequence	(0008,1115)	SQ	Contains references to all images processed by DAS	ALWAYS	AUTO
>Series Instance UID	(0020,000E)	SQ	UID of the series to which the referenced image belongs	ALWAYS	AUTO
>Referenced Image Sequence	(0008,1140)	SQ	Sequence of Items where each Item provides reference to a selected set of Image SOP Class/SOP Instance pairs	ALWAYS	AUTO
>>Referenced SOP Class UID	(0008,1150)	UI	Uniquely identifies the referenced SOP Class. This is the same for all Images referenced by this presentation state.	ALWAYS	IMAGES
>>Referenced SOP Instance UID	(0008,1155)	UI	Uniquely identifies the referenced SOP Instance	ALWAYS	IMAGES

## 8.1.1.3.11. Displayed Area Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Displayed Area Selection Sequence	(0070,005A)	SQ		ALWAYS	AUTO
>Referenced Image Sequence	(0008,1140)	SQ		ALWAYS	AUTO
>>Referenced SOP Class UID	(0008,1150)	UI	Uniquely identifies the referenced SOP Class. Shall be the same for all Images referenced by this presentation state.	ALWAYS	IMAGES
>>Referenced SOP Instance UID	(0008,1155)	UI	Uniquely identifies the referenced SOP Instance	ALWAYS	IMAGES
>Displayed Area Top Left Hand Corner	(0070,0052)	SL	1/1	ALWAYS	AUTO
>Displayed Area Bottom Right Hand Corner	(0070,0053)	SL	image rows/ columns	ALWAYS	AUTO

>Presentation Size Mode	(0070,0100)	CS	"SCALE TO FIT"	ALWAYS	AUTO
>Presentation Pixel Spacing	(0070,0101)	DS		ALWAYS	AUTO

#### 8.1.1.3.12. Graphic Annotation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Graphic Annotation Sequence	(0070,0001)	SQ		ALWAYS	AUTO
>Referenced Image Sequence	(0008,1140)	SQ		ALWAYS	AUTO
>>Referenced SOP Class UID	(0008,1150)	UI	the referenced source images SOP Class	ALWAYS	IMAGES
>>Referenced SOP Instance UID	(0008,1155)	UI	the referenced source images SOP Instance UID	ALWAYS	IMAGES
>Graphic Layer	(0070,0002)	CS	from the CAD report - typically "Kodak Mammography Algorithms x.y.z"	ALWAYS	AUTO
>Graphic Object Sequence	(0070,0009)	SQ		ALWAYS	AUTO
>>Graphic Annotation Units	(0070,0005)	CS	"PIXEL"	ALWAYS	AUTO
>>Graphic Dimensions	(0070,0020)	US	"2"	ALWAYS	AUTO
>>Number of Graphic Points	(0070,0021)	US		ALWAYS	AUTO
>> Graphic Data	(0070,0022)	FL		ALWAYS	AUTO
>>Graphic Type	(0070,0023)	CS	"POLYLINE", "ELLIPSE", "CIRCLE" or "POINT".	ALWAYS	AUTO
>>Graphic Filled	(0070,0024)	CS	"No"	ALWAYS	AUTO

#### 8.1.1.3.13. Graphic Layer Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Graphic Layer Sequence	(0070,0060)	SQ		ALWAYS	AUTO
>Graphic Layer	(0070,0002)	CS	from the CAD report - typically "Kodak Mammography Algorithms x.y.z"	ALWAYS	AUTO
>Graphic Layer Order	(0070,0062)	IS	"1"	ALWAYS	AUTO
>Graphic Layer Recommended Display Grayscale Value	(0070,0066)	US	"32767"	ALWAYS	AUTO

#### 8.1.1.3.14. Softcopy Presentation LUT Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Presentation LUT Shape	(2050,0020)		"IDENTITY"	ALWAYS	AUTO

#### 8.1.1.3.15. SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.1.1.1	ALWAYS	AUTO

SOP Instance UID	(0008,0018)	UI	new created	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	from image	ANAP	IAMGE

#### 8.1.1.3.16. Overlay Identification Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Overlay Number	(0020,0022)	IS	A number used to identify this standalone overlay. This is used to index the overlays in a standalone overlay object. For example, there can be 3 overlays in a standalone overlay object.	VNAP	AUTO
Overlay Date	(0008,0024)	DA	The date the Overlay was created.	ANAP	AUTO
Overlay Time	(0008,0034)	TM	The time the Overlay was created.	ANAP	AUTO
Referenced Image Sequence	(0008,1140)	SQ		ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)	UI	the referenced source images SOP Class	ALWAYS	IMAGE
>Referenced SOP Instance UID	(0008,1155)	UI	the referenced source images SOP Instance UID	ALWAYS	IMAGE

#### 8.1.1.3.17. Overlay Plane Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Overlay Rows	(60xx,0010)	US	image rows	ALWAYS	IMAGE
Overlay Columns	(60xx,0011)	US	image columns	ALWAYS	IMAGE
Overlay Type	(60xx,0040)	CS	"G"	ALWAYS	AUTO
Overlay Origin	(60xx,0050)	SS	1/1	ALWAYS	AUTO
Overlay Bits Allocated	(60xx,0100)	US	1	ALWAYS	AUTO
Overlay Bit Position	(60xx,0102)	US	0	ALWAYS	AUTO
Overlay Data	(60xx,3000)	OW		ALWAYS	AUTO
Overlay Description	(60xx,0022)	LO	from the CAD report - typically "Kodak Mammography Algorithms x.x.x"	ANAP	AUTO
Overlay Subtype	(60xx,0045)	LO	"AUTOMATED"	ANAP	AUTO
Overlay Label	(60xx,1500)	LO	a string like "RCC-MASS"	ANAP	AUTO

#### 8.1.1.3.18. Standalone Overlay SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	"1.2.840.10008.5.1.4.1.1.8"	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	a new uid created for this instance	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	from image	ANAP	IMAGE

### 8.1.2. Usage of Attributes from received IODs

The DICOM Adapter Service (and/or the CAD engine which it feeds) utilizes the following attributes from the images received (by an instance of the DcmStore adapter):

Module	Attribute Name	Tag ID	Type	Significance
General series	Modality	(0008,0060)	I	Only cases of type MG are accepted and processed (see 4.2.1.1 above).
	Series Instance UID	(0020,000E)	I	Used internally to identify each case that is processed.

DX Positioning	View Code Sequence	(0054,0220)	3	Used for the interpretation of the images in the CAD processing for the case.
DX Detector	Imager Pixel Spacing	(0018,1164)	1	
Mammography Image	Image Laterality	(0020,0062)	1	
	Implant Present	(0028,0013)	3	
Image Pixel	Samples per pixel	(0028,0002)	1	
	Photometric Interpretation	(0028,0004)	1	
	Rows	(0028,0010)	1	
	Columns	(0028,0011)	1	
	Bits Allocated	(0028,0100)	1	
	Bits Stored	(0028,0101)	1	
	High Bit	(0028,0102)	1	
	Pixel Representation	(0028,0103)	1	
Pixel Data	(7FE0,0010)	1		

The DICOM Adapter Service (in particular an instance of the DcmArchive adapter) utilizes the following attributes from the response to a MWL query (from the MWLread adapter):

Module	Attribute Name	Tag ID	Type	Significance
Patient	Patient's Name	(0010,0010)	2	Added to the case meta-data, and then used for subsequent export of the case.
	Patient ID	(0010,0020)	2	
	Patient's Birth Date	(0010,0030)	2	
	Patient's Sex	(0010,0040)	2	
Patient Study	Patient's Age	(0010,1010)	3	
General Study	Study Instance UID	(0020,000D)	1	
	Study Date	(0008,0020)	2	
	Study ID	(0020,0010)	2	
	Accession Number	(0008,0050)	2	
	Referring Physician's Name	(0008,0090)	2	

### 8.1.3. Attribute Mapping

The DICOM Adapter Service (in particular the DcmStore and DcmOutput-SR adapters) does not utilize any external protocols such as HL7, so the mapping of attributes is not applicable (except as already described above).

The first release of DcmArchive obtains its data from a local store (the procedure log), and it does not re-map any of the meta-data found there. The meta-data stored here either is entered manually (using another application provided by Kodak), or is populated using the MWLread adapter (see [8.1.2](#)). Both the manual meta-data entry tool, and the MWLread adapter, map the user visible "case identifier" to one of the meta-data fields (this is configurable).

### 8.1.4. Coerced/Modified fields

The following table lists attributes whose value may be modified on export from DcmOutput-SR and DcmOutput-OVL. - i.e., the element may have a different value in the exported structured report compared to the corresponding element in a received image object.

#### 8.1.4.1 DcmOutput-SR

Module	Attribute Name	Tag ID	Coercion conditions
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SR General content Module	Content Date	(0008,0023)	These are set as the the date and time when the SR is created.
	Content Time	(0008,0033)	
General Series Module	Series instance UID	(0020,000e)	The result of the CAD processing is a new series for the mammography study, and so a new series instance UID is generated to uniquely identify this series.
	Series number	(0020,0011)	The series number is generated as an increment of one on the series number of the input case.
	Modality	(0008,0060)	The modality of the structured report is set as "SR".
General Equipment Module	Manufacturer	(0008,0070)	This is the manufacturer of the system that creates the structured report - so it is set to "Eastman Kodak Company".
	Software version	(0018,1020)	This is set as the version of the DICOM Adapter Service software that generates the SR from the CAD report.
SOP Common Module	SOP class UID	(0008,0016)	This is the SOP class for the mammography CAD structured report, and so it is set to the value "1.2.840.10008.5.1.4.1.1.88.50".
	SOP instance UID	(0008,0018)	This is a created SR, and so it is a new SOP instance. A new SOP instance UID is created to uniquely identify this SOP instance.
	Instance number	(0020,0013)	The instance number of this created SR is set to "1".

#### 8.1.4.1 DcmOutput-OVL

Module	Attribute Name	Tag ID	Coercion conditions
General Series Module	Series number	(0020,0011)	The series number is generated as an increment of one on the series number of the input case.
	Modality	(0008,0060)	The modality for the standalone overlay is "OT", for the GSPS is "PR"
General Equipment Module	Manufacturer	(0008,0070)	This is the manufacturer of the system that creates the overlay or GSPS - so it is set to "Eastman Kodak Company".
	Software version	(0018,1020)	This is set as the version of the DICOM Adapter Service software that generates the standalone overlay or GSPS from the CAD report.
SOP Common Module	SOP class UID	(0008,0016)	The value is "1.2.840.10008.5.1.4.1.1.8" for standalone overlay and "1.2.840.10008.5.1.4.1.1.1.1" for GSPS
	SOP instance UID	(0008,0018)	This is a new created UID for the OVL or GSPS.
	Instance number	(0020,0013)	The instance number is set sequentially from 0.

## 8.2. Data Dictionary of Private Attributes

The DICOM Adapter Service (in particular the DcmOutput-SR, DcmOutput-OVL and DcmArchive adapters) does not place any private attributes in the created SOP Instances.

## 8.3. Coded Terminology and Templates

Support for Coded Terminology and templates shall be described here.

### 8.3.1. Context Groups

The Context Groups defined in DICOM PS 3.16 are used.

No additional Codes or Controlled Terminology are used in the Kodak DICOM Adaptor Service.

No private context groups are used in the Kodak DICOM Adapter Service.

### 8.3.2. Template Specifications

No extensions to templates are used in the Kodak DICOM Adapter Service.

No private templates are used in the Kodak DICOM Adapter Service.

### **8.3.3. Private Code definitions**

No private codes are used in the Kodak DICOM Adapter Service.

## **8.4. Grayscale Image Consistency**

There is no support for the DICOM Grayscale Standard Display function in the DICOM Adapter Service. But when the digitized films are exported as Mammography for presentation images, a LUT can be used to convert the raw data to PValues, which may help the DICOM Grayscale Standard Display function get better image display quality.

## **8.5. Standard Extended/Specialized/Private SOP Classes**

The DICOM Adapter Service does not support any Specialized or Private SOP Classes.

## **8.6. Private Transfer Syntaxes**

The DICOM Adapter Service does not implement any private Transfer Syntaxes.